PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF

ENGINEERING & TECHNOLOGY

ALL BRANCHES

CBCS Syllabus for
First Year B.Tech. (All Branches)
w.e.f.
Academic Year 2020-21

PUNYASHLOK AHILYADEVI HOLKAR

SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF ENGINEERING & TECHNOLOGY

CBCS Curriculum for First Year B.Tech. (All Branches)

W.E.F. 2020-21

- Semester I : Theory Courses

Course Code	***Name of the Course***	***Engagement Hours***			***Credits***	***FA***	***SA***		***Total***
		L	***T***	***P***		***ESE***	***ISE***	***ICA***	
C011/ C012	Engineering Physics / Engineering Chemistry $	3			3	70	30		100
C112	Engineering Mathematics-I	3			3	70	30		100
C113	Basics of Civil and Mechanical Engineering	4			4	70	30		100
C114	Engineering Mechanics	3			3	70	30		100
C115	Universal Human Values	2			2	50			50
C116	Communication Skills	1			1		25		25
	Total	**16**			**16**	**330**	**145**		**475**

- Semester I : Laboratory / Tutorial Courses

Course Code	***Name of the Course***	***Engagement Hours***			***Credits***	***FA***	***SA***		***Total***
		L	***T***	***P***		***ESE***	***ISE***	***ICA***	
C011/ C012	Engineering Physics / Engineering Chemistry $			2	1			25	25
C112	Engineering Mathematics-I		1		1			25	25
C113	Basics of Civil and Mechanical Engineering			2	1			25	25
C114	Engineering Mechanics			2	1			25	25
C116	Communication Skills			2	1			25	25
C117	Creativity & Design Thinking			2	1			50	50
C118	Workshop Practice			2	1			50	50
	Total			**12**	**7**			**225**	**225**
	Grand Total	**16**	**1**	**12**	**23**	**330**	**145**	**225**	**700**
C119	Induction Program	*** Please see note below*							

- Semester II : Theory Courses

Course Code	***Name of the Course***	***Engagement Hours***			***Credits***	***FA***	***SA***		***Total***
		L	***T***	***P***		***ESE***	***ISE***	***ICA***	
C011/ C012	Engineering Physics / Engineering Chemistry $	3			3	70	30		100
C122	Engineering Mathematics - II	3			3	70	30		100
C123	Basic Electrical & Electronics Engineering	3			3	70	30		100
C124	Programming for problem solving	2			2		25		25
C125	Engineering Graphics and CAD	2			2	70	30		100
C126	Professional Communication	1			1		25		25
Total		**14**			**14**	**280**	**170**		**450**

Semester II: Laboratory / Tutorial Courses

Course Code	***Name of the Course***	***Engagement Hours***			***Credits***	***FA***	***SA***		***Total***
		L	***T***	***P***		***ESE (POE)***	***ISE***	***ICA***	
C011/ C012	Engineering Physics / Engineering Chemistry$			2	1			25	25
C122	Engineering Mathematics- II		1		1			25	25
C123	Basic Electrical & Electronics Engineering			2	1			25	25
C124	Programming for problem solving			4	2	50#		50	100
C125	Engineering Graphics and CAD			4	2			50	50
C126	Professional Communication			2	1			25	25
	Total			**14**	**8**	**50**		**200**	**250**
Grand Total		**14**	**1**	**14**	**22**	**330**	**170**	**200**	**700**
C127	Democracy, Elections and Good Governance *					**50**			**50**

- Legends used–

L	Lecture	FA	Formative Assessment
T	Tutorial	SA	Summative Assessment
P	Lab Session	ESE	End Semester Examination
		ISE	In Semester Evaluation
		ICA	Internal Continuous Assessment

- **Notes-**

1. $ - Indicates approximately half of the total students at F. Y. will enroll under Group A and remaining will enroll under Group B.

   Group A will take up course of Engineering Physics (theory & laboratory) in Semester I and will take up course of Engineering Chemistry (theory & laboratory) in semester II.

   Group B will take up course of Engineering Chemistry (theory & laboratory) in Semester I and will take up course of Engineering Physics (theory & laboratory) in semester II.

2. # - Indicates the subject 'Programming for Problem Solving' shall have a University 'Practical and Oral Examination' at the end of the semester assessing student's programming skills.

3. For the Course (C113) Basics of Civil and Mechanical Engineering, Practicals of Basics of Civil Engineering and Basics of Mechanical Engineering will be conducted in alternate weeks.

4. In Semester Evaluation (ISE) marks shall be based upon student's performance in minimum two tests & mid-term written test conducted & evaluated at institute level.

   Internal Continuous Assessment Marks (ICA) are calculated based upon student's performance during laboratory sessions / tutorial sessions.

5. *- Democracy, Elections & Good Governance is mandatory course. The marks earned by student with this course shall not be considered for calculation of SGPA/CGPA. However, student must complete End Semester Examination (ESE) of 50 marks (as prescribed by university) for fulfillment of this course. This course is not considered as a passing head for counting passing heads for ATKT. However, student must pass this subject for award of the degree.

6. Student must complete induction program of minimum five days before commencement of the regular academic schedule at the first semester.

GUIDELINES FOR INDUCTION PROGRAM (C119)

New entrants into an Engineering program come with diverse thoughts, mind set and different social, economic, regional and cultural backgrounds. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose.

An induction program for the new UG entrant students is proposed at the commencement of the first semester. It is expected to complete this induction program before commencement of the regular academic schedule.

Its purpose is to make new entrants comfortable in their new environment, open them up, set a healthy daily routine for them, create bonding amongst the peers as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The Induction Program shall encompass (but not limited to) below activity –

1. Physical Activities
2. Creative Arts
3. Exposure to Universal Human Values
4. Literary Activities
5. Proficiency Modules
6. Lectures by Experts / Eminent Persons
7. Visit to Local Establishments like Hospital /Orphanage
8. Familiarization to Department

Induction Program Course do not have any marks or credits however performance of students for Induction Program is assessed at institute level using below mandatory criteria –

1. Attendance and active participation
2. Report writing

P. A. H. Solapur University, Solapur
First Year B. Tech (All Branches) Semester-I/II

C011 ENGINERING PHYSICS

Teaching Scheme
Theory– 3Hrs. /Week, 3Credits
Laboratory– 2 Hrs./Week,1Credit

Examination Scheme
Theory – ESE- 70Marks
ISE –30Marks
ICA-25Marks

- **Course Objectives:**

C011.O1	To make students understand fundamentals of crystal system, classification of solids depending on energy gap with their electronic properties
C011.O2	To introduce students sound engineering through basic concepts of acoustics and ultrasonic
C011.O3	To make students understand the basic concepts of relativistic mechanics
C011.O4	To make students recall and discuss the concepts of wave optics through diffraction and polarization
C011.O5	To make students comprehend basics, working of laser and optical fiber
C011.O6	To introduce students basic concepts of quantum mechanics and nanotechnology

- **Course Outcomes:**

At the end of this course, students will be able to

C011.1	Describe the concepts of semiconducting material and crystal structure.
C011.2	Apply basic concepts of acoustics and ultrasonic in engineering field.
C011.3	Relate space, time, mass and energy equations.
C011.4	Express the concepts of diffraction, polarization and can relate them to day to day observable phenomena.
C011.5	Explain the fundamental concepts, advantages and applications of laser and optical fiber in the field of science, engineering and medical.
C011.6	Express the basic concepts of quantum mechanics and nanotechnology.

- **Course Curriculum**

Section I

Unit No. 01: Semiconductor Physics		**Hours:05**			**Marks: 12**
Sr.No	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
1.1	Classification of solids, Fermi level (definition), Fermi-Dirac probability distribution function (introduction only)	03	01	Explanation, Definition, Classification	Remembering, Understanding
1.2	Fermi level in intrinsic and extrinsic semiconductors, effect of impurity concentration on Fermi level, derivation for E_{Fin}	09	04	Explanation, Derivation Numerical	Remembering, Understanding Applying
1.3	Hall effect and applications, numerical on this chapter				
Unit No. 02: Crystallography		**Hour :06**			**Marks: 13**
Sr.No	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
2.1	Introduction to crystal systems, characteristics of cubic unit cell: number of atoms per unit cell, atomic radius, co-ordination number	04	02	Explanation, Definition	Remembering, Understanding
2.2	Atomic packing factor, void space, density of crystal, symmetry elements (axis, center and plane), Bragg's Law	04	02	Explanation, Describe, Numerical	Remembering, Understanding
2.3	Miller indices, inter planner distance (by using Miller indices), numericals on this chapter	05	02	Explanation, Derivation, Numerical	Remembering, Understanding, Applying
Unit No. 03: Sound Engineering		**Hours: 06**			**Marks: 13**
Sr.No	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
3.1	Acoustics: Introduction, reverberation, reverberation time, absorption coefficient (definition only), Sabine's formula, basic requirements for acoustically good hall	04	02	Explanation, State Define Numerical	Remembering, Understanding , Applying
3.2	Factors affecting acoustics of auditorium and their remedies, numericals on this chapter	05	02	Explanation, Numerical	Remembering, Understanding,

3.3	Ultrasonic**:** Introduction, piezoelectric effect and magnetostriction effect (introduction), properties of ultrasonic waves, detection methods of ultrasonic waves and applications.	04	02	Explanation, State	Remembering, Understanding , Applying
Unit No. 04: Relativistic Mechanics		**Hours:06**			**Marks:12**
Sr.No	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
4.1	Introduction, postulates of special theory of relativity, Lorentz transformation of space and time, numericals on this chapter	05	02	Explanation, Derive, State Numerical	Remembering, Understanding , Applying
4.2	Length contraction, time dilation,	04	02	Explanation, Derivation, Numerical	Remembering, Understanding, Applying
4.3	Equivalence of mass and energy	04	02	Explanation, Derivation, Numerical	Remembering, Understanding, Applying

Section II

Unit No. 05: Wave Optics		**Hours: 06**			**Marks:13**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
5.1	Diffraction**:** Introduction, resolving power, Rayleigh criterion, theory of diffraction grating and its resolving power.	04	02	Explanation, State Define	Understanding, Applying
5.2	Polarization: concept, optic axis, Malus law, positive and negative crystals	04	02	Explanation, State, Differentiate	Remembering, Understanding, Applying
5.3	Optical activity, specific rotation, Laurent's half shade Polarimeter, Numericals on this chapter	05	02	Explanation, Define Numerical	Remembering, Understanding
Unit No. 06: LASER			**Hours: 06**		**Marks:13**
Sr.No	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
6.1	Interaction of radiation with matter-Stimulated absorption, spontaneous and stimulated emission, population inversion, pumping, metastable state, properties of laser	04	02	Explanation , State, Define	Remembering, Understanding

6.2	He-Ne gas laser Holography (construction and reconstruction), applications of laser (science, engineering and medical),	09	04	Explanation, Describe	Remembering, Understanding
6.3				Explanation	Remembering, Understanding, Applying
Unit No. 07: Optical Fibers				**Hours: 05**	**Marks:12**
Sr.No	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
7.1	Introduction, structure of optical fiber, basic principle of optical fiber (total internal reflection)	03	01	Explanation, State,	Remembering, Understanding
7.2	Derivation for acceptance angle, acceptance cone and numerical aperture, fractional refractive index change, numericals on this chapter	05	02	Define, Derive, Numerical	Remembering, Understanding, Applying
7.3	Classification of optical fibers- single mode and multi-mode fiber, step index and graded index fibers, advantages of optical fibers over conducting wires	05	02	Explanation, Classify	Remembering, Understanding
Unit No. 08: Introduction to Quantum Mechanics and Nanotechnology			**Hours:05**		**Marks: 12**
Sr.No	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
8.1	De Broglie hypothesis, De Broglie wavelength of matter waves: in terms of kinetic energy and associated with particle in thermal equilibrium, properties of matter waves	05	02	Explanation , Numerical	Remembering, Understanding, Applying
8.2	Davisson-Germer experiment (apparatus, investigations and analysis), numericals on this chapter Nanotechnology: introduction, carbon Nanotubes and its classification, applications of nanotechnology- electronics, energy, automobiles, space and defense, medical, environmental, textile, cosmetics	07	03	Explanation , Numerical	Remembering, Understanding, Applying
8.3				Define, State, Classify	

- **In Semester Evaluation (ISE):**

  In Semester Evaluation (ISE) marks shall be based upon student's performance in minimum two tests & mid-term written test conducted & evaluated at institute level.

- **Internal Continuous Assessment (ICA):**
  *Internal Continuous Assessment (ICA) marks are calculated based on student's performance during laboratory sessions (minimum **eight** experiments out of below list).*

1. Measurement of band gap energy of a semiconductor diode.
2. To determine Hall coefficient and charge carrier concentration by Hall Effect.
3. Study of Crystal structures.
4. Determination of velocity of sound using Kundt's tube apparatus.
5. Determination of wavelength of light by using diffraction grating.
6. Resolving power of a telescope/ diffraction grating.
7. Verification of inverse square law of intensity of light (Malus law).
8. To determine specific rotation by using Laurent's Half Shade Polarimeter.
9. Calculation of divergence of LASER beam.
10. Determination of wavelength of LASER using diffraction grating.
11. Determination of inter-planar distance'd' using XRD pattern.
12. Study of Fiber optics.
13. To determine the Numerical Aperture of the optical fiber.

- **Text / Reference Books:**

1. Engineering Physics, R.K. Gaur and S.L. Gupta, Dhanapat Rai Publications
2. A Text Book of Engineering Physics, M.N. Avadhanulu, P.G. Kshirsagar, S. Chand and Company Ltd.
3. Modern Physics, B.L. Theraja, S. Chand and Company Ltd.
4. A Text Book of Optics, Subramanya and BrijLal, S. Chand and Company Ltd.
5. Nanotechnology: Principles and Practices, Sulabha K. Kulkarni, Capital Publishing Company
6. Nanoscience and Nanotechnology: Fundamentals to Frontiers –M.S. Ramachandra Rao, Shubra Singh, Wiley India Pvt Ltd, New Delhi
7. Engineering Physics, D.K. Bhattacharya, Poonam Tandon, Oxford University Press
8. Solid State Physics, S.O. Pillai, McGraw Hill Publications.

P. A. H. Solapur University, Solapur
First Year B. Tech (All Branches) Semester-I/II

C012 ENGINERING CHEMISTRY

Teaching Scheme
Theory– 3Hrs. /Week, 3Credits
Laboratory– 2 Hrs./Week,1Credit

Examination Scheme
Theory – ESE- 70Marks
ISE –30Marks
ICA-25Marks

- **Course Objectives:**

C012.O1	To impart knowledge of importance of quality of water and appropriate water treatment process
C012.O2	To impart knowledge of corrosion & its prevention techniques
C012.O3	To equip students with the required analytical skills
C012.O4	To introduce students different engineering materials and their applications
C012.O5	To make students apply knowledge for determining quality of water, fuel, Polymer& oils
C012.O6	To introduce students to different energy storage systems and cells

- **Course Outcomes:**

At the end of this course, students will able to

C012.1	Describe importance of quality of water and appropriate water treatment process.
C012.2	Recognize various types of corrosion & propose a suitable prevention technique.
C012.3	Describe various instrumental techniques.
C012.4	Identify and explain different engineering materials like metals, ceramics, fuels, lubricants, polymers for various engineering and day to day applications.
C012.5	Calculate hardness of water, concentration of unknown solution, calorific value of fuels, saponification & acid value of oils, molecular weight of polymers etc.
C012.6	Describe various types of energy storage systems with their applications.

- **Course Curriculum**

Section I

Unit No. 01: Water Chemistry		**Hours :07**			**Marks: 16**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
1.1	Introduction, water quality parameters like pH, acidity, alkalinity, total solids, Dissolved oxygen, chlorides (definitions & permissible limits as per BIS), BOD, COD, (Definition, Determination &Significance).	3	1	Explanation	Understanding remembering
1.2	Hardness: types of hardness (temporary/ permanent), Calcium carbonate equivalent hardness and its calculations. (Numerical problems on hardness),	4	2	Explanation, numerical	Remembering, understanding, applying
1.3	Scale and sludge in boilers: Formation, disadvantages and prevention. Softening of water by Ion exchange process and reverse osmosis process.	5	2	Explanation	Understanding, remembering
1.4	Treatment of water for domestic purpose by aeration, sedimentation with coagulation process. Disinfection of water by chloramine, bleaching powder, chlorine and ozone.	4	2	Explanation, applications	Remembering, understanding

Unit No. 02: Energy Storage system		**Hours :04**			**Marks: 08**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
2.1	Introduction and Overview, Basic Principles of electrochemistry, Batteries –Characteristics, Li-ion Batteries, Fuel cell-Principle, Component of Fuel Cell	4	2	Explanation	Remembering, understanding
2.2	Various types of Fuel Cell AFC, PEFMC, methanol Based Fuel Cell and their applications, Hydrogen Production and hydrogen Storage System	4	2	Explanation, applications	Remembering, understanding

Unit No. 03: Lubricants		**Hours: 05**			**Marks:13**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
3.1	Lubricants & lubrication, functions, classification of lubricants: Solid, semisolid and liquid.	3	1	Explanation	Remembering, understanding
3.2	Characteristic properties of lubricants (only definition) such as viscosity, viscosity index, flash point & fire point, cloud point & pour point, aniline point, oiliness, saponification value & acid value (numerical problems on saponification & acid value)	5	2	Explanation, numerical	Remembering, understanding, applying
3.3	Types of lubrication such as fluid film, boundary (thin film) and extreme pressure. Selection of lubricants for cutting tools, I.C. engine, gears, transformers, delicate instruments & refrigeration system.	5	2	Explanation application	Remembering, understanding

Unit No. 04: Corrosion		**Hours :06**			**Marks:13**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
4.1	*Corrosion:* definition, classification *Dry corrosion*: oxidation corrosion: nature of oxide film. *Wet corrosion* – electrochemical corrosion: Hydrogen evolution mechanism, oxygen absorption mechanism.	5	2	Explanation	Remembering, understanding
4.2	Factors influencing corrosion, testing and measurement of corrosion by weight loss method and electrical resistance method	4	2	Explanation	Remembering, understanding
4.3	*Prevention of corrosion by: cathodic*protection, anodic protection by anodizing and potentiostat. *Protective coatings*: methods of application of metal coatings such as hot dipping (galvanization &tinning), metal cladding.	4	2	Explanation	Remembering, understanding

Section II

Unit No. 05: : Metals, Alloys & Ceramics		**Hours :05**			**Marks:10**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
5.1	*Metallic Materials:* types of iron: cast iron, steel and wrought iron: composition, properties and applications. Alloys: definition, purposes of making alloys.	4	2	Explanation, application	Remembering, understanding
5.2	*Ceramics:* definition, classification, properties. *Glass:* general properties, general method of manufacture of glass, types of glasses: soft, hard,borosilicate, optical, laminated and safety glass.	6	3	Explanation, application	Remembering, understanding

Unit No. 06: Fuels		**Hours:07**			**Marks:15**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
6.1	Introduction, classification, characteristics of good fuel, comparison between solid, liquid and gaseous fuel, calorific value (gross and net),	4	2	Explanation,	Remembering, understanding,
6.2	Determination of calorific value by bomb calorimeter and Boy's calorimeter. Dulong's formula for calorific value. (numerical problems on calorific value.)	7	3	Explanation, Application, Numerical	Remembering, understanding, Applying
6.3	Petroleum: introduction, composition, classification, origin, refining of crude oil. *Biodiesel:* Introduction, preparation, advantages and disadvantages.	4	2	Explanation	Remembering, understanding

Unit No. 07: Polymers		**Hours :07**			**Marks:16**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
7.1	Polymerization, types of polymerization (no mechanism), degree of polymerization (DP), numerical problems on degree of polymerization, number average molecular weight (definitions and numerical problems)	5	2	Explanation, application, numerical	Remembering, understanding, applying
7.2	*Plastics:* definition, properties, types of plastics (thermo softening and thermosetting), properties and applications of PVC and PET, molding of plastic into articles: compression, extrusion and injection.	5	2	Explanation, application	Remembering, understanding

7.3	*Rubber:* Classification, isolation of natural rubber, vulcanization, properties and applications of Buna-S and Thiokol rubbers. *Biodegradable Polymers:* Introduction, examples with applications.	6	3	Explanation, application	Remembering, understanding
Unit No. 08: Modern Analytical Techniques		**Hours:04**			**Marks:09**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
8.1	*Concentration of solution-*: molarity, normality, mole fraction (definition and numerical problems),	4	2	Explanation, application, numerical	Remembering, understanding, applying
8.2	*Chromatography:* definition, types. *GLC:* definition, instrumentation and application of GLC. *Thermal analysis:* definition of TGA, instrumentation and application of TGA.	5	2	Explanation	Remembering, understanding

- **In Semester Evaluation (ISE):**
  ISE shall be based upon student's performance in minimum two tests & mid-term written test conducted & evaluated at institute level

- **Internal Continuous Assessment (ICA):**
  *ICA shall be based on minimum **Eight** experiments out of below list*

1. Determination of Hardness of water.
2. Determination of Alkalinity of water.
3. Determination of Chloride content in given water.
4. Determination of dissolved oxygen in water.
5. Determination of viscosity of a lubricant by Ostwald's viscometer.
6. Estimation of Copper in Bronze metal alloy.
7. Preparation of phenol formaldehyde resin.
8. Preparation of urea Formaldehyde resin.
9. Determination of COD of water sample.
10. Separation of mixture of organic compounds by TLC.
11. Determination of oil and grease from waste water.
12. Hands on Determination of pH by pH meter.
13. Hands on Determination of EMF of acid base titration by potentiometer.

- **Text Books:**

1. A text book of Engineering Chemistry, S.S. Dara, S SUmare, SChand
2. A text book of Engineering Chemistry, ShashiChawala, Dhanpat Rai&Co
3. A text book of Experiments and Calculations in Engineering Chemistry, S.S. Dara. S Chand

- **Reference Books:**

1. Engineering Chemistry, Jain and Jain, Dhanpat Rai& Co
2. Engineering Chemistry, M. Subha Ramesh, Dr. S. Vairan-Ed.-IInd Wiley
3. Instrumental Methods of chemical analysis, Chatwal and Anand, Himalaya Pub House
4. Industrial Chemistry, B.K. Sharma, Goyal
5. Chemistry for Engineers, Rajesh Agnihotri, Wiley
6. Fundamentals of Engineering Chemistry, S.K.Singh, New AgeInt.
7. Engineering Chemistry (NPTEL Web book), B. L. Tembe, Kamaluddin& M. S.Krishnan.
8. Fuel Cells-Shripad Revankar, Pradeep Majumdar
9. Fuel Cell Fundamentals-Ryan O'Hayre, Suk-Won Cha, Johnwiley& Sons
10. Recent trends in Fuel Cell Science and Technology-Suddhasatwa Basu,Anamaya Publishers, NewDelhi.

P. A. H. Solapur University, Solapur

First Year B. Tech (All Branches) Semester-I

C112 ENGINEERING MATHEMATICS - I

Teaching Scheme
Theory– 3Hrs. /Week, 3 Credits
Tutorial– 1 Hrs./Week,1Credit

Examination Scheme
Theory – ESE- 70Marks
ISE- 30Marks
ICA-25Marks

- **Course Objectives:**

C112.O1	To introduce the students to higher order derivatives of various standard functions and Mean Value Theorems.
C112.O2	To introduce the students to the expansion of functions about any point and to evaluate the indeterminate forms of limits.
C112.O3	To introduce the students to rank of matrix, solution of simultaneous equations, Eigen values and Eigen vectors.
C112.O4	To introduce the student to Multivariable differentiation and its applications.
C112.O5	To introduce the student to vector differentiation and applications.

- **Course Outcomes:**

At the end of this course, students will be able to

C112.1	Compute higher order derivative of standard functions and verify Mean Value Theorems.
C112.2	Describe the power series expansion of a given function and evaluate limits
C112.3	Apply matrices techniques for solving system simultaneous linear equations, Eigen values and Eigen vectors of the matrix
C112.4	Evaluate Multivariable derivatives and can implement to estimate maxima and minima of multivariable function
C112.5	Compute velocity vector, gradient, divergence, curl and applications.

- **Course Curriculum**

Section I

Unit No. 01: Successive Differentiation and Mean Value Theorems			**Hours : 06**		**Marks: 13**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
1.1	Definition & symbol, nth derivatives of standard functions like $e^{ax}, \frac{1}{ax+b}, (ax+b)^m, \frac{1}{(ax+b)^m}, \log(ax+b), \sin(ax+b), \cos(ax+b), a^x, e^{ax}Sin(bx+c)$ and $e^{ax}\cos(bx+c)$	01	01	Definition	Remembering
1.2	n^{th}derivatives of algebraic functions, n^{th}derivatives of functions belongs to polar form	03	01	Determination of n^{th} order derivative	Remembering, understanding, applying
1.3	Statement of Leibnitz's Theorem (without proof), nth derivative of product of two functions by Leibnitz theorem, formation of higher order differential equations for the given functions,	06	03	Determination of n^{th} order derivative	Remembering, understanding, applying
1.4	Mean Value Theorem (MVT) (Without Proof) : Rolles MVT, Lagranges MVT, Cauchys MVT	03	01	Verification, finding value of Constant	Remembering, understanding, applying
Unit No. 02: Expansion of Functions and Indeterminate forms			**Hours : 07**		**Marks: 19**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
2.1	Statement of Maclaurin's series (without proof), expansion of standard functions and examples using Maclaurin's series. Expansion of functions by standard series method, differentiation and integration, method of substitution.	08	03	Numerical example, evaluate	Remembering, understanding, applying
2.2	Statement of Taylor's series (without proof), expansion of functions *f(x)* about any point	03	01	Numerical example, evaluate	Remembering, applying

2.3	Indeterminate forms of the type $\frac{0}{0}, \frac{\infty}{\infty}, 0\times\infty, \infty-\infty, 1^{\infty}, 0^{0}, \infty^{0}$ *by* L_{ϵ} Hospital's rule.	08	03	Evaluate, applications	Understanding, applying

Unit No 03: Matrices			**Hours : 09**		**Marks: 20**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
3.1	Definition of Symmetric, Skew-Symmetric and orthogonal Matrices, Rank of matrix, canonical form or normal form of matrix	03	01	Numerical example, evaluate	Remembering, understanding
3.2	System of Simultaneous Linear Equations - homogeneous and non-homogeneous	05	02	Numerical example, evaluate	Understanding, applying
3.3	Linear dependence and independence of vectors, Cayley - Hamilton Theorem (without proof) Inverse by Cayley Hamilton Theorem	06	03	Definition application	Understanding, applying
3.4	Eigen values , Eigen vectors and their properties	06	03	Definition , determination	Remembering, understanding, applying

Section II

Unit No.04: Multivariable Differential Calculus		**Hours: 09**		**Marks: 18**	
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
4.1	Partial(Multivariable) derivatives of first and higher order , variable to be treated as constant	06	03	Evaluate	Remembering, understanding
4.2	Total derivative, Partial(Multivariable) differentiation of composite function	06	03	Determination	Remembering, understanding,
4.3	Homogeneous functions and Euler's Theorem (without proof)	06	03	Applications	Remembering, applying

Unit No. 05 : Applications of Multivariable Differential Calculus			**Hours : 07**		**Marks: 17**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
5.1	Jacobians, properties of Jacobians i.e., $J.J^{*}=1$, Jacobians of composite functions	05	02	Definition, applications	Remembering, understanding, applying
5.2	Errors and approximations	03	01	Application, numerical example, evaluate	Remembering, understanding, applying
5.3	Maxima & minima of functions of two variables	06	03	Definition, applications	Remembering, understanding, applying
5.4	Lagrange's method of Undetermined multipliers (one condition)	03	01	applications	Understanding, applying
Unit No. 06: Vector Differential Calculus			**Hours : 07**		**Marks: 17**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
6.1	Velocity vector, acceleration vector, tangential and normal component of acceleration	03	01	Evaluate	Remembering, understanding,
6.2	Vector differential operator, gradient, directional derivatives, angle between surfaces,	07	03	Evaluate/ numerical	Understanding, applying
6.3	Divergence and curl, solenoidal and irrotational field	07	03	Evaluate/ apply Standard results	Understanding, applying

- **In Semester Evaluation (ISE):**
  ISE shall be based upon student's performance in minimum two tests & mid-term written test conducted & evaluated at institute level

- **Internal Continuous Assessment (ICA):**
  ICA shall be based on student's performance during tutorial sessions and on completion of minimum six assignments assignment

- **Text Books:**

1. A Text Book of Applied Mathematics, P.N. and J.N. Wartikar, Vol.1, Pune VidyarthiGrihaPrakashan.
2. Advanced Engineering Mathematics, H. K. Dass, S. Chand Publications, Delhi.
3. Engineering Mathematics (Volume I), ITL Education, Cengage Learning.
4. Engineering Mathematics, Ravish R Sing and Mukul Bhatt, McGraw Hill.
5. Applied Mathematics-I,II, Kreyzig's, Wiley.
6. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications,2008

- **Reference Books**:

1. Higher Engineering Mathematics (42nd Edition), B.S. Grewal Khanna Publications ,Delhi.
2. Engineering Mathematics, Srimanta Pal and Subodh C. Bhunia, Oxford HigherEducation.
3. Mathematics for Engineering Applications, Kuldip S. Rattan and Naathan W. Klingbeil Wiley. (Modeling and Core Engineering Application)
4. Higher Engineering Mathematics, Ramana B.V., Tata McGraw Hill New Delhi,2010.

P. A. H. Solapur University, Solapur
First Year B. Tech (All Branches) Semester-I

C113 BASICS OF CIVIL AND MECHANICAL ENGINEERING

Teaching Scheme
Theory– 4Hrs. /Week, 4 Credits
Laboratory – 2 Hrs./Week,1Credit

Examination Scheme
Theory – ESE- 70Marks
ISE –30Marks
ICA-25Marks

- **Course Objectives:**

C113.O1	To describe the relevance of Civil Engineering for various applications in different branches of Engineering and Technology
C113.O2	To enable the students to carry out simple surveys using traditional and modern surveying instruments, and introducing them to Remote sensing, GIS and GPS Technology
C113.O3	To introduce the students to the important concepts from Environment & Water Resources Engineering, Transportation engineering, Buildings elements and 'Green' Buildings.
C113.O4	To introduce the students' to thermodynamic processes.
C113.O5	To introduce the students to 2-stroke and 4-stroke IC Engines
C113.O6	To introduce the students to power producing and power absorbing devices

- **Course Outcomes**:

At the end of course, students will be able to

C113.1	Describe the role of civil engineer in the development and the relevance of civil engineering knowledge with the other branches of engineering and technology.
C113.2	Carry out simple surveys like measurement of distances, elevations and angles using traditional and modern surveying instruments, as well as they will be conversant with the Remote sensing, GIS and GPS Techniques.
C113.3	Explain various concepts of Environment & Water resources management, Transportation engineering, Buildings elements and Green Buildings.
C113.4	Determine the heat and work quantum in thermodynamic processes.
C113.5	Distinguish between 2-stroke and 4-stroke I.C. engines.
C113.6	Distinguish and select the type of power plants and power producing/absorbing systems.

- **Course Curriculum**

Section-I

BASICS OF CIVIL ENGINEERING

Unit No. 01: Introduction to Civil Engineering		**Hours:08**			**Marks: 13**
Sr.No	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
1.1	Definition and various sub domains of Civil engineering.	13	8	Explanation	Remembering understanding
1.2	Relevance of the Civil Engineering branch with the other branches of engineering and technology			Explanation	Remembering understanding
1.3	Role of civil engineer in various construction activities and development			Explanation	Remembering, understanding
1.4	General principles of Surveying, Classification of surveying, Measurement of horizontal distances, Leveling using dumpy level/auto level			Explanation Calculation	Remembering, understanding Applying

Unit No. 02 Surveying Remote Sensing and GIS		**Hours : 07**			**Marks: 12**
Sr.No	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
2.1	Angular measurements using Compass & Theodolite, Demonstration of 'Total Station'	12	7	Definition, explanation Calculation	Remembering, understanding Applying
2.2	Fundamentals of 'Remote sensing' and its application in various fields			Explanation	Remembering, understanding
2.3	Geo Informatics: Introduction to Geographic Information system (GIS), Fundamentals of Global Positioning System (GPS), Demonstration of GPS meter.			Explanation	Remembering, understanding

Unit No. 03: Building Elements , Green Buildings & Modern Building Services		**Hours : 08**			**Marks: 13**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
3.1	General idea about substructure, super structure, Elements of a building (Foundation, Column, beam, plinth, lintel, chajja, roof, parapet, spout etc.) and their functions	13	8	Definition, explanation	Remembering, understanding
3.2	Superstructure: Principle of load transfer, frame structures, load bearing wall structures.			Definition, explanation	Remembering, understanding
3.3	Green Buildings: Concept , Principles of Planning and construction of green building			Explanation	Remembering, understanding
3.4	Heating, ventilation, and air conditioning. Elevators, escalators and ramps (Civil Engineering aspects only), Fire safety for buildings.			Explanation	Remembering, understanding

Unit No. 04: Environmental Engineering, Water Resources Engg. & Infrastructure		**Hours :7**			**Marks: 12**
Sr.No	*Subunit*	*Marks*	*Hours*	Assessment	Bloom's Level
4.1	Environmental Engineering: Water treatment systems; Effluent treatment systems; Solid waste management. Sustainable development, Calculation of carbon emission	12	7	Definition, Explanation	Remembering, understanding
4.2	Sources of water, Hydrology, Dams and storage reservoirs.			Definition, Explanation	Remembering, understanding
4.3	Various modes of transportation, Roads , Railways Bridges, Tunnels, Docks, Harbours. Introduction to roads: IRC classification, Typical functional cross sections. Introduction to 'Intelligent transport systems'- Interdisciplinary applications.			Explanation	Remembering, understanding

Section-II
BASICS OF MECHANICAL ENGINEERING

Unit No.05:Thermodynamics		**Hours :08**			**Marks:16**
Sr.No	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
5.1	Definition of thermodynamics, thermodynamic Systems, surrounding, universe, types of systems, state of system, properties- intensive and extensive, thermodynamic equilibrium, process and cycle, Zeroth Law of thermodynamics	04	02	Explanation	Remembering understanding
5.2	Work and forms of work, heat, first law of thermodynamics, first law applied to flow processes, steady flow process, steady flow energy equation (SFEE), (numerical on first law of thermodynamics, cyclic and non-cyclic processes, SFEE) Limitations of first law, Kelvin Plank and Clausius statements of second law of thermodynamics.	12	06	Explanation, derivations, numerical on P-V relations, work done and SFEE applications	Remembering, understanding, applying

Unit No. 06: Refrigeration and Air Conditioning		**Hours :02**			**Marks: 04**
Sr.No	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
6.1	Refrigeration: definition of refrigeration, Vapour compression refrigeration cycle (VCRS), domestic refrigerator, air conditioning: window air conditioner, split air conditioner.	04	02	Explanation	Remembering, understanding

Unit No. 07: Pumps, Compressors & Turbines		**Hours :04**			**Marks: 08**
Sr.No	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
7.1	Power absorbing devices Pumps: definition, classification, construction, working and applications of reciprocating pump, centrifugal pump. compressors: construction, working and applications of reciprocating compressor, rotary compressors (vane blower) Power producing devices Turbines: construction, working and applications of Pelton wheel, Francis and Kaplan turbines	8	4	Definition, explanation	Remembering Understanding

Unit No. 08: Power Plants		**Hours: 06**			**Marks:08**
Sr. No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
8.1	Thermal power plant, site selection criteria, advantages, disadvantages	04*	02	Explanation	Remembering Understanding
8.2	Hydroelectric power plant, site selection criteria, advantages, disadvantages	04*	02	Explanation	Remembering, understanding
8.3	Nuclear power plant, BWR, PWR, site selection criteria, advantages, disadvantages	04*	02	Explanation	Remembering, understanding,
** Question will be based on any two subunits.*					

Unit No. 09: Internal Combustion Engines		**Hours :07**			**Marks: 14**
Sr. No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
9.1	Definition, classification, components of IC Engine	04	02	Explanation	Remembering understanding
9.2	Two stroke, four stroke engines, SI and CI Engines	04	02	Comparison, explanation	Remembering, understanding
9.3	Otto and diesel cycles, thermal efficiency of Otto, diesel air standard cycle (numerical treatment)	06	03	Explanation numerical on Otto and diesel cycle	Remembering, understanding, Applying

- **In Semester Evaluation (ISE):**

  ISE shall be based upon student's performance in minimum three tests conducted and evaluated at institute level.

- **Internal Continuous Assessment (ICA):**

Section-I

The ICA shall consist of any 6 Practicals / Demonstrations from the following list:

1. Measurement of Horizontal Distances and offsetting.
2. Study and Use of Dumpy level/Auto Level for Determination of difference in Elevations.
3. Study and Use of Theodolite for angular measurements.
4. Demonstration of 'Total Station' for distance measurement, Level determination and coordinate calculations.
5. Determination of 'coordinates' of a survey stations on Earth by using GPS meter.
6. Use of Geographic Positioning System (GPS) for tracking and navigation.
7. Demonstration of remotely sensed satellite image and aerial photograph.
8. Assignment on Calculation of 'Carbon footprints' of household appliances by using 'Carbon footprint calculator.

**Note:*

1. Practicals of Basics of Civil Engineering and Basics of Mechanical Engineering will be conducted in alternate weeks.
2. As a part of the completion of ICA, student shall submit separate completed Journals and drawings at the end of the course.

Section-II

*ICA shall be based on minimum **six** experiments out of below list*

1. Study of domestic refrigerator
2. Study of split airconditioner
3. Study of 2 stroke engine
4. Study of 4 stroke engine
5. Study of pumps
6. Study of compressors
7. Demonstration of turbines
8. Demonstration of Power Plant equipments.

- **Text Books for Basics of Civil Engineering:**

1. Elements of Civil Engineering, S. S. Bhavikatti, New Age International Publishers.
2. Building Construction and Drawing, Bindra and Arora, Dhanpat Rai Publications
3. Essentials of Civil Engineering, Rangwala, S. C, Charotar Publishing House
4. Basics of Remote Sensing & GIS, S. Kumar, University Sc. Press

- **Reference Books for Basics of Civil Engineering:**

1. Manual on Green Building, Kolhatkar.
2. Energy-efficient buildings in India, MiliMajumdar, TERI Press.
3. Construction Technology, Vol. I to IV, Chudley, R, Longman group, England Course Plan.
4. Mamlouk, M. S., and Zaniewski, J. P., Materials for Civil and Construction Engineering, Pearson Publishers

- **Text Books for Basics of Mechanical Engineering:**

1. Thermal Engineering, P.L. Ballaney, Khanna Publishers
2. Thermal Engineering, Domkundwar, Kothandaraman, Domkundwar, Dhanpat Rai & Co

- **Reference Books for Basics of Mechanical Engineering:**

1. Engineering Thermodynamics, P K Nag, The Tata McGraw-Hill Companies
2. Mechanical Engineering Design, Joseph E Shigley, Charles R Mischke, The Tata McGraw- Hill Companies.

P. A. H. Solapur University, Solapur

First Year B. Tech (All Branches) Semester-I

C114 ENGINEERING MECHANICS

Teaching Scheme	**Examination Scheme**
Theory– 3Hrs. /Week, 3 Credits	**Theory – ESE**- 70Marks
Tutorial – 2 Hrs./Week,1Credit	**ISE** –30Marks
	ICA-25Marks

- **Course Objectives:**

C114.O1	To impart knowledge of basic phenomena in Engineering Mechanics and to lay a foundation for its Engineering applications by studying Statics and Dynamics
C114.O2	To develop scientific approach amongst the students towards analysis and design of various structural elements
C114.O3	To enable problem solving abilities and inculcate experimental, observational, and investigatory skills amongst the learners
C114.O4	To prepare the student for higher level courses in analysis and design of Engineering structures

- **Course Outcomes:**

At the end of this course, the student will be able to:

C114.1	Apply fundamentals of Engineering Mechanics for analyzing effects of a system forces acting on a rigid body.
C114.2	Analyze various types of statically determinate beams, pin jointed trusses by analytical and graphical methods.
C114.3	Locate centroid and centre of Gravity and calculate moment of Inertia of plane lamina.
C114.4	Apply knowledge of Kinematics and Kinetics of rigid body motion to solve problems of bodies in motion.
C114.5	Use Work Energy methods for analyzing linear and rotational motion.

- **Course Curriculum**

Section I

Unit No. 01: Resultant of coplanar forces		**Hours : 05**			**Marks: 10**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
1.1	Basic units, SI units, body, rigid body, particle, scalar quantities, vector quantities, Idealization of engineering problems, force, law of transmissibility of force, moment of a force, couple, moment of a couple, resultant, parallelogram law of forces, triangle law of forces, polygon law of forces. Varignon's theorem	04	02	Definition, explanation, derivations	Remembering, understanding, applying, analyzing
1.2	Composition of co-planar concurrent and non-concurrent forces: analytical method, graphical method, Bow's notation.	06	03	Explanation, derivations, numerical examples	Remembering, understanding, applying

Unit No. 02: Equilibrium of Rigid Bodies		**Hours : 07**			**Marks: 16**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
2.1	Equilibrium of co-planar forces, analytical and graphical conditions of equilibrium, different type of supports, free body diagrams, Lami's theorem	05	02	Definition, explanation, derivations, numerical examples	Remembering, understanding, applying
2.2	Friction, types of friction, limiting friction, laws of Friction, Static and Dynamic friction, inclined planes, ladders, support reactions of statically determinate beams with point loads, inclined loads, uniformly distributed load, uniformly varying loads and couples.	09	04	Definition, explanation, derivations, numerical examples	Understanding, applying, analyzing
2.3	Principle of virtual work (concept only), introduction to forces in space.	02	01	Explanation	Remembering, understanding

Unit No. 03: Analysis of Pin-Jointed Plane Frames			**Hours:06**		**Marks:12**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
3.1	Pin-jointed statically determinate plane trusses-perfect frames, assumptions, determination of nature and magnitude of a force in a member, simple trusses; zero force members.	04	02	Definition, explanation	Understanding, applying, analyzing
3.2	Analysis of trusses by method of joints, method of sections and graphical method.	08	04	Explanation, numerical examples	Applying, analyzing
Unit No. 04: Center of Gravity and Moment of Inertia				**Hours :05**	**Marks:11**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
4.1	Centre of gravity, centroid of a composite area, Centroid of simple figures from first principle, Centroid of composite sections; Centre of Gravity and its implication	03	02	Definition, explanation, derivations, numerical examples	Remembering, understanding, applying
4.2	Moment of inertia- Definition, moment of inertia of plane, sections from first principles, Theorems of moment of inertia, perpendicular axis theorem, parallel axis theorem, moment of inertia of symmetrical and unsymmetrical sections, radius of gyration, polar moment of inertia. Concept of Centre of mass.	09	04	Explanation, numerical examples	Understanding, applying, analyzing

Section II

Unit No. 05: Kinematics of particles		**Hours : 08**			**Marks: 16**
Sr. No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
5.1	Rectilinear motion, equations of motion, motion curves and their applications, relative velocity- simple problems.	06	03	Definition, explanation, derivations, numerical examples	Remembering, understanding, applying
5.2	Curvilinear motion, angular motion, relation between angular motion and linear motion, equation of angular motion, tangential and radial acceleration.	10	05	Definition, explanation, derivations, numerical examples	Remembering, understanding, applying, analyzing
Unit No. 06: Kinetics of Particles		**Hours : 06**			**Marks: 12**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
6.1	Newton's laws of motion for linear motion and angular motion, D'Alembert's principle, rectilinear motion on a rough inclined plane, motion of a lift, motion of connected bodies.	10	05	Definition, explanation, derivations, numerical examples	Understanding, applying
6.2	Circular motion, kinetics of rotation-torque, mass moment of inertia, problems on centroidal rotation	06	03	Definition, explanation, derivations, numerical examples	Understanding, applying, analyzing
Unit No. 07: Work Energy Methods		**Hours : 06**			**Marks: 16**
Sr. No	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
7.1	Potential energy, kinetic energy of linear motion, principle of conservation of energy, work energy equation.	08	03	Definition, explanation, derivations, numerical Examples	Remembering, understanding, applying, analyzing

7.2	Impulse momentum method, collision, Impact- central, eccentric, direct, oblique, elastic, plastic, coefficient of restitution, Loss of kinetic energy due to impact	08	03	Definition, explanation, derivations, numerical examples	Remembering, understanding, applying, analyzing
Unit No 08: Mechanical Vibrations		**Hours: 02**		**Marks: 05**	
Sr. No	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
8.1	Mechanical Vibrations: - Basic terminology, free and forced vibrations, resonance and its effects, Degree of freedom.	05	02	Explanation, derivations, numerical examples	Remembering, understanding, applying

Note: Scope of Graphical methods in unit 1, 2, 3 is limited to ICA only.

- **In Semester Evaluation (ISE):**

  ISE shall be based upon student's performance in minimum three tests conducted and evaluated at institute level.

- **Internal Continuous Assessment (ICA):**
  ICA shall be based on the following experiments and assignments

A. *Experiments:*

1. Law of parallelogram of forces
2. Triangle Law of forces using Jib crane apparatus
3. Law of polygon of forces
4. Law of Moments using Bell crank lever
5. Support reaction of beams
6. Newton's Second law using Fletcher's trolley

B. *Graphic Statics : Problems on*

1. Finding resultant of forces (2 Problems)
2. Evaluating support reactions (2 Problems)
3. Finding forces in the members of statically determinate truss. (2 Problems)

C. *Assignments based on the various units in curriculum.*

- **Text Books:**

1. Engineering Mechanics, Bhavikatti S. S., New Age International Pvt. Ltd.
2. Engineering Mechanics, K. L. Kumar, Tata McGraw Hill Publications
3. Engineering Mechanics, Basudeb Bhattacharyya, Oxford University Press.
4. Engineering Mechanics - Statics and Dynamics, A. Nelson, McGraw Hill Education (India) Pvt. Ltd.
5. Engineering Mechanics Statics and Dynamics, A.K. Dhiman, P. Dhiman& D.C. Kelshreshtha, McGraw Hill Education (India) Pvt. Ltd
6. A Text book of Engineering Mechanics, R.S. Khurmi, S. Chand Publications
7. Engg Mechanics by Sadhu Singh (Khanna Publishers)

- **Reference Books:**

1. Vector Mechanics for Engineers: Statics and Dynamics by Beer and Johnson, Tata McGraw Hill Education (India) Pvt. Ltd.
2. Engineering Mechanics by Irving H. Shames, Prentice Hall of India, New Delhi.
3. Engineering Mechanics Statics and Dynamics by Ferdinand Singer, Harper & Row Publications.
4. Engineering Mechanics Statics, Vol.1, SI Version, 7th Edition – J. L. Meriam, L. G. Kraige, Wiley India Pvt. Ltd., New Delhi.
5. Engineering Mechanics Dynamics, SI Version, 7th Edition – J. L. Meriam, L. G. Kraige, Wiley India Pvt. Ltd., and New Delhi.

P. A. H. Solapur University, Solapur

First Year B.Tech (All Branches) Semester-I

C115 UNIVERSAL HUMAN VALUES

Teaching Scheme
Theory– 2 Hr /Week, 2Credit

Examination Scheme
Theory ESE – 50Marks

- **Course Outcomes:**

Upon completion of this course, students will be able to,

C115.1	Appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
C115.2	Develop holistic perspective towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence.
C115.3	Appreciate the Universal Human Values and movement towards value-based living in a natural way.
C115.4	Highlight ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

- **Course Curriculum:**

UNIT 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education (7)

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations.
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority.
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations understanding and living in **harmony** at various levels.

UNIT 2: Understanding Harmony in the Human Being - Harmony in Myself! (7)

1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
2. Understanding the needs of Self ('I') and 'Body' – *Sukh*and *Suvidha*
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
4. Understanding the characteristics and activities of 'I' and harmony in'I'
5. Understanding the harmony of I with the Body: *Sanyam*and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail.
6. Programs to ensure *Sanyam*and*Swasthya*

UNIT 3: Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship (8)

1. Understanding Harmony in the family – the basic unit of human interaction
2. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship
3. Understanding the meaning of Vishwas; Difference between intention and competence
4. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship
5. Understandingtheharmonyinthesociety(societybeinganextensionoffamily): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals
6. Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family!

UNIT 4: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence (8)

1. Understanding the harmony in the Nature
2. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature
3. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space
4. Holistic perception of harmony at all levels of existence

- **Text Books**

1. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2
2. The teacher'smanual: R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010

- **Reference Books**

1. B L Bajpai, 2004, *Indian Ethos and Modern Management*, New Royal Book Co., Lucknow. Reprinted2008.
2. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Common wealth Purblishers.
3. Sussan George, 1976, *How the Other Half Dies*, Penguin Press. Reprinted 1986, 1991
4. Ivan Illich, 1974, *Energy & Equity*, The Trinity Press, Worcester, and HarperCollins, USA
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.
6. Subhas Palekar, 2000, *How to practice Natural Farming*, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
7. A Nagraj, 1998, *Jeevan Vidyaek Parichay*, Divya Path Sansthan, Amarkantak.

8. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs, Britain.
9. A.N. Tripathy, 2003, *Human Values*, New Age International Publishers.

- **Relevant websites, movies and documentaries**

1. Value Education websites, http://uhv.ac.in,http://www.uptu.ac.in
2. Story of Stuff, http://www.storyofstuff.com
3. Al Gore, An Inconvenient Truth, Paramount Classics,USA
4. Charlie Chaplin, Modern Times, United Artists,USA
5. IIT Delhi, Modern Technology – the UntoldStory
6. Gandhi A., Right Here Right Now, CyclewalaProductions
7. AICTE On-line Workshop on Universal Human Values Refresher Course-I Handouts
    - UHV-I handouts

https://drive.google.com/drive/folders/16eOka8AoBpLGlCDajRvk4MXgfXQWzFCB?usp=sharing

    - UHV-II handouts

https://drive.google.com/drive/folders/15eHkMVguzRBDrb65GFi7jMN6UEP5JEk1?usp=sharing

P. A. H. Solapur University, Solapur

First Year B.Tech (All Branches) Semester-I

C116 COMMUNICATION SKILLS

Teaching Scheme
Theory– 1 Hr /Week,1Credit
Laboratory– 2 Hrs. /Week,1Credit

Examination Scheme
ISE – 25Marks
ICA– 25Marks

- **Course Objectives:**

C116.O1	To make students understand English Grammar and its application in Communication
C116.O2	To develop writing skills amongst students
C116.O3	To develop and enhance oral communication skills of students
C116.O4	To nurture reading and comprehension skills of the students
C116.O5	To prepare students for professional written communication
C116.O6	To prepare students for competitive exams with focus on verbal ability

- **Course Outcomes:**

At the end of this course, students will be able to

C116.1	Frame grammatically correct sentences for day to day Communication.
C116.2	Use numerous appropriate words and sentences in written communication.
C116.3	Demonstrate effective oral communication skills in various situations.
C116.4	Read, comprehend and answer the questions based on a passage.
C116.5	Draft letters, emails, write paragraphs and essays with appropriate content and context.
C116.6	Solve verbal ability questions in competitive exams

- **Course Curriculum**

Unit No. 01: English Grammar		**Hours : 06**		
Sr.No.	*Subunit*	*Hours*	*Assessment*	*Bloom's Level*
1.1	Articles, nouns, pronouns, verbs, modal verbs, auxiliary verbs & tenses	03	Sentence formation, corrections / error finding	Remembering, understanding, applying, creating
1.2	Adjectives, adverbs, prepositions, conjunctions	02	Sentence formation, corrections / error finding	Remembering ,understanding, applying, creating
1.3	i. Idioms& phrases ii. Clichés iii. Redundancies	01	Identifying Meaning of the idioms, phrases and Clichés and using them appropriately. Sentence Correction/ error finding	Remembering Understanding applying, creating
Unit No. 02: Vocabulary		**Hours : 02**		
Sr.No.	*Subunit*	*Hours*	*Assessment*	*Bloom's Level*
2.1	Synonyms & antonyms	01	Synonym / antonym of the given word	Remembering, understanding, applying
2.2	Prefixes & suffixes	01	Word formation.	Remembering, understanding, apply
Unit No. 03: Oral Communication		**Hours : 02**		
Sr.No.	*Subunit*	*Hours*	*Assessment*	*Bloom's Level*
3.1	Situational conversation	01	Role play based on formal or informal conversation, writing a conversation based on a situation	Applying, creating
3.2	Impromptu speaking –extempore	01	extempore speech	Applying, creating, evaluating

Unit No. 04: Reading Comprehension		**Hours :02**		
Sr.No.	*Subunit*	*Hours*	*Assessment*	*Bloom's Level*
4.0	Reading comprehension	02	Questions based on a passage	understanding, evaluating, applying,
Unit No. 05: Writing Practices-1		**Hours :03**		
Sr.No.	*Subunit*	*Hours*	*Assessment*	*Bloom's Level*
5.1	Writing business letters	01	Writing a professional / business letter	Understanding, applying, creating
5.2	E-mail communication	01	Writing a professional e-mail	Understanding, applying, creating
5.3	Paragraph writing & Essay writing	01	Writing a paragraph of about 120 words & an essay of about300 words	Understanding, applying, Creating

- **In Semester Evaluation (ISE)–**

  ISE shall be based on three theory examination conducted at institute level covering above curriculum. Examinations shall include sufficient questions covering all topics / subtopics

- **Internal Continuous Assessment (ICA)-**

  ICA shall be based on performance of the student during the laboratory sessions in Language Lab covering minimum12 exercises out of blow-

1. Grammar Exercise –I based on articles, nouns and pronouns.
2. Grammar Exercise –II based on verbs, modal verbs, auxiliary verbs &tenses
3. Grammar Exercise –III based on adjectives, adverbs, prepositions, conjunctions
4. Grammar Exercise –IV based on idioms and phrases, clichés &redundancies
5. Vocabulary – Based on the synonym of the given word
6. Vocabulary – Find the antonym of the given word
7. Exercise on word formation (prefixes /suffixes)
8. Writing conversation based on a formal situation
9. Writing conversation based on a formal situation
10. Exercise based on reading comprehension
11. Professional / business letter writing
12. Professional / business E mail writing
13. Writing a paragraph of about 120 words / an essay of about 300 words on a given topic.
14. Extempore speech on a given topic

- **Text Books:**

1. English Grammar Just for You. RajeevanKaral. Oxford University Press
2. Technical English. Dr. M. Hemamalini. Wiley India Pvt.
3. English for Practical Purposes, Z. N. Patil, B.S. Valke, A.R. Thorat, Zeenath Merchant
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge UniversityPress.2006.
5. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press.
6. Communication Skills, Sanjay Kumar and Pushpa Lata. Oxford University Press.2011

- **References Books:**

1. English Grammar & Composition , Wrenn & Martin, S.Chand
2. Practical English Usage . MichaelSwan.OUP.1995.
3. Remedial English Grammar. F.T Wood. Macmillan.2007.
4. On Writing Well. William Zinsser. Harper ResourceBook.2001.
5. Business Communication, Shalini Kalia, Shailja Agarwal,Wiley
6. Communication Skills for Technical Students, T. M. Farhathullah, Orient Black Swan
7. Longman Dictionary of Contemporary English
8. Essential Activator, Longman
9. Word Power Made Easy, Norman Lewis

P. A. H. Solapur University, Solapur

First Year B. Tech. (All Branches) Semester-I

C117 CREATIVITY AND DESIGN THINKING

Teaching Scheme
Laboratory- 02 Hrs/Week,1Credit

Examination Scheme
ICA -50 Marks

- **Course Outcomes:**

At the end of the course, students will be able to-

C117.1	Relate with and Compare the various learning styles and memory techniques and Apply them in their engineering education.
C117.2	Analyze emotional experience and Experiment with emotional expressivity to better understand users while designing products.
C117.3	Appreciate the importance creativity and design thinking, Develop new ways of thinking and Learn the innovation cycle for creating innovative products.
C117.4	Understand individual differences and its impact on everyday decisions so as to demonstrate frameworks, strategies, techniques while creating innovative products.
C117.5	Develop skills for evaluating, articulating, refining, and creating an innovative engineering product that solves customer problems(s).

- **Course Curriculum:**

Unit No.	Contents
1	**An Insight into Learning, Remembering & Emotions** Understanding the Learning Process, Understanding the Memory process, Memory enhancement techniques. Understanding Emotions: Experience & Expression, Assessing Empathy, Application with Peers.
2	**Introduction to Creativity and Tools for creativity** The creative person, Lateral & vertical Thinking concept, Creative style- adaptor & Innovator. Tools for creativity: Brain storming, Six hat technique, TRIZ, Divergent and Convergent,
3	**Basics of Design Thinking:** Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Stages of Design Thinking Process (explain with examples) – Empathize, Define, Ideate, Prototype, Test

4	**Being Ingenious & Fixing Problem:** Understanding Creative thinking process, Understanding Problem Solving, Testing Creative Problem Solving, Zoom in Zoom Out, TRIZ Contradiction matrix, Combined practices
5	**Process of Product Design, Prototyping & Testing** Process of Engineering Product Design, Stages of Product Design, Examples of best product designs and functions, Prototyping- need & its types, Rapid Prototype Development process, Testing. **Assignment: Engineering Product Design. Sample Example**
6	**Celebrating the Difference:** Understanding Individual differences & Uniqueness, Group Discussion and Activities to encourage the understanding, acceptance and appreciation of Individual differences
7	**Design Thinking & Customer Centricity:** Use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of Customer Expectations with Product Design
8	**Feedback, Re-Design & Re-Create:** Feedback loop, Focus on User Experience, Address "ergonomic challenges, User focused design, rapid prototyping & testing, final product **Final Presentation – *"Solving Practical Engineering Problem through Innovative Product Design & Creative Solution"***

- **Internal Continuous Assessment (ICA):**

Activities are to be conducted using various tools of creative thinking and design thinking. Typical case studies shall be done to understand process of design thinking and product development.
Minimum 8 Experiments shall be carried out and students shall complete eight assignments based on the syllabus /experiments.
In addition to the above, the institute may prescribe additional modes of assessment such as Case study, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

- **TEXT BOOKS:**

1. Thinking Design by S. Balaram (Author), Publisher : Sage India; ISBN-10 : 8132103149
2. The Creative thinker's Toolkit: Course Guidebook by Gerard Puccio, The great courses, 2014
3. Six Thinking Hat by Marcela Pandolfo,
4. Basic Design Thinking by Gavin Ambrose &Paul Harris, AVA Publishing
5. Design Thinking for Beginners: Innovation as a factor for entrepreneurial success,Publisher : Personal Growth Hackers (18 August 2019),ISBN-10 : 3967160629

- **REFERENCE BOOKS:**

1. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011 (Unit I).
2. Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 2013. (Unit III).
3. Design Thinking for Educators: Unleashing Imaginnovation Ideas Being Student Centric, D.M. ,ArvindMallik, Publisher : Notion Press; 1st edition (17 September 2019), ISBN-10 : 1646506928
4. Cracking the Creativity code: Zoom in Zoom out framework for creativity, fun and success by ArieRuttenberg and ShlimoMaital, Publisher- SAGE, 2014

- **WEB REFERENCES:**

1. https://dschool.**stanford**.edu/.../**design**resources/.../ModeGuideBOOTCAMP2010L.pdf
2. https://dschool.**stanford**.edu/use-our-methods/
3. https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process
4. http://www.creativityatwork.com/design-thinking-strategy-for-innovation/
5. https://www.nngroup.com/articles/design-thinking/
6. https://designthinkingforeducators.com/design-thinking/
7. www.**designthinking**formobility.org/wp-content/.../10/**NapkinPitch**_Worksheet.pdf

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First Year B. Tech. (All Branches) Semester-I

C118 WORKSHOP PRACTICE

Teaching Scheme
Laboratory- 02 Hrs/Week, 1 Credit

Examination Scheme
ICA -50 Marks

- **Course Objective:**

C118.O1	To make a student learn hardware and software of a computer.
C118.O2	To make student assemble a desktop PC from its components and also using alternatives.
C118.O3	To make the students acquainted with various skills and tools involved in electronics.
C118.O4	To make students aware of various circuit building techniques, acquaint with the knowledge for tools and to have hands on for the same.
C118.O5	To make the students acquainted with various skills involved in manufacturing and assembly.
C118.O6	To make student aware of various cutting and joining processes and to have hands on for the same.

- **Course Outcomes:**

At the end of this course, the student will be able to

C118.1	Identify various hardware and software components of a computer and compare between them.
C118.2	Assemble a desktop from components supplied and Setup a working desktop system using a Raspberry Pi board.
C118.3	Identify and use various electronic components and instruments.
C118.4	Develop basic electronic circuits on breadboards.
C118.5	Demonstrate the use of an Arduino board using basic circuits.
C118.6	Prepare different shaped metal work piece joints from the given metal blanks by selecting different tools and machines.
C118.7	Perform different types of welding of metal components.
C118.8	Select different engineering tools required to perform, fitting, machining, welding and joining processes.

- **Course Curriculum:**

Unit No.	Unit Title	No. of Lab/ Task Sessions	Assessment	Bloom's Level
From Computer Science Engineering Domain				
01	1.Name and identify various PC hardware components: USB Mouse, PS/2 Mouse, Keyboard, LCD/LED Monitor, VGA, HDMI, CAT5, CAT6, server, routers, fiber cable, Hard disk, RAM, CMOS battery, SMPS, cache, ROM, BIOS 2.Type using all your fingers and achieve a speed of 30 words per minute	03	Demonstration, Hands-on experience, report writing	Perception (LI), Set (L2), Guided response(L3),
02	1.Introduction to various important software: Ubuntu, Windows, Mac, Libre office and Microsoft Office; Firefox, Google Chrome, Tor; Linux Command Line (few basic commands); Photoshop, Gimp Understand the broad structure and functioning of the Internet; Learn the following terms and concepts: LAN, DNS, Proxy, Router, Hub, Switch, Server, Client, Website, Web-server; Understand basic networking commands, applications and services: ssh, telnet, ftp, winscp, ping, http, https, various search services (google, start page, aggregator search services) 2.Prepare a working LAN cable by using crimping tools.	03	Explaining, and hands-on experience, report writing	Perception (LI), Set (L2), Guided response(L3)
03	1.Assemble a Desktop PC from it's Components: Install any two operating systems on a PC making it dual boot, including latest version of Ubuntu Linux, Windows 7/8 2. Connect 2-4 computers together using a network hub to create a LAN	04	Explaining, and hands-on experience, report writing	Perception (LI), Set (L2), Guided response(L3)
04	1.Setup a working desktop system using a Raspberry Pi board. Download the OS image from web. 2.Try installing one of the various operating systems on the board: Raspbian,	04	Explaining, and hands-on experience, report	Perception (LI), Set (L2), Methodology

	Ubuntu Mate, Openelec, OSMC, Pidora, RISC OS, Arch Linux ARM, etc.		writing	(L4)
From Electronics Engineering Domain				
05	Introduction to Basic Electronic Components and Devices : Introduction to various electrical passive components such as Resistors, inductors and capacitors, introduction to active components, introduction to breadboard, Measurement of resistance using the colour code, series and parallel connection of the resistances and its implementation on breadboard. Timer IC: Application of IC-555 as an Astable mode Calculation of duty cycle and frequency of IC 555 in a stable mode.	03	Components introduction identification, Series-Parallel resistor identification and reduction, implementation, Timer calculations, report writing	Introduce (L1) Identify (L2) Calculate / Solve (L3)
06	Introduction to Electronics Instruments: Exposure to usual electronic equipment/instruments such as Soldering iron, Multimeter, Oscilloscope, Function generator, Power supply, Information about their front panels, Demonstrations on their working, Hands-on for measurement of component values and DC voltage using multimeter, measurement of amplitude, time period and frequency of the waveform Square wave/any small signal from function generator on Oscilloscope (DSO), Measurement of the voltage and current in the circuit implemented on breadboard using multimeter.	03	Ability to state and demonstrate the use of electronics tools and classify, report writing	State/Demonstrate (L1) Classify (L2)
07	Introduction to Arduino: Arduino Configuration and architecture, Device and platform features, Concept of digital and analog ports, Familiarizing with Arduino Interfacing Board, Introduction to Embedded C and Arduino platform (IDE), Arduino data types (Variables and constants, Operators, Control Statements, Arrays, Function).	04	Demonstration of Arduino Platform with ability to discriminate analog and digital pins and its usage, report writing	Demonstrate (L1) Classify (L2)
08	Arduino I/O & Sensors **:** Arduino I/O Functions (Pins Configured as INPUT, Pull-up Resistors, Pins Configured as OUTPUT,FUNCTIONS: pinMode(), digitalWrite(), analogRead(),Arduino Interrupts), SENSORS: Humidity Sensor, Temperature Sensor, Water	04	Configuring I/O pins, Interfacing simple sensors, report writing	Classify (L2) Interface (L3)

	Detector / Sensor, PIR Sensor, Ultrasonic Sensor, Magnetic relay switches.			
From Mechanical and Civil Engineering Domain				
09	Assembly: assembly of the following assemblies/sub-assembly-Three and Four jaw chuck.	01	Assembly job, team working, report writing	Perception (LI), Set (L2), Guided response(L3), Mechanism (L4)
10	Assembly: assembly of the following assemblies/sub-assembly- Lathe Tailstock	01	Assembly job, team working, report writing	Perception (LI), Set (L2), Guided response(L3), Mechanism (L4)
11	Assembly: assembly of the following assemblies/sub-assembly- Apron of Lathe	01	Assembly job, team working, report writing	Perception (LI), Set (L2), Guided response(L3), Mechanism (L4)
12	Assembly: assembly of the following assemblies/sub-assembly-Cross Slide assembly	01	Assembly job, team working, report writing	Perception (LI), Set (L2), Guided response(L3), Mechanism (L4)
13	Assembly: assembly of the following assemblies/sub-assembly-Tumbler Gear assembly for different types of threads	01	Assembly job, team working, report writing	Perception (LI), Set L2), Guided response(L3, Mechanism (L4)
14	Welding: demonstration and hands on- arc welding, gas welding, resistance welding, gas cutting, spot welding.	03	Explaining, and hands-on experience, report writing	Perception (LI), Set (L2), Guided response (L3)
15	Fitting job :One job on fitting, to size, male-female fitting including, marking, cutting, shearing, chipping sizing of metals, drilling and tapping to know concept of inter changeability.	03	Fitting job, report writing	Perception (LI), Set (L2), Mechanism (L4)
16	Machine Tools: demonstration and hands on- Lathe Machine, Drilling Machine, Milling Machine	03	Explaining, and hands-on experience, report writing	Perception (LI), Set (L2), Guided response(L3)

- **Internal Continuous Assessment (ICA):**

ICA shall be based on completion of any of the eight LAB Sessions / Tasks on the above-mentioned units along with the report writing.

- **Text Books:**

1. Building Your Own Computer Made Easy: The Step By Step Guide (Computers Made Easy) by James Bernstein.
2. Raspberry Pi Cookbook: Software and Hardware Problems and Solutions 3rd Edition by Simon Monk .
3. A text book of Computer Hardware and Networking (DJ 5) [Print Replica] Kindle Edition by Ms. Jyotika Deshmukh .
4. Principles of Electronics by V.K Mehta (Author), Rohit Mehta (Author).
5. Basic Electronics: Devices, Circuits and it Fundamentals by Kal.
6. The Basic Soldering Guide Handbook: Learn to solder electronics successfully by Alan R Winstanley.
7. Engineering Practices, M Karthik.
8. Workshop Technology, Raghuvanshi.
9. Workshop Technology, HajraChowdhary, Media Promoters & Publishers Pvt. Ltd.

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First Year B. Tech. (All Branches) Semester-II

C122 ENGINEERING MATHEMATICS -II

Teaching Scheme
Theory – 3 Hrs. /Week,3Credits
Tutorial– 1 Hr. /Week,1Credit

Examination Scheme
Theory – ESE -70Marks
ISE - 30Marks
ICA–25Marks

- **Course Objectives:**

C122.O1	To introduce to student some methods to find the solution of first order & first degree ordinary differential equations with its applications
C122.O2	To introduce to student awareness of concept of convergence of sequences and series
C122.O3	To introduce the tools of differentiation of functions of complex variable that are used in various techniques dealing engineering problems
C122.O4	To make familiar to tracing of Cartesian, polar and parametric curves
C122.O5	To acquaint the student with mathematical tools needed in evaluating improper integrals, multiple integrals and their usage

- **Course Outcomes:**

At the end of this course, student will be able to

C122.1	Solve first order ordinary differential equation and able to apply in different Engineering applications.
C122.2	Test divergence & convergence of infinite series.
C122.3	Use the tools of differentiation of functions of a complex variable that are used in various techniques dealing engineering problems.
C122.4	Draw approximate shape of planer curve with justification.
C122.5	Evaluate improper and multiple integrals and their usage.

- **Course Curriculum**

Section I

Unit No. 01: ODE of First order and Degree and Application			**Hours : 09**		**Marks: 22**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
1.1	Order, degree and general solution of differential equations, non-homogeneous differential Equations.	03	01	Solution of differential equations.	Remembering, understanding,
1.2	Exact differential equations, non- exact reducible to exact, linear differential equations, non linear reducible to linear.	10	04	Solution of differential equations.	Understanding, applying
1.3	Applications to orthogonal trajectories, electrical and mechanical engineering (projectile motion and Newton's law of cooling)	09	04	Application of ordinary differential equations.	Remembering, understanding, applying
Unit No. 02: Infinite Series			**Hours : 06**		**Marks: 13**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
2.1	Infinite sequences, infinite series, types of series	01	01	Examine	Remembering, understanding,
2.2	Test of convergence, absolute and conditional convergence,	05	02	Apply standard results	Remembering, applying
2.3	Cauchy test, comparison test and De Alembert's test	07	03	Numerical, apply standard results	Remembering, understanding, applying
Unit No. 03: Complex Variable (Differentiation)			**Hours : 08**		**Marks: 17**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
3.1	Statement of De-Moivre's Theorem (without proof), application of De-Moivre's theorem –roots of algebraic equations,	04	02	Numerical example, evaluate, applications	Remembering , understanding Applying
3.2	Circular and Hyperbolic functions	01	01	Definition,	Remembering, applying

3.3	Differentiation, Cauchy Riemann Equations (Without Proof), Analytic Functions, Elementary Analytic Functions (Exponential, Trigonometric and Logarithmic function)	06	02	Simplification, applications	Remembering, applying
3.4	Harmonic Functions and Conjugates, Construction of Analytic Function	06	03	Definition, Evaluate, applications	Remembering, applying

Section II

Unit No. 04: Integral Calculus			**Hours : 07**		**Marks: 16**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
4.1	Gamma function and properties,	04	02	Evaluate/numerical,	Remembering, understanding, applying
4.2	Beta function and properties, duplication formula with proof.	09	03	Evaluate/numerical,	Remembering, understanding, applying
4.3	Differentiation under integral sign with constant limit	03	02	Evaluate/numerical,	Remembering, understanding, applying
Unit No. 05: Curve Tracing			**Hours : 06**		**Marks: 13**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
5.1	Tracing of Cartesian curves-	05	02	Trace of curve	Understanding, applying
5.2	Tracing of polar curves	04	02	Trace of curve	Understanding, applying
5.3	Tracing of parametric curves	04	02	Trace of curve	Remembering, understanding, applying

Unit No. 06: Multivariable Integral Calculus		**Hours :09**			**Marks: 23**
Sr.No..	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
6.1	Direct evaluation of Double integral, Evaluation over the given region,	05	02	Evaluate/numerical,	Understanding, applying
6.2	Change of order of integration, change to polar, triple integration	09	04	Evaluate/numerical,	Understanding, applying
6.3	Application of double integral to find area and mass of lamina.	09	03	Application/numerical	Remembering, understanding, applying

- **In Semester Evaluation (ISE):**
  ISE shall be based upon student's performance in minimum two tests & mid-term written test conducted & evaluated at institute level

- **Internal Continuous Assessment (ICA):**
  ICA shall be based on student's performance during tutorial sessions and on completion of minimum six assignments based on above curriculum.

- **Text Books:**
  1. A Text Book of Applied Mathematics, P.N. and J.N. Wartikar, Vol.1, Pune VidyarthiGrihaPrakashan.
  2. Advanced Engineering Mathematics, H. K. Dass, S. Chand Publications, Delhi.
  3. Engineering Mathematics (Volume I), ITL Education, Cengage Learning.
  4. Engineering Mathematics, Ravish R Sing and Mukul Bhatt, McGraw Hill.
  5. Applied Mathematics-I,II, Kreyzig's, Wiley.
  6. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications,2008.

- **Reference Books**:

  1. Higher Engineering Mathematics (42nd Edition), B.S. Grewal Khanna Publications, Delhi.
  2. Engineering Mathematics, Srimanta Pal and Subodh C. Bhunia, Oxford Higher Education.
  3. Mathematics for Engineering Applications, Kuldip S. Rattan and Naathan W. Klingbeil Wiley. (Modeling and Core Engineering Application)
  4. Higher Engineering Mathematics, Ramana B.V., Tata McGraw Hill New Delhi,2010.

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First Year B. Tech. (All Branches) Semester-II

C123 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Teaching Scheme
Theory– 3 Hrs. /Week, 3 Credits
Tutorial –2 Hr. /Week, 1 Credit

Examination Scheme
Theory –ESE-70Marks
ISE –30Marks
ICA–25Marks

- ## Course Objectives:

C123.O1	To introduce to student various simplification methods for dc circuits so as student can analyze dc circuits and can solve numerical problems based on it
C123.O2	To introduce to student fundamentals of magnetic circuits and electromagnetic induction and its application.
C123.O3	To make student comprehend generation and behavior of single phase ac circuits for R,L,C load.
C123.O4	To introduce to student analysis of poly phase ac circuit.
C123.O5	To emphasize on working and applications of diode.
C123.O6	To make student comprehend working of bipolar junction transistor with basic configurations.
C123.O7	To make student understand different types of transducers & application areas of transducers.
C123.O8	To introduce to student fundamental of digital electronics.

- ## Course Outcomes:

At the end of this course, students will be able to

C123.1	Apply the various simplification methods to analyze dc circuits.
C123.2	Use the concept of magnetic circuits to calculate parameters of magnetic circuits and single phase transformer.
C123.3	Apply knowledge of ac fundamentals and poly phase to analyze ac circuits.
C123.4	Explain working, characteristics and applications of diode and BJT.
C123.5	Select appropriate transducers to measure various physical parameters like distance, temperature etc.
C123.6	Perform arithmetic operations on digital number system.

- **Course Curriculum**

Section I

Unit No. 01:DC Circuits		**Hours : 06**		**Marks: 15**	
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
1.1	Ohm's law, Resistance, specific resistance, energy sources, concepts of open circuit and short circuit	03	01	Explanation, Understandings, applications	Understanding, applying
1.2	Kirchhoff's Voltage and Current law & it's applications for circuit solutions	05	02	Explanation, simplification of circuits (numerical), applications	Remembering, understanding, applying
1.3	Simplifications of circuits using series, parallel combinations, Star-delta, delta-star conversions	07	03	Explanation, simplification of circuits (numerical), applications	Remembering, understanding, applying

Unit No. 02: Magnetic Circuit and Single Phase Transformer		**Hours:06**		**Marks: 16**	
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
2.1	Basic definitions related to magnetic circuit (flux, mmf, reluctance, flux density, magnetic field strength, permeability) Comparison between electric and magnetic circuit.	05	02	Explanation, Understandings,	Understanding,
2.2	Series magnetic circuits with air gap, magnetic leakage and fringing	03	01	Explanation, Understandings	Remembering, Understanding
2.3	Faraday's law of electromagnetic induction, Lenz's law, concept of self and mutual inductance	03	01	Selection, discussion	Remembering, understanding
2.4	Working principle and construction of Single Phase transformer, EMF-equation of Single phase transformer	05	02	Explanation, Understandings, Derivation, Numerical	Remembering, Understanding, applying

Unit No. 03: Single Phase AC Circuits		**Hours :06**			**Marks:14**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
3.1	Introduction to AC, Generation of alternating voltage and current, concept of cycle, period, frequency, phase difference, Instantaneous value, Peak value	03	01	Explanation, Understandings, applications	Understanding, applying
3.2	RMS value of an alternating quantity, average value of an alternating quantity, form factor, peak factor.	04	02	Explanation, understandings, applications	Remembering, understanding, applying
3.3	AC through pure resistance, pure inductance and pure capacitance, Phasor diagram, Series AC circuit (RL, RC and RLC): impedance	07	03	Explanation, simplification of circuits (numerical), applications	Remembering, Understanding, applying

Unit No. 04:Poly-PhaseCircuits		**Hours :03**			**Marks:05**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
4.1	Generation of three phase voltages	01	01	Explanation	Understanding, Remembering
4.2	Relations of voltage and current in star and delta connections for balanced systems.	04	02	Explanation, simplification of circuits (numerical), applications, Derivation	Remembering, understanding, applying

Section II

Unit No. 05:SemiconductorDiodes		**Hours: 06**			**Marks:14**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
5.1	*Semiconductors and p-n junction diode* -Doping, depletion layer, barrier potential, construction, working, biasing, V-I characteristics, ratings.	04	02	Explain, define	Recalling, understanding

5.2	*Diode applications*-Circuit diagram & working of half wave rectifier, full wave rectifier, bridge rectifier, capacitor filter using full wave rectifier- circuit diagram, working and formula of ripple factor.	05	02	Explain, define, apply	Recalling, understanding, applying
5.3	*Special Purpose Diodes*- photo diode, LED- application of LED as 7- segment display , Zener diode- Working principle, V-I characteristics, ratings, application of Zener as voltage regulator	05	02	Explain define, apply	Recalling, defining, understanding

Unit No 06: Bipolar Junction Transistor			**Hours: 04**		**Marks: 10**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
6.1	*Bipolar Junction Transistor*- construction, biasing, configuration with I/O characteristics for -CB,CE,CC, comparison between CB,CE,CC configurations, ratings of transistor	05	02	Explain, define, numerical	Recall, understanding
6.2	*Application of transistor*-BJT as switch and amplifier	05	02	Explain, apply	Recall, understanding, applying

Unit No 07:Electrical Transducers			**Hours: 04**		**Marks:10**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
7.1	Introduction, parameters for selection of transducers, wire type strain gauge , load cell , LVDT	05	02	Explain, define, apply, select	Recall, understanding, applying
7.2	Temperature & other transducers- thermocouple , thermistor, LDR , solar cell	05	02	Explain, define, select	Recall, understanding, applying
Unit No 08: Introduction to Digital Electronics			**Hours: 07**		**Marks: 16**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
8.1	*Number system*- decimal, binary, octal, hexadecimal & their inter- conversion , BCD code	05	02	Numerical	Recalling, understanding, applying

8.2	*Binary Arithmetic*- addition, subtraction, subtraction using 2's complement	04	02	Numerical	Recalling, understanding, applying
8.3	*Logic Gates*- AND, OR, NOT, NAND,NOR,EX-OR, EX-NOR Gates - symbol, output equation, truth table, realization of basic gates using universal gates	05	02	Explain, define, numerical	Recalling, understanding, applying
8.4	*Boolean Algebra*- laws & rules, De- Morgan theorem	02	01	Explain, define, simplify	Recalling understanding, applying

- **In Semester Evaluation(ISE):**

ISE shall be based upon student's performance in minimum two tests & mid-term written Test conducted & evaluated at institute level

- **Internal Continuous Assessment (ICA):**

ICA shall be based on :

Basic Electrical Engineering :(Minimum 5 experiments from the following)

1. Hands on types of wires, wiring systems and wiring exercises.
2. Verification of KVL and KCL
3. Verification of voltage relation of RL, RC and RLC series connected AC circuits
4. Verification of line and phase relation for star connected load.
5. Verification of line and phase relation for delta connected load
6. Verification of transformation ratio of single phase transformer.

Basic Electronics Engineering :(Minimum 5 experiments from the following)

1. Identification, testing and measurement of electronic components -resistors, capacitors, inductors.
2. V-I characteristics of PN junction diode.
3. Half and full wave rectifier.
4. Controlling relay using transistor as a switch.
5. Measurement of distance using LVDT.
6. Verification of truth table of basic gates and universal gates using IC's.

- **Text-Books:**

1. Electrical Technology (Volume I & 2), B L Theraja, 22nd edition, S Chand & Company Ltd
2. Basic Electrical Engineering, V K Mehta, Revised edition, S Chand & Company Ltd.
3. Basic Electronics Solid State, B L Thereja, Revised edition, S Chand & Company Ltd.

4. Digital Principles and Applications, Albert Malvino , Donald Leach, Tata McGraw Hills Publication
5. Principles of Electronic Devices and Circuits (Analog and Digital) ,B.L.Theraja , R.S.Sedha, S. Chand publication

- **Reference-Books:**

1. Basic Electrical Engineering, Dr. Debashisha Jena, Revised Edition, Wiley Engineering Press
2. Electrical Engineering Fundamentals, V Del Toro, 2nd edition,Prentice-Hall
3. Electrical Technology, E Hughes, 10th edition, ELBS, Longman
4. Laboratory courses in Electrical Engineering, S G Tarnekar, P K Kharbanda, S B Bodhe and S D Naik, S Chand & Company Ltd
5. Basic Electronics Engineering, V. Baru , R. Kaduskar, S.Gaikwad , Dreamtech Publication
6. Electronic Devices and Circuits , David A. Bell ,Oxford University, Press India, Fifth edition
7. Electronic Devices, Floyd, Pearson Education publication
8. Electronic Device & Circuits, Millman Halkias ,Tata McGraw Hill, Third edition
9. Electronic Components and Materials, M. A. Joshi (Wheeler publication)

P. A. H. Solapur University, Solapur

First Year B. Tech. (All Branches) Semester-II

C124 PROGRAMMING FOR PROBLEM SOLVING

Teaching Scheme
Theory – 2Hrs. /Week, 2 Credits
Laboratory– 4Hrs. /Week, 2 Credit

Examination Scheme
POE –ESE-50Marks
ISE–25Marks
ICA-50Marks

- **Course Objectives:**

C124.O1	To introduce the concepts of algorithm& flowchart for problem solving
C124.O2	To introduce the fundamentals of structured programming
C124.O3	To formulate simple C programs using various control structures & loop structures
C124.O4	To apply the concept of functions & pointers to solve the problems
C124.O5	To apply the concept of arrays to solve the problems
C124.06	To apply concept of structures, unions and files to solve the problems

- **Course Outcomes:**

At the end of this course, students will be able to

C124.1	Design the flowcharts and algorithms for the given problem .
C124.2	Translate the algorithms into C programs and test & execute the programs.
C124.3	Implement C programs by appropriately selecting control and loop structures.
C124.4	Implement C programs using functions and pointers.
C124.5	Implement C programs using arrays, structure and unions and files.
C124.6	Develop small applications using C Programming concepts.

- **Course Curriculum**

UNIT 1: Fundamentals of Computers & Structure of a 'C' Program		**Hours: 05**			**ICA Marks: 7**
Sr. No.	Subunit	ISE Marks #	Hours	Assessment	Bloom's Level(Cognitive)
1.1	Block Diagram of computer with description, Algorithm, sequence, selection, Flowchart Structure of 'C' program, building blocks of 'C' program (pre-processor, compilation and execution of 'C' program)	02	02	Explanation, Formulation	Remember, Understand Apply
1.2	C character set, tokens, constants, variables, keywords , primitive data types , 'C' operators (arithmetic, unary, binary , ternary ,Logical, assignment, relational, increment and decrement, conditional, bit wise, sizeof)	03	02	Explanation, Formulation	Remember, Understand
1.3	Operator precedence, expressions, type casting and type conversion, formatting input and output (getchar, putchar ,printf, scanf), Storage Classes - Automatic, Register, Static, External storage classes.	02	01	Explanation Application	Understand, Apply

UNIT 2: Control Structures			**Hours:05**		**ICA Marks:8**
2.1	Loops using (i) if (ii) if-else (iii) nested if –else (iv) else if ladder (v) while vi) do-while vii) for, break, continue, goto statement, nesting of loops, (vi) switch-case.	08	05	Programming	Understand, Apply,

UNIT 3: Arrays and Strings			**Hours:05**		**ICA Marks:9**
3.1	Declaration and initialization of one dimensional array, accessing elements and displaying, finding element from array	04	02	Programming	Understand, Apply

3.2	Declaration and initialization of two dimensional arrays, accessing and displaying elements.			Programming	Understand, Apply
3.3	Declaration and initialization of strings, Display of strings with different formats, string library function (strlen, strcpy, strcmp, strcat, gets, puts).	05	03	Programming	Understand, Apply

UNIT 4: Structures and Unions		**Hours:03**			**ICA Marks:6**
4.1	Definition of structure and union, declaration	02	01	Programming	Understand, Apply
4.2	Accessing elements and displaying elements, difference between structure and union.	04	02	Programming	Understand, Apply

UNIT 5: Pointers		**Hours:04**			**ICA Marks:7**
5.1	Introduction, Declaration of pointer, initialization, accessing pointer, pointer to basic data types, pointer to array (one dimensional)	02	01	Programming	Understand, Apply
5.2	Pointers of Arrays, Array of Pointer , Pointer to Pointer , Pointer and String, Pointer and Structures, Pointer to Functions in C, Pointers and Dynamic memory.	05	03	Programming	Understand, Apply

UNIT 6: Functions		**Hours:05**			**ICA Marks:8**
6.1	Declaration & definition, passing parameters to functions, pass by value, scope of variable, return statement.	02	02	Programming	Understand, Apply
6.2	function using call by value and call by reference	02	01	Programming	Understand, Apply
6.3	Recursion: Processes and Recursion in C. How recursion works, Factorial, Fibonacci sequence, Towers of Hanoi, Advantages and Disadvantages of recursive techniques	04	02	Programming	Understand, Apply

UNIT 7: Files		**Hours:03**			**ICA Marks:5**
7.1	Introduction, Streams and file types, File operations, File I/O, Structures of read and write, other file functions, command file arguments.	05	03	Programming	Understand, Apply

- **End Semester Evaluation (ESE):**
  University ESE of 'Practical and Oral Examination' at the end of the semester, assessing student's programming skills.

- **In Semester Evaluation (ISE):**
  ISE shall be based upon student's performance in minimum three tests conducted & evaluated at institute level
  Test-I – Written paper based on Unit-I of minimum of 30 marks
  Test-II & Test-III – Practical & Oral Examination based on remaining units.

- **Internal Continuous Assessment (ICA):**
  ICA shall be based on the following programming assignments.

1. Assignment based on fundamentals of algorithm & flowcharts
   - Formulate simple algorithms & flowcharts for arithmetic and logical problems

2. Fundamentals of C programming & IDE
   - Programming, debugging and execution
   - Structure of C program (documentation section, header section, main function, declaration of variables, set of instructions)
   - C character set, tokens, constants, variables, keywords
   - C operators

3. Formatted input output functions in C
   - Programs based on simple arithmetic & logical operators
   - Programs based on getchar() and putchar() functions

4. Different operators in C
   - Programs based on multiple arithmetic operations (+, - , / , * and %)
   - Programs based on left shift (<<), right shift (>>), and(&) , or(|) and xor(^) bitwise operators.
   - Programs based on increment, decrement operators.
   - Programs based on type casting using cast operator.
   - Programs based on sizeof () operator.

5. Decision control statement (if, if-else , nested if-else, else if ladder)
   - Programs based on use of single control statement
   - Programs based on multiple control statement
   - Programs based on nested control statements combined with other operators.

6. Loop statement (for, while, do-while, nested loop)
   - Programs based on for loop.
   - Programs based on while loop.
   - Programs based on do-while loop.
   - Program demonstrating difference in while & do-while loop.
   - Programs based on nested loops.
   - Programs demonstrating use of break, continue &goto statements.

7. Switch-case statement
   - Programs based on switch-case statement.
   - Programs demonstrating variations in switch-case statement.
   - Menu driven programs.

8. Functions
   - Programs based on simple use of functions.
   - Programs demonstrating function call by passing parameters by value.
   - Programs on iterative and recursive functions
   - Programs on customized string handling functions

9. Pointers
   - Program demonstrating basics of pointers.
   - Programs based on pointer arithmetic & operations.
   - Program based on pointers & array

10. Arrays
   - Programs based on single dimension array manipulations.
   - Programs based on two dimension array manipulations & matrix operations.
   - Programs based on string handling & manipulations.

11. Structures & Unions
   - Programs based on Structure & its manipulation operations.
   - Programs demonstrating use of Unions.
   - Program demonstrating the difference between structure & union.

12. Programs based on functions, pointers and recursion.

13. Programs based on file operations

14. To develop small application (mini project) using C Programming concepts.

- Text Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. Simplifying C – Harshal Arolkar&Sonal Jain, Dreamtech (ForUnit-01)
3. Let s 'C' – Yaswant Kanetkar , BPB Publication
4. Programming in ANSI C- C Balgurusamy, Tata McGrawHill

- Reference Books:

1. The C Programming Language (ANSI C Version), Brian W. Kernighan, Dennis M. Ritchie, PHI Publications
2. Programming in C – B.L. Juneja, Cengage Learning
3. Projects using C- PVN Varalaxmi, Scitech Publications
4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

- **Web resource:** https://onlinecourses.nptel.ac.in/noc18_cs31/preview

P. A. H. Solapur University, Solapur

First Year B. Tech. (All Branches) Semester-II

C125 ENGINEERING GRAPHICS AND CAD

Teaching Scheme
Theory – 2Hrs. /Week, 2Credits
Laboratory–4Hrs. /Week, 2 Credit

Examination Scheme
Theory ESE – 70Marks
ISE – 30 Marks
ICA – 50 Marks

- **Course Objectives:**

C125.O1	Draw the projections of oblique lines and planes
C125.O2	Interpret and draw the cut sections of solids
C125.O3	Visualize and draw the orthogonal views
C125.O4	Draw the developments of truncated solids and construct the solids from given developed surface
C125.O5	Draft the machine components and related parts by using commercial drafting software

- **Course Outcomes:**

At the end of this course, students will be able to

C125.1	Draw projection of lines and planes for engineering applications.
C125.2	Draw regular and sectional views of various types of solids.
C125.3	Draw the 2 D view (orthogonal views) given 3D drawing.
C125.4	Draw the development of the regular and truncated solids.
C125.5	Draft the 2-D drawing of machine components.

- **Course Curriculum**

Unit No. 01: Projections of Lines			**Hours :06**		**Marks:20**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
1.1	Introduction to first and third angle method of projection, Projections of points on Principal reference planes and on auxiliary planes including coordinate system of points. Horizontal, frontal, profile and oblique lines, true length of line. Projections of lines with its inclination to one reference plane and with two reference planes (oblique lines). True length and inclination with the reference planes, point view of line.	10	03	Graphical problem horizontal, frontal and oblique lines, problems on TL of line	Remembering(L1) Understanding(L2), Applying(L3)
1.2	Grade and bearing of line. Angle between lines, intersecting, skew, parallel and Perpendicular lines	10	03	Problems on intersecting, skew, parallel lines and perpendicular lines	Remembering(L1) Understanding(L2), Applying(L3)

Unit No. 02: Projections of Planes			**Hours :06**		**Marks:20**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
2.1	Projections of planes (regular polygons, circle, Isosceles triangle, Rhombus and Rectangle) Plane inclined to one reference plane and with two reference planes	10	03	Graphical problem on oblique planes by three stage and auxiliary plane methods	Remembering(L1) Understanding(L2), Applying(L3) 53

2.2	True shape, edge view, angle with reference plane dip & strike of plane (for objective type question only)	10	03	Graphical problem	Remembering (L1) Understanding (L2), Applying (L3)
Unit No 03: Projections of Solids			**Hours :06**		**Marks:20**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
3.1	Classification of solids, projections of solids (cylinder, cone, pyramid and prism) Solid inclination to one reference plane and with two reference planes (excluding composite solids)	20	06	Graphical problem on oblique planes by three stage and auxiliary plane methods	Remembering(L1) Understanding(L2), Applying(L3)

Unit No 04: Orthographic Projections			**Hours:06**		**Marks:20**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
4.1	Fundamental of projection along with classification, type of lines used in drawing, conventions used in sectional drawings Projections from the pictorial - view of the objects on the principal planes by viewing from front, top and sides using first angle projection method ,full sectional view **Introduction to Computer aided drafting** to draft 2-D drawings for simple object using Draw and Modify Commands.	20	06	Graphical problem to draw principal views of objects.	Remembering(L1) Understanding(L2) Applying(L3)

Unit No 05: Sections of Solids			**Hours:06**		**Marks:20**
Sr. No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
5.1	Sections of above solids by cutting planes inclined to one reference plane and perpendicular to other	20	06	Drawing views of solids cut by section plane inclined to one reference plane	Remembering (L1) Understanding (L2),Applying(L3)

- **In Semester Evaluation (ISE):**

  ISE shall be based upon student's performance in minimum two tests & mid-term written test conducted & evaluated at institute level.

- **Internal Continuous Assessment (ICA):**

  ICA shall be based on below drawing assignments

Sr. No.	***Name of Sheet***	***No. of Sheets***
1.	Projection of lines and planes	01
2.	Projection of solids and sections	01
3.	Orthographic projections	01
4.	Computer aided drafting: Introduction to computer aided drafting package to make 2-D drawings. (For simple object using Draw and Modify Commands)	02

- **Text Book:**

1. Engineering Drawing, D.N. Jolhe, TATA McGraw Publishing Co-Ltd.
2. Engineering drawing, N.D. Bhatt, Charotar Publishing House Pvt. Ltd.
3. Natarajan, K. V., A text book of Engineering Graphics, Pub.: Dhanalakshmi Publishers, Chennai, 2006
4. Engineering Graphics - I, M. L. Dabhade, Vision Publication

- **Reference Book:**

1. Engineering Drawing, N. S. Parthasarathy & Vela Murali, Oxford Publication.
2. Engineering Drawing, K. L. Narayana& P. Kannaiah, Scitech Publication.
3. Engineering Graphics, A. M. Chandra, New Age International Publisher s.
4. Venugopal, K. and Prabhu Raja, V., Engineering Drawing and Graphics + AutoCAD, Pub.: New Age International,2009.

P. A. H. Solapur University, Solapur

First Year B.Tech (All Branches) Semester-II

C126 PROFESSIONAL COMMUNICATION

Teaching Scheme
Theory– 1 Hr /Week, 1Credit
Laboratory– 2 Hrs. /Week, 1Credit

Examination Scheme
ISE – 25 Marks
ICA – 25 Marks

- **Course Objectives:**

C126.O1	To nurture student's effective presentations skills
C126.O2	To equip student with skills for participating effectively in group discussion
C126.O3	To equip student with skills for performing effectively in personal interview
C126.O4	To develop resume writing skills of students
C126.O5	To develop and enhance the report writing skills of the students
C126.O6	To inculcate soft skills in students for personal and professional success

- **Course Outcomes:**

At the end of this course, student will able to

C126.1	Prepare good quality presentation and deliver it effectively.
C126.2	Participate effectively in group discussion
C126.3	Perform effectively in personal interview
C126.4	Prepare effective resume for job interviews
C126.5	Draft and write various reports professionally.
C126.6	Demonstrate various soft skills like team skills, leadership, creativity, etc. in different situations.

- **Course Curriculum**

Unit No 01: Presentation Skills		**Hours : 02**		
Sr.	*Subunit*	*Hours*	*Assessment*	*Bloom's Level*
1.1	Pronunciation, Intonation, Stress and Rhythm	01	Making a Presentation	Understanding, applying, evaluating, creating
1.2	Presentation- effective planning, preparing &delivering	01	Preparing and delivering presentations	Understanding, applying, evaluating, creating
Unit No 02: Group Discussion		**Hours : 02**		
Sr.	*Subunit*	*Hours*	*Assessment*	*Bloom's Level*
2.0	Group Discussion- introduction, traits evaluated, types, tips for successful participation, individual Traits	02	Mock group discussion	Remembering, understanding, applying, evaluating, creating
Unit No 03: Personal Interview		**Hours : 02**		
Sr.	*Subunit*	*Hours*	*Assessment*	*Bloom's Level*
3.0	Introduction, types of interviews, preparatory steps for employment interviews, skill tips, frequently asked questions during interviews	02	Mock personal interview	Remembering, understanding, applying, evaluating, creating
Unit No 04: Writing Practices -II		**Hours : 03**		
Sr.	*Subunit*	*Hours*	*Assessment*	*Bloom's Level*
4.1	Resume Writing	01	Writing resume for campus placement	Remembering, understanding, applying, evaluating, creating
4.2	Technical report writing- types, structures, data collection, content, form	01	Write a report on event / industrial visit / project	Remembering, understanding, applying, evaluating, creating
4.3	Précis Writing	01	Précis Writing	Remembering, understanding, applying, evaluating, creating

Unit No 05: Induction to Soft Skills		**Hours :06**		
Sr.	*Subunit*	*Hours*	*Assessment*	*Bloom's Level*
5.1	Personal SWOC analysis	06	Assessment through presentation, exercise, case study, role play, skit and group activity	Remembering, understanding, applying, evaluating, creating
5.2	Goal setting			
5.3	Motivation			
5.4	Leadership and team working			
5.5	Ethical values			
5.6	Stress management			
5.7	Emotional intelligence			
5.8	Positive thinking and attitude			
5.9	Decision making			
5.10	Creativity			

- **In Semester Evaluation (ISE)–**
  ISE shall be based on three theory examination conducted at institute level covering above curriculum. Examinations shall include sufficient questions covering all topics / subtopics

- **Internal Continuous Assessment (ICA)-**
  ICA shall be based on performance of the student during the laboratory sessions in language Lab covering minimum12 exercises out of the following exercises:

1. Power point presentation and a delivery
2. Writing views on a topic for group discussion in about 180words
3. Participation in a group discussion
4. Writing responses to the frequently asked questions in personal interview
5. Mock personal interview.
6. Resume writing for campus placement
7. Industrial visit report writing
8. Other technical report writing
9. Self SWOC analysis
10. Oral presentation on self-short term and long term goals
11. Writing self-short term and long term goals
12. Role play on leadership and team working
13. Exercise on Précis Writing
14. Case study on decision making, stress management, success stories, positive thinking, entrepreneurship, etc.

✓ *Note – Students shall be encouraged to use ICT tools for compilation, analysis, report writing and presentation.*

- **Text Books:**

1. Soft Skills: An Integrated Approach to Maximize Personality, Gajendra Singh Chauhan &Sangeeta Sharma, Willy Indian Pvt. Ltd.
2. On Writing Well. William Zinsser. Harper ResourceBook.2001.
3. Technical English. Dr. M. Hemamalini, Willy Indian Pvt. Ltd
4. Professional Speaking Skills. Aruna Koneru. Oxford University Press

- **References Books:**

1. Soft Skills. K. Alex., S. Chand Publications
2. Soft Skills – A Text book for Undergraduates. Ajay R Tengse, Orient Black Swan
3. Communication Skills Sanjay Kumar Pushpa Lata Oxford University Press
4. Managing Soft Skills for Personality Development, B N Ghosh- McGraw Hill Publication
5. Soft Skills for Everyone Jeff Butterfield, Cengage Learning
6. Soft Skills for Mangers. Dr. T. Kalyana Chakravarthi& Dr. T. Ltha Chakravarthi Biztantra Publication

SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF ENGINEERING & TECHNOLOGY

ALL BRANCHES

CBCS Syllabus for

First Year B.Tech. (All Branches)
w.e.f. Academic Year 2018-19

V3.1 as on July 19, 2018

SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF ENGINEERING & TECHNOLOGY
CBCS Curriculum for First Year B.Tech. (All Branches)
WEF 2018-19

- Semester I : Theory Courses

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		*Total*
		L	*T*	*P*		*ESE*	*ISE*	*ICA*	
C011/ C012	Engineering Physics / Engineering Chemistry$	3			3	70	30		100
C112	Engineering Mathematics I	3			3	70	30		100
C113	Basic Electrical & Electronics Engineering	4			4	70	30		100
C114	Engineering Mechanics	3			3	70	30		100
C115	Basic Mechanical Engineering	3			3	70	30		100
C116	Communication Skills	1			1		25		25
	Total	17			17	350	175		525

- Semester I : Laboratory / Tutorial Courses

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		*Total*
		L	*T*	*P*		*ESE*	*ISE*	*ICA*	
C011/ C012	Engineering Physics / Engineering Chemistry$			2	1			25	25
C112	Engineering Mathematics I		1		1			25	25
C113	Basic Electrical & Electronics Engineering			2	1			25	25
C114	Engineering Mechanics			2	1			25	25
C115	Basic Mechanical Engineering			2	1			25	25
C116	Communication Skills			2	1			25	25
C117	Workshop Practice			2	1			25	25
	Total		1	12	7			175	175
	Grand Total	**17**	**1**	**12**	**24**	**350**	**175**	**175**	**700**
C118	Induction Program	*# (Please see note below)*							

- Semester II : Theory Courses

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		*Total*
		L	*T*	*P*		*ESE*	*ISE*	*ICA*	
C011/ C012	Engineering Physics / Engineering Chemistry$	3			3	70	30		100
C122	Engineering Mathematics II	3			3	70	30		100
C123	Engineering Graphics & Design	3			3	70	30		100
C124	Basic Civil Engineering	3			3	70	30		100
C125	Programming for Problem Solving	2			2		25		25
C126	Professional Communication	1			1		25		25
	Total	15			15	280	170		450
C127	Democracy, Elections and Good Governance					30			30

- Semester II : Laboratory / Tutorial Courses

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		*Total*
		L	*T*	*P*		*ESE (POE)*	*ISE*	*ICA*	
C011/ C012	Engineering Physics / Engineering Chemistry$			2	1			25	25
C122	Engineering Mathematics II		1		1			25	25
C123	Engineering Graphics & Design			4	2			50	50
C124	Basic Civil Engineering			2	1			25	25
C125	Programming for Problem Solving			4	2	50#		50	100
C127	Professional Communication			2	1			25	25
	Total		1	14	8	50		200	250
	Grand Total	**15**	**1**	**14**	**23**	**330**	**170**	**200**	**700**
C128	Democracy, Elections and Good Governance							20	

- Legends used –

L	Lecture	FA	Formative Assessment
T	Tutorial	SA	Summative Assessment
P	Lab Session	ESE	End Semester Examination
		ISE	In Semester Evaluation
		ICA	Internal Continuous Assessment

- **Notes-**

1. $ - Indicates approximately half of the total students at FE will enroll under Group A and remaining will enroll under Group B.

   Group A will take up course of Engineering Physics (theory & laboratory) in Semester I and will take up course of Engineering Chemistry (theory & laboratory) in semester II.

   Group B will take up course of Engineering Chemistry (theory & laboratory) in Semester I and will take up course of Engineering Physics (theory & laboratory) in semester II

2. # - Indicates the subject 'Programming for Problem Solving' shall have a University 'Practical and Oral Examination' at the end of the semester assessing student's programming skills.

3. In Semester Evaluation (ISE) marks shall be based upon student's performance in minimum two tests & mid-term written test conducted & evaluated at institute level

   Internal Continuous Assessment Marks (ICA) are calculated based upon student's performance during laboratory sessions / tutorial sessions

4. Democracy, Elections & Good Governance is mandatory course. The marks earned by student with this course shall not be considered for calculation of SGPA/CGPA. However student must complete ICA of 20 marks and End Semester Examination (ESE) of 30 marks (as prescribed by university, time to time) for fulfillment of this course. This course is not considered as a passing head for counting passing heads for ATKT. However, student must pass this subject for award of the degree

5. Student must complete induction program of minimum five days before commencement of the regular academic schedule at the first semester.

GUIDELINES FOR INDUCTION PROGRAM (C128)

New entrants into an Engineering program come with diverse thoughts, mind set and different social, economical, regional and cultural backgrounds. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose.

A **Five day** induction program for the new UG entrant students is proposed at the commencement of the first semester. It is expected to complete this induction program before commencement of the regular academic schedule.

Its purpose is to make new entrants comfortable in their new environment, open them up, set a healthy daily routine for them, create bonding amongst the peers as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The Induction Program shall encompass (but not limited to) below activity –

1. Physical Activities
2. Creative Arts
3. Exposure to Universal Human Values
4. Literary Activities
5. Proficiency Modules
6. Lectures by Experts / Eminent Persons
7. Visit to Local Establishments like Hospital / Orphanage
8. Familiarization to Department

Induction Program Course do not have any marks or credits however performance of students for Induction Program is assessed at institute level using below mandatory criteria –

1. Attendance and active participation
2. Report writing

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Solapur University, Solapur

First Year B.Tech (All Branches) Semester-I/II

C011 ENGINERING PHYSICS

Teaching Scheme
Theory– 3Hrs. /Week, 3 Credits
Laboratory– 2 Hrs. /Week, 1Credit

Examination Scheme
Theory –ESE -70 Marks
ISE - 30 Marks
ICA - 25 Marks

- **Course Objectives :**

C011.O1	To make student understand fundamentals of crystal system, classification of solids depending on energy gap with their electronic properties.
C011.O2	To introduce student sound engineering through basic concepts of acoustics and ultrasonic.
C011.O3	To make student understand the basic concepts of relativistic mechanics.
C011.O4	To make student recall and discuss the concepts of wave optics through diffraction and polarization.
C011.O5	To make student comprehend basics, working of laser and optical fiber.
C011.O6	To introduce student basic concepts of quantum mechanics and nanotechnology.

- **Course Outcomes :**

At the end of this course, student will be able to

C011.1	Describe the concepts of semiconducting material and crystal structure.
C011.2	Apply basic concepts of acoustics and ultrasonic in engineering field.
C011.3	Relate space, time, mass and energy equations.
C011.4	Express the concepts of diffraction, polarization and can relate them to day to day observable phenomena.
C011.5	Explain the fundamental concepts, advantages and applications of laser and optical fiber in the field of science, engineering and medical.
C011.6	Express the basic concepts of quantum mechanics and nanotechnology.

- **Course Curriculum**

Section I

Unit No 01: Semiconductor Physics		**Hours:05**			**Marks: 12**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
1.1	Classification of solids, Fermi level (definition), Fermi-Dirac probability distribution function (introduction only)	03	02	Explanation, Definition, Classification	Remembering, Understanding
1.2	Fermi level in intrinsic and extrinsic semiconductors, effect of impurity concentration on Fermi level, derivation for E_{Fin}	04	02	Explanation, Derivation	Remembering, Understanding
1.3	Hall effect and its applications, numericals on this chapter	05	01	Explanation, Derivation Numerical	Understanding, Applying

Unit No 02: Crystallography			**Hour : 06**		**Marks: 13**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
2.1	Introduction to crystal systems, characteristics of cubic unit cell: number of atoms per unit cell, atomic radius, co-ordination number	04	02	Explanation, Definition	Remembering, Understanding
2.2	Atomic packing factor, void space, density of crystal, symmetry elements (axis, center and plane),Bragg's Law	04	02	Explanation, Describe, Numerical	Remembering, Understanding
2.3	Miller indices, inter planner distance (by using Miller indices), numericals on this chapter	05	02	Explanation, Derivation, Numerical	Remembering, Understanding, Applying

Unit No 03: Sound Engineering			**Hours: 05**		**Marks: 13**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
3.1	Acoustics: Introduction, reverberation, reverberation time, absorption coefficient (definition only), Sabine's formula, basic requirements for acoustically good hall	04	02	Explanation, State Define Numerical	Remembering, Understanding, Applying
3.2	Factors affecting acoustics of auditorium and their remedies, numericals on this chapter	05	01	Explanation, Numerical	Remembering, Understanding,
3.3	Ultrasonic **:**Introduction, piezoelectric effect and magnetostriction effect (introduction), properties of ultrasonic waves, detection methods of ultrasonic waves and applications.	04	02	Explanation, State	Remembering, Understanding, Applying

Unit No 04: Relativistic Mechanics			**Hours: 05**		**Marks: 13**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
4.1	Introduction, postulates of special theory of relativity, Lorentz transformation of space and time,numericals on this chapter	05	02	Explanation, Derive State Numerical	Remembering, Understanding, Applying
4.2	Length contraction, time dilation,	04	02	Explanation, Derivation, Numerical	Remembering, Understanding, Applying
4.3	Equivalence of mass and energy	04	01	Explanation, Derivation, Numerical	Remembering, Understanding, Applying

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Section II

Unit No 05: Wave Optics			**Hours: 06**		**Marks: 13**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
5.1	Diffraction**:**Introduction, resolving power, Rayleigh criterion, theory of diffraction grating and its resolving power.	04	02	Explanation, State Define	Understanding, Applying
5.2	Polarization: concept, optic axis, Malus law, positive and negative crystals	04	02	Explanation, State, Differentiate	Remembering, Understanding, Applying
5.3	Optical activity, specific rotation, Laurent's half shade polarimeter, Numericals on this chapter	05	02	Explanation, Define Numerical	Remembering, Understanding

Unit No 06: LASER			**Hours: 05**		**Marks: 13**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
6.1	Interaction of radiation with matter-Stimulated absorption, spontaneous and stimulated emission, population inversion, pumping, metastable state, properties of laser	04	02	Explanation, State, Define	Remembering, Understanding
6.2	He-Ne gas laser	05	01	Explanation, Describe	Remembering, Understanding
6.3	Holography (construction and reconstruction), applications of laser (science, engineering and medical),	04	02	Explanation	Remembering, Understanding, Applying

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Unit No 07: Optical Fibers			**Hours: 05**		**Marks: 13**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
7.1	Introduction, structure of optical fiber, basic principle of optical fiber (total internal reflection)	04	01	Explanation, State,	Remembering, Understanding
7.2	Derivation for acceptance angle, acceptance cone and numerical aperture, fractional refractive index change, numericals on this chapter	05	02	Define, Derive, Numerical	Remembering, Understanding, Applying
7.3	Classification of optical fibers- single mode and multi-mode fiber,step index and graded index fibers,advatntages of optical fibers over conducting wires	04	02	Explanation, Classify	Remembering, Understanding

Unit No 08: Introduction to Quantum Mechanics and Nanotechnology			**Hours: 05**		**Marks: 12**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
8.1	De Broglie hypothesis, De Broglie wavelength of matter waves: in terms of kinetic energy and associated with particle in thermal equilibrium, properties of matter waves	03	03	Explanation, Numerical	Remembering, Understanding, Applying
8.2	Davisson-Germer experiment (apparatus, investigations and analysis), numericals on this chapter	05	01	Explanation, Numerical	Remembering, Understanding, Applying
8.3	Nanotechnology: introduction,carbon nano tubes and its classification, applications of nanotechnology-electronics, energy, automobiles, space and defense, medical, environmental, textile, cosmetics	04	01	Explanation, Define, State, Classify	Remembering, Understanding,

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- **In Semester Evaluation (ISE):**

  In Semester Evaluation (ISE) marks shall be based upon student's performance in minimum two tests & mid-term written test conducted & evaluated at institute level.

- **Internal Continuous Assessment (ICA):**

  *Internal Continuous Assessment (ICA) marks are calculated based on student's performance during laboratory sessions (minimum **eight** experiments out of below list).*

1. Measurement of band gap energy of a semiconductor diode.
2. To determine Hall coefficient and charge carrier concentration by Hall Effect.
3. Study of Crystal structures.
4. Determination of velocity of sound using Kundt's tube apparatus.
5. Determination of wavelength of light by using diffraction grating.
6. Resolving power of a telescope/ diffraction grating.
7. Verification of inverse square law of intensity of light (Malus law).
8. To determine specific rotation by using Laurent's half shade Polarimeter.
9. Calculation of divergence of LASER beam.
10. Determination of wavelength of LASER using diffraction grating.
11. Determination of inter-planar distance 'd' using XRD pattern.
12. Study of Fiber optics.
13. To determine the Numerical Aperture of the optical fiber.

- **Text / Reference Books:**

1. Engineering Physics, R.K. Gaur and S.L. Gupta, DhanapatRai Publications
2. A Text Book of Engineering Physics, M.N. Avadhanulu, P.G. Kshirsagar, S. Chand and Company Ltd.
3. Modern Physics,B.L. Theraja, S. Chand and Company Ltd.
4. A Text Book of Optics, Subramanya and BrijLal, S. Chand and Company Ltd.
5. Nanotechnology: Principles and Practices, Sulabha K. Kulkarni, Capital Publishing Company
6. Nanoscience and Nanotechnology: Fundamentals to Frontiers – M.S. RamachandraRao, Shubra Singh, Wiley India Pvt Ltd, New Delhi
7. Engineering Physics, D.K. Bhattacharya, PoonamTandon, Oxford University Press
8. Solid State Physics, S.O. Pillai, McGraw Hill Publications

Solapur University, Solapur

First Year B. Tech. (All Branches) Semester-I / II

C012 ENGINEERING CHEMISTRY

Teaching Scheme
Theory– 3 Hrs. /Week, 3 Credits
Laboratory– 2 Hr. /Week, 1 Credit

Examination Scheme
Theory –ESE -70 Marks
ISE – 30 Marks
ICA – 25 Marks

- ## Course Objectives :

C012.O1	To impart knowledge of importance of quality of water and appropriate water treatment process
C012.O2	To impart knowledge of corrosion & its prevention techniques.
C012.O3	To equip student with the required analytical skills.
C012.O4	To introduce to student different engineering materials and their applications.
C012.O5	To make student apply knowledge for determining quality of water, fuel, polymer& oils.
C012.O6	To introduce student different chemical reactions and commonly used drug molecules.

- ## Course Outcomes :

At the end of this course, student will able to

C012.1	Describe importance of quality of water and appropriate water treatment process.
C012.2	Recognize various types of corrosion & propose a suitable prevention technique.
C012.3	Describe various instrumental techniques.
C012.4	Identify and explain different engineering materials like metals, ceramics, fuels, lubricants, polymers for various engineering and day to day applications.
C012.5	Calculate hardness of water, concentration of unknown solution, calorific value of fuels, saponification & acid value of oils, molecular weight of polymers etc.
C012.6	Describe various types of chemical reactions and commonly used drug molecules.

- **Course Curriculum**

Section I

Unit No 01: Water Chemistry			**Hours : 07**		**Marks: 16**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
1.1	Introduction, water quality parameters like pH, acidity, alkalinity, total solids, Dissolved oxygen, chlorides (definitions & permissible limits as per BIS), BOD, COD, (Definition, Determination & Significance).	3	2	Explanation	Understanding remembering
1.2	Hardness: types of hardness (temporary/ permanent), Calcium carbonate equivalent hardness and its calculations. (Numerical problems on hardness),	4	1	Explanation, numerical	Remembering, understanding, applying
1.3	Scale and sludge in boilers: Formation, disadvantages and prevention. Softening of water by Ion exchange process and reverse osmosis process.	5	2	Explanation	Understanding, remembering
1.4	Treatment of water for domestic purpose by aeration, sedimentation with coagulation process. Disinfection of water by chloramine, bleaching powder, chlorine and ozone.	4	2	Explanation, applications	Remembering, understanding

Unit No 02: Organic reactions and Synthesis of Drug Molecules			**Hours : 03**		**Marks: 08**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
2.1	Introduction to organic reactions: Addition, substitution, elimination and rearrangement (no mechanism)	4	2	Explanation	Remembering, understanding
2.2	Synthesis and uses of commonly used drug molecules: Paracetamol, Aspirin and Ibuprofen.	4	1	Explanation, applications	Remembering, understanding

Unit No 03: Lubricants		**Hours: 06**			**Marks:13**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
3.1	Lubricants & lubrication, functions, classification of lubricants: Solid, semisolid and liquid.	4	2	Explanation	Remembering, understanding
3.2	Characteristic properties of lubricants (only definition) such as viscosity, viscosity index, flash point & fire point, cloud point & pour point, aniline point, oiliness, saponification value & acid value (numerical problems on saponification & acid value)	5	2	Explanation, numerical	Remembering, understanding, applying
3.3	Types of lubrication such as fluid film, boundary (thin film) and extreme pressure. Selection of lubricants for cutting tools, I.C. engine, gears, transformers, delicate instruments & refrigeration system.	4	2	Explanation application	Remembering, understanding

Unit No 04: Corrosion		**Hours : 05**			**Marks:13**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
4.1	*Corrosion:* definition, classification *Dry corrosion*: oxidation corrosion: nature of oxide film. *Wet corrosion* – electrochemical corrosion: Hydrogen evolution mechanism, oxygen absorption mechanism.	5	2	Explanation	Remembering, understanding
4.2	Factors influencing corrosion, testing and measurement of corrosion by weight loss method and electrical resistance method	4	1	Explanation	Remembering, understanding
4.3	*Prevention of corrosion by: cathodic* protection, anodic protection by anodizing and potentiostat. *Protective coatings*: methods of application of metal coatings such as hot dipping (galvanization &tinning), metal cladding.	4	2	Explanation	Remembering, understanding

Section II

Unit No 05: : Metals, Alloys & Ceramics		**Hours : 04**			**Marks: 10**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
5.1	*Metallic Materials:* types of iron: cast iron, steel and wrought iron: composition, properties and applications. Alloys: definition, purposes of making alloys.	4	2	Explanation, application	Remembering, understanding
5.2	*Ceramics:* definition, classification, properties. *Glass:* general properties, general method of manufacture of glass, types of glasses: soft, hard, borosilicate, optical, laminated and safety glass.	6	2	Explanation, application	Remembering, understanding

Unit No 06: Fuels		**Hours : 07**			**Marks:15**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
6.1	Introduction, classification, characteristics of good fuel, comparison between solid, liquid and gaseous fuel, calorific value (gross and net),	3	2	Explanation	Remembering, understanding
6.2	Determination of calorific value by bomb calorimeter and Boy's calorimeter. Dulong's formula for calorific value. (numerical problems on calorific value.)	8	3	Explanation, Application, Numerical	Remembering, understanding, Applying
6.3	*Petroleum:* introduction, composition, classification, origin, refining of crude oil. *Biodiesel:*introduction, preparation, advantages and disadvantages.	4	2	Explanation	Remembering, understanding

Unit No 07: Polymers		**Hours : 06**			**Marks:16**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
7.1	Polymerization, types of polymerization (no mechanism), degree of polymerization (DP), numerical problems on degree of polymerization, number average molecular weight (definitions and numerical problems)	4	2	Explanation, application, numerical	Remembering, understanding, applying
7.2	*Plastics:* definition, properties, types of plastics (thermo softening and thermosetting), properties and applications of PVC and PET, molding of plastic into articles: compression, extrusion and injection.	6	2	Explanation, application	Remembering, understanding
7.3	*Rubber:*Classification, isolation of natural rubber, vulcanization, properties and applications of Buna-S and Thiokol rubbers. *Biodegradable Polymers:* Introduction, examples with applications.	6	2	Explanation, application	Remembering, understanding

Unit No 08: Modern Analytical Techniques		Hours : 04			Marks: 09
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
8.1	*Concentration of solution*-: molarity, normality, mole fraction (definition and numerical problems),	4	2	Explanation, application, numerical	Remembering, understanding, applying
8.2	*Chromatography:* definition, types. *GLC:* definition, instrumentation and application of GLC. *Thermal analysis:* definition of TGA, instrumentation and application of TGA.	5	2	Explanation	Remembering, understanding

- **In Semester Evaluation (ISE):**

  ISE shall be based upon student's performance in minimum two tests & mid-term written test conducted & evaluated at institute level

- **In Semester Continuous Assessment (ICA):**

  *ICA shall be based on minimum **Eight** experiments out of below list*

1. Determination of Hardness of water.
2. Determination of Alkalinity of water.
3. Determination of Chloride content in given water.
4. Determination of dissolved oxygen in water.
5. Proximate analysis of coal (Ash. Moisture, Volatile matter and fixed carbon).
6. Determination of viscosity of a lubricant by Ostwald's viscometer.
7. Determination of aniline point of lubricating oil.
8. Determination of percentage of copper in Brass.
9. Estimation of rate of corrosion of Aluminium in acidic and basic media.
10. Estimation of Copper in Bronze metal alloy.
11. Estimation of Zinc in Brass.
12. Volumetric estimation of calcium in lime stone.
13. Volumetric estimation of CaO and MgO from Dolomite by EDTA method.
14. Preparation of phenol formaldehyde resin.
15. Preparation of urea Formaldehyde resin.
16. Determination of COD of water sample.
17. Separation of Metal ions by paper chromatography
18. Separation of mixture of organic compounds by TLC.
19. Separation of mixture of organic compounds by Column chromatography.
20. Determination of oil and grease from waste water.
21. Ion exchange column for removal of hardness of water.
22. Hands on Determination of pH by pH meter
23. Hands on Determination of EMF of acid base titration potentiometer
24. Hands on Experimental demonstration of Photo colorimeter

- **Text Books:**

1. A text book of Engineering Chemistry, S.S. Dara, S S Umare, S Chand
2. A text book of Engineering Chemistry, Shashi Chawala, Dhanpat Rai & Co
3. A text book of Experiments and Calculations in Engineering Chemistry, S.S. Dara. S Chand

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- **Reference Books:**

1. Engineering Chemistry, Jain and Jain, Dhanpat Rai & Co
2. Engineering Chemistry, M. Subha Ramesh, Dr. S. Vairan-Ed.-IInd Wiley
3. Instrumental Methods of chemical analysis, Chatwal and Anand,Himalaya Pub House
4. Industrial Chemistry, B.K.Sharma,Goyal
5. Chemistry for Engineers, Rajesh Agnihotri, Wiley
6. Fundamentals of Engineering Chemistry, S.K.Singh, New Age Int.
7. Engineering Chemistry (NPTEL Web book), B. L. Tembe, Kamaluddin & M. S. Krishnan.

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Solapur University, Solapur

First Year B. Tech. (All Branches) Semester-I

C112 ENGINEERING MATHEMATICS- I

Teaching Scheme
Theory – 3 Hrs /Week, 3 Credits
Tutorial– 1 Hr. /Week**,** 1 Credit

Examination Scheme
Theory – ESE -70 Marks
ISE – 30 Marks
ICA – 25 Marks

- **Course Objectives :**

C112.O1	To introduce to student higher order derivatives of various standard functions and Mean Value Theorems.
C112.O2	To introduce to student the expansion of functions about any point and to evaluate the indeterminate forms of limits.
C112.O3	To introduce to student rank of matrix, solution of simultaneous equations, Eigen values and Eigen vectors.
C112.O4	To introduce to student Multivariable differentiation and its applications
C112.O5	To introduce to student vector differentiation and applications.

- **Course Outcomes :**

At the end of this course,

C112.1	Student can compute higher order derivative of standard functions and verify Mean Value Theorems.
C112.2	Student can express the power series expansion of a given function and evaluate limits
C112.3	Students are able to use matrices techniques for solving system simultaneous linear equations , Eigen values and Eigen vectors of the matrix
C112.4	Student can evaluate Multivariable derivatives and can implement to estimate maxima and minima of multivariable function
C112.5	Students can compute velocity vector, gradient, divergence, curl and applications.

- **Course Curriculum**

Section I

Unit No 01: Successive Differentiation and Mean Value Theorems			**Hours : 06**		**Marks: 13**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
1.1	Definition & symbol, nth derivatives of standard functions like $e^{ax}, \frac{1}{ax+b}, (ax+b)^m, \frac{1}{(ax+b)^m}, \log(ax+b), \sin(ax+b), \cos(ax+b), a^x, e^{ax}Sin(bx+c)\ and\ e^{ax}\cos(bx+c)$	01	01	Definition	Remembering
1.2	n^{th} derivatives of algebraic functions, n^{th} derivatives of functions belongs to polar form	03	02	Determination of n^{th} order derivative	Remembering, understanding, applying
1.3	Statement of Leibnitz's Theorem (without proof), nth derivative of product of two functions by Leibnitz theorem, formation of higher order differential equations for the given functions,	06	02	Determination of n^{th} order derivative	Remembering, understanding, applying
1.4	Mean Value Theorem(MVT) (Without Proof) : Rolles MVT, Lagranges MVT, Cauchys MVT	03	01	Verification, finding value of Constant	Remembering, understanding, applying
Unit No 02: Expansion of Functions and Indeterminate forms			**Hours : 06**		**Marks: 19**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
2.1	Statement of Maclaurin's series (without proof), expansion of standard functions and examples using Maclaurin's series. Expansion of functions by standard series method, differentiation and integration, method of substitution.	09	03	Numerical example, evaluate	Remembering, understanding, applying
2.2	Statement of Taylor's series (without proof), expansion of functions *f(x)* about any point	04	01	Numerical example, evaluate	Remembering, applying
2.3	Indeterminate forms of the type $\frac{0}{0}, \frac{\infty}{\infty}, 0\times\infty, \infty-\infty, 1^\infty, 0^0, \infty^0\ by\ L$ Hospital's rule.	06	02	Evaluate, applications	Understanding, applying

Unit No 03: Matrices			**Hours : 09**		**Marks: 20**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
3.1	Definition of Symmetric, Skew-Symmetric and orthogonal Matrices, Rank of matrix, canonical form or normal form of matrix	04	02	Numerical example, evaluate	Remembering, understanding
3.2	System of Simultaneous Linear Equations - homogeneous and non-homogeneous	04	03	Numerical example, evaluate	Understanding, applying
3.3	Linear dependence and independence of vectors, Cayley - Hamilton Theorem (without proof) Inverse by Cayley Hamilton Theorem	06	02	Definition, applications	Understanding, applying
3.4	Eigen values , Eigen vectors and their properties	06	02	Definition , determination	Remembering, understanding, applying

Section II

Unit No 04: Multivariable Differential Calculus			**Hours : 07**		**Marks: 18**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
4.1	Partial(Multivariable) derivatives of first and higher order , variable to be treated as constant	06	03	Evaluate	Remembering, understanding
4.2	Total derivative, Partial(Multivariable) differentiation of composite function	06	02	Determination	Remembering, understanding,
4.3	Homogeneous functions and Euler's Theorem (without proof)	06	02	Applications	Remembering, applying

Unit No 05 : Applications of Multivariable Differential Calculus			**Hours : 07**		**Marks: 17**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
5.1	Jacobians , properties of Jacobians i.e. $J.J^* = 1$, Jacobians of composite functions	04	02	Definition, applications	Remembering, understanding, applying
5.2	Errors and approximations	04	02	Application, numerical example, evaluate	Remembering, understanding, applying
5.3	Maxima & minima of functions of two variables	06	02	Definition, applications	Remembering, understanding, applying
5.4	Lagrange's method of Undetermined multipliers (one condition)	03	01	applications	Understanding, applying

Unit No 06: Vector Differential Calculus			**Hours : 07**		**Marks: 17**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
6.1	Velocity vector, acceleration vector, tangential and normal component of acceleration	04	02	Evaluate	Remembering, understanding,
6.2	Vector differential operator, gradient, directional derivatives, angle between surfaces,	06	03	Evaluate/numerical	Understanding, applying
6.3	Divergence and curl, solenoidal and irrotational field	07	02	Evaluate/ apply standard results	Understanding, applying

- **In Semester Evaluation (ISE):**
  ISE shall be based upon student's performance in minimum two tests & mid-term written test conducted & evaluated at institute level

- **In Semester Continuous Assessment (ICA):**
  ICA shall be based on student's performance during tutorial sessions and on completion of minimum six assignments assignment

- **Text Books:**
  1. A Text Book of Applied Mathematics, P.N. and J.N. Wartikar, Vol.1, Pune Vidyarthi Griha Prakashan.
  2. Advanced Engineering Mathematics, H. K. Dass, S. Chand Publications, Delhi.
  3. Engineering Mathematics (Volume I), ITL Education, Cengage Learning.
  4. Engineering Mathematics, Ravish R Sing and Mukul Bhatt, McGraw Hill.
  5. Applied Mathematics-I,II, Kreyzig's, Wiley.
  6. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications, 2008

- **Reference Books**:

  1. Higher Engineering Mathematics (42nd Edition), B.S. Grewal Khanna Publications, Delhi.
  2. Engineering Mathematics, Srimanta Pal and Subodh C. Bhunia, Oxford Higher Education.
  3. Mathematics for Engineering Applications, Kuldip S. Rattan and Naathan W. Klingbeil Wiley. (Modeling and Core Engineering Application)
  4. Higher Engineering Mathematics, Ramana B.V., Tata McGraw Hill New Delhi, 2010.

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Solapur University, Solapur

First Year B. Tech. (All Branches) Semester-I

C113 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Teaching Scheme
Theory– 4Hrs /Week, 4 Credits
Laboratory– 2 Hrs /Week, 1 Credit

Examination Scheme
Theory –ESE - 70 Marks
ISE – 30 Marks
ICA – 25 Marks

- **Course Objectives :**

C113.O1	To introduce to student various simplification methods for dc circuits so as student can analyze dc circuits and can solve numerical problems based on it
C113.O2	To introduce to student fundamentals of magnetic circuits and electromagnetic induction and its application.
C113.O3	To make student comprehend generation and behavior of single phase ac circuits for R,L,C load
C113.O4	To introduce to student analysis of poly phase ac circuit.
C113.O5	To emphasize on working and applications of diode.
C113.O6	To make student comprehend working of bipolar junction transistor with basic configurations
C113.O7	To make student understand different types of transducers & application areas of transducers.
C113.O8	To introduce to student fundamental of digital electronics.

- **Course Outcomes :**

At the end of this course,

C113.1	Student can apply the various simplification methods to analyze dc circuits.
C113.2	Student can use the concept of magnetic circuits to calculate parameters of magnetic circuits and single phase transformer
C113.3	Student can apply knowledge of ac fundamentals to analyze series ac circuits.
C113.4	Student can use the concept of poly phase ac circuit to analyze three phase star, delta circuits.
C113.5	Student can explain working and applications of diode.
C113.6	Student can explain working and characteristics of BJT.
C113.7	Select appropriate transducers to measure various physical parameters like distance, temperature etc.
C113.8	Perform arithmetic operations on digital number system and solve Boolean expressions.

- **Course Curriculum**

Section I

Unit No 01: DC Circuits			**Hours : 07**		**Marks: 15**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
1.1	Ohm's law, Resistance, specific resistance, energy sources, concepts of open circuit and short circuit	01	01	Explanation, Understandings, applications	Understanding, applying
1.2	Kirchhoff's Voltage and Current law& it's applications for circuit solutions	04	02	Explanation, simplification of circuits (numerical), applications	Remembering, understanding, applying
1.3	Simplifications of circuits using series, parallel combinations	04	02	Explanation, simplification of circuits (numerical), applications	Remembering, understanding, applying
1.4	Star-delta, delta-star conversions	06	02	Derivation, numerical	Understanding

Unit No 02: Magnetic Circuit and Single Phase Transformer			**Hours : 06**		**Marks: 16**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
2.1	Basic definitions related to magnetic circuit (flux, mmf, reluctance, flux density, magnetic field strength, permeability) Comparison between electric and magnetic circuit.	02	01	Explanation, Understandings,	Understanding,
2.2	Series magnetic circuits with air gap, magnetic leakage and fringing	04	02	Numerical, applying	Remembering, understanding
2.3	Faraday's law of electromagnetic induction, Lenz's law, concept of self and mutual inductance	02	01	Selection, discussion	Remembering, understanding
2.4	Working principle and construction of Single Phase transformer	04	01	Explanation, Understandings,	Understanding,
2.5	EMF-equation of Single phase transformer	04	01	Explanation, Derivation, Numerical	Remembering, understanding, applying

Unit No 03: Single Phase AC Circuits		**Hours : 08**			**Marks: 14**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
3.1	Introduction to AC, Generation of alternating voltage and current, concept of cycle, period, frequency, phase difference, Instantaneous value, Peak value	02	01	Explanation, Understandings, applications	Understanding, applying
3.2	RMS value of an alternating quantity, average value of an alternating quantity, form factor, peak factor.	04	01	Explanation, understandings, applications	Remembering, understanding, applying
3.3	AC through pure resistance, pure inductance and pure capacitance, Phasor diagram	02	02	Explanation, simplification of circuits (numerical), applications	Understanding, applying
3.4	Series AC circuit (RL, RC and RLC): impedance , complex power, power factor	06	04	Explanation, simplification of circuits (numerical), applications	Remembering, understanding, applying

Unit No 04: Poly-Phase Circuits		**Hours : 03**			**Marks: 05**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
4.1	Generation of three phase voltages	01	01	Explanation	Understanding, Remembering
4.2	Relations of voltage and current in star and delta connections for balanced systems.	04	02	Explanation, simplification of circuits (numerical), applications, Derivation	Remembering, understanding, applying

Section II

Unit No 05: Semiconductor Diodes			**Hours : 07**		**Marks: 14**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
5.1	*Semiconductors and p-n junction diode* **-**Doping, depletion layer, barrier potential, construction, working, biasing, V-I characteristics, ratings.	04	02	Explain, define	Recalling, understanding

5.2	*Diode applications*-Circuit diagram & working of half wave rectifier, full wave rectifier, bridge rectifier. Analysis of above rectifiers- average & RMS value of voltage & current, ripple factor and efficiency, capacitor filter using full wave rectifier- circuit diagram, working and formula of ripple factor.	06	03	Explain, define, apply, numerical	Recalling, understanding, applying
5.3	*Special Purpose Diodes*- photo diode, LED- application of LED as 7-segment display , Zener diode- Working principle, V-I characteristics, ratings, application of Zener as voltage regulator	04	02	Explain, define, apply	Recalling, defining, understanding

Unit No 06: Bipolar Junction Transistor			**Hours : 04**		**Marks: 10**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
6.1	*Bipolar Junction Transistor*-construction, biasing, configuration with I/O characteristics for -CB,CE,CC, comparison between CB,CE,CC configurations, ratings of transistor	06	03	Explain, define, numerical	Recall, understanding
6.2	*Application of transistor*-BJT as switch and amplifier	04	01	Explain, apply	Recall, understanding, applying

Unit No 07: Electrical Transducers			**Hours : 05**		**Marks: 10**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
7.1	Introduction, parameters for selection of transducers, wire type strain gauge , load cell , LVDT	06	02	Explain, define, apply, select	Recall, understanding, applying
7.2	Temperature & other transducers-thermocouple , thermistor, reluctance pulse pickup, photoelectric pickup, LDR , solar cell	04	03	Explain, define, select	Recall, understanding, applying

Unit No 08: Introduction to Digital Electronics			**Hours : 08**		**Marks: 16**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
8.1	*Number system*- decimal, binary, octal, hexadecimal & their inter-conversion , BCD code	04	02	Numerical	Recalling, understanding, applying
8.2	*Binary Arithmetic*- addition, subtraction, subtraction using 2's complement	04	02	Numerical	Recalling, understanding, applying
8.3	*Logic Gates*- AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR Gates - symbol, output equation, truth table, realization of basic gates using universal gates	04	02	Explain, define, numerical	Recalling, understanding, applying
8.4	*Boolean Algebra*- laws & rules, De-Morgan theorem, simplification of logical expressions using Boolean algebra	04	02	Explain, define, simplify	Recalling understanding, applying

- **In Semester Evaluation (ISE):**

  ISE shall be based upon student's performance in minimum two tests & mid-term written Test conducted & evaluated at institute level

- **In Semester Continuous Assessment (ICA):**

  *ICA shall be based on minimum **Five** experiments from 1 to 6 and Minimum Five experiments from 7 to 13 out of below list*

1. Hands on types of wires, wiring systems and wiring exercises.
2. Verification of KVL and KCL
3. Verification of voltage relation of RL, RC and RLC series connected AC circuits
4. Verification of line and phase relation for star connected load.
5. Verification of line and phase relation for delta connected load
6. Verification of transformation ratio of single phase transformer.
7. Identification, testing and measurement of electronic components – resistors, capacitors, inductors.
8. V-I characteristics of PN junction diode.
9. Half and full wave rectifier.
10. Controlling relay using transistor as a switch.
11. Measurement of distance using LVDT.
12. Verification of truth table of basic gates and universal gates using IC's.
13. Implementation of Boolean expression using basic gates.

- **Text-Books :**

1. Electrical Technology (Volume I & 2), B L Thereja, 22nd edition, S Chand & Company Ltd
2. Basic Electrical Engineering, V K Mehta, Revised edition, S Chand & Company Ltd
3. Basic Electronics Solid State, B L Thereja, Revised edition, S Chand & Company Ltd
4. Digital Principles and Applications, Albert Malvino , Donald Leach, Tata McGraw Hills Publication
5. Principles of Electronic Devices and Circuits (Analog and Digital), B. L. Theraja , R. S. Sedha , S. Chand publication

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- **Reference-Books :**

1. Basic Electrical Engineering, Dr.Debashisha Jena, Revised Edition, Wiley Engineering Press
2. Electrical Engineering Fundamentals, V Del Toro, 2nd edition, Prentice-Hall
3. Electrical Technology, E Hughes, 10th edition, ELBS, Longman
4. Laboratory courses in Electrical Engineering, S G Tarnekar, P K Kharbanda, S B Bodhe and S D Naik, S Chand & Company Ltd
5. Basic Electronics Engineering, V. Baru , R. Kaduskar, S.Gaikwad , Dreamtech Publication
6. Electronic Devices and Circuits , David A. Bell ,Oxford University, Press India, Fifth edition
7. Electronic Devices, Floyd, Pearson Education publication
8. Electronic Device & Circuits, Millman Halkias ,Tata McGraw Hill, Third edition
9. Electronic Components and Materials, M. A. Joshi (Wheeler publication)

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SOLAPUR UNIVERSITY, SOLAPUR
First Year B. Tech. (All Branches) Semester I
C114 ENGINEERING MECHANICS

Teaching Scheme
Theory – 3Hrs. /Week, 3 Credits
Laboratory– 2 Hrs. /Week, 1 Credit

Examination Scheme
Theory- ESE -70 Marks
ISE – 30 Marks
ICA – 25 Marks

- **Course Objectives:**

C114.O1	To impart knowledge of basic phenomena in Engineering Mechanics, and to lay a foundation for its Engineering applications by studying Statics and Dynamics.
C114.O2	To develop scientific approach amongst the students towards analysis and design of various structural elements.
C114.O3	To enable problem solving abilities and inculcate experimental, observational, and investigatory skills amongst the learners.
C114.O4	To prepare the student for higher level courses in analysis and design of Engineering structures.

- **Course Outcomes:**

At the end of this course, the student will be able to:

C114.1	Apply fundamentals of Engineering Mechanics for analyzing effects of a system forces acting on a rigid body.
C114.2	Analyze various types of statically determinate beams, pin jointed trusses by analytical and graphical methods.
C114.3	Locate centroid and centre of Gravity and calculate moment of Inertia of plane lamina.
C114.4	Apply knowledge of Kinematics and Kinetics of rigid body motion to solve problems of bodies in motion.
C114.5	Use Work Energy methods for analyzing linear and rotational motion.

- **Course Curriculum**

Section I

Unit No 01: Resultant of coplanar forces				**Hours : 05**	**Marks: 10**
Sr. No.	***Subunit***	***Marks***	***Hours***	***Assessment***	***Bloom's Level***
1.1	Basic units, SI units, body, rigid body, particle, scalar quantities, vector quantities, Idealization of engineering problems, force, law of transmissibility of force, moment of a force, couple, moment of a couple, resultant, parallelogram law of forces, triangle law of forces, polygon law of forces. Varignon's theorem	04	02	Definition, explanation, derivations	Remembering, understanding, applying, analyzing
1.2	Composition of co-planar concurrent and non concurrent forces: analytical method, graphical method, Bow's notation.	06	03	Explanation, derivations, numerical examples	Remembering, understanding, applying

Unit No 02: Equilibrium of Rigid Bodies				**Hours : 07**	**Marks: 16**
Sr. No.	***Subunit***	***Marks***	***Hours***	***Assessment***	***Bloom's Level***
2.1	Equilibrium of co-planar forces, analytical and graphical conditions of equilibrium, different type of supports, free body diagrams, Lami's theorem	05	02	Definition, explanation, derivations, numerical examples	Remembering, understanding, applying
2.2	Friction, types of friction, limiting friction, laws of Friction, Static and Dynamic friction, inclined planes, ladders, support reactions of statically determinate beams with point loads, inclined loads, uniformly distributed load, uniformly varying loads and couples.	09	04	Definition, explanation, derivations, numerical examples	Understanding, applying, analyzing
2.3	Principle of virtual work (concept only), introduction to forces in space.	02	01	Explanation	Remembering, understanding

Unit No 03: Analysis of Pin-Jointed Plane Frames		**Hours:06**			**Marks:12**
Sr. No.	***Subunit***	***Marks***	***Hours***	***Assessment***	***Bloom's Level***
3.1	Pin-jointed statically determinate plane trusses-perfect frames, assumptions, determination of nature and magnitude of a force in a member, simple trusses; zero force members.	04	02	Definition, explanation	Understanding, applying, analyzing
3.2	Analysis of trusses by method of joints, method of sections and graphical method.	08	04	Explanation, numerical examples	Applying, analyzing
Unit No 04: Center of Gravity and Moment of Inertia			**Hours :05**		**Marks:11**
Sr. No	***Subunit***	***Marks***	***Hours***	***Assessment***	***Bloom's Level***
4.1	Centre of gravity, centroid of a composite area, Centroid of simple figures from first principle, Centroid of composite sections; Centre of Gravity and its implication	03	02	Definition, explanation, derivations, numerical examples	Remembering, understanding, applying
4.2	Moment of inertia- Definition, moment of inertia of plane, sections from first principles, Theorems of moment of inertia, perpendicular axis theorem, parallel axis theorem, moment of inertia of symmetrical and unsymmetrical sections, radius of gyration, polar moment of inertia.	08	03	Explanation, numerical examples	Understanding, applying, analyzing

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SECTION II

Unit No 05: Kinematics of particles				**Hours : 08**	**Marks: 16**
Sr. No	***Subunit***	***Marks***	***Hours***	***Assessment***	***Bloom's Level***
5.1	Rectilinear motion, equations of motion, motion curves and their applications, relative velocity-simple problems.	06	03	Definition, explanation, derivations, numerical examples	Remembering, understanding, applying
5.2	Curvilinear motion, angular motion, relation between angular motion and linear motion, equation of angular motion, tangential and radial acceleration, motion of a projectile.	10	05	Definition, explanation, derivations, numerical examples	Remembering, understanding, applying, analyzing
Unit No 06: Kinetics of Particles				**Hours : 06**	**Marks: 12**
Sr. No	***Subunit***	***Marks***	***Hours***	***Assessment***	***Bloom's Level***
6.1	Newton's laws of motion for linear motion and angular motion, D'Alembert's principle, rectilinear motion on a rough inclined plane, motion of a lift, motion of connected bodies.	08	04	Definition, explanation, derivations, numerical examples	Understanding, applying
6.2	Circular motion, kinetics of rotation-torque, mass moment of inertia, problems on centroidal rotation	04	02	Definition, explanation, derivations, numerical examples	Understanding, applying, analyzing
Unit No 07: Work Energy Methods				**Hours : 06**	**Marks: 16**
Sr. No	***Subunit***	***Marks***	***Hours***	***Assessment***	***Bloom's Level***
7.1	Potential energy, kinetic energy of linear motion and rotation, principle of conservation of energy, work energy equation.	08	03	Definition, explanation, derivations, numerical examples	Remembering, understanding, applying, analyzing

7.2	Impulse momentum method, collision, Impact- central, eccentric, direct, oblique, elastic, plastic, coefficient of restitution, Loss of kinetic energy due to impact	08	03	Definition, explanation, derivations, numerical examples	Remembering, understanding, applying, analyzing
Unit No 08: Mechanical Vibrations				**Hours: 02**	**Marks: 05**
8.1	Mechanical Vibrations: - Basic terminology, free and forced vibrations, resonance and its effects, Degree of freedom.	05	02	Explanation, derivations, numerical examples	Remembering, understanding, applying

Note: Scope of Graphical methods in unit 1, 2, 3 is limited to ICA only.

- **In Semester Evaluation (ISE):**

  ISE shall be based upon student's performance in minimum three tests conducted and evaluated at institute level.

- **In Semester Continuous Assessment (ICA):**

  ICA shall be based on the following experiments and assignments

  A. *Experiments:*
  1. Law of parallelogram of forces
  2. Triangle Law of forces using Jib crane apparatus
  3. Law of polygon of forces
  4. Law of Moments using Bell crank lever
  5. Support reaction of beams
  6. Newton's Second law using Fletcher's trolley
  7. Centrifugal force.

  B. Graphic Statics : Problems on
  1. Finding resultant of forces (2 Problems)
  2. Evaluating support reactions (2 Problems)
  3. Finding forces in the members of statically determinate truss. (2 Problems)

  C. Assignments based on the various units in curriculum

- **Text Books:**

1. Engineering Mechanics, Bhavikatti S. S., New Age International Pvt. Ltd.
2. Engineering Mechanics, K. L. Kumar, Tata McGraw Hill Publications
3. Engineering Mechanics, Basudeb Bhattacharyya, Oxford University Press.
4. Engineering Mechanics - Statics and Dynamics, A. Nelson, McGraw Hill Education (India) Pvt. Ltd.
5. Engineering Mechanics Statics and Dynamics ,A.K. Dhiman, P.Dhiman & D.C. Kelshreshtha, McGraw Hill Education (India) Pvt. Ltd
6. A Text book of Engineering Mechanics, R.S. Khurmi, S. Chand Publications

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- **Reference Books:**

1. Vector Mechanics for Engineers: Statics and Dynamics by Beer and Johnson, Tata McGraw Hill Education (India) Pvt. Ltd.
2. Engineering Mechanics by Irving H. Shames, Prentice Hall of India, New Delhi.
3. Engineering Mechanics Statics and Dynamics by Ferdinand Singer, Harper& Row Publications.
4. Engineering Mechanics Statics, Vol.1, SI Version, 7th Edition – J. L. Meriam, L. G. Kraige, Wiley India Pvt. Ltd., New Delhi.
5. Engineering Mechanics Dynamics, SI Version, 7th Edition – J. L. Meriam, L. G. Kraige, Wiley India Pvt. Ltd., and New Delhi.

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Solapur University, Solapur

First Year B. Tech. (All Branches) Semester-I

C115 BASIC MECHANICAL ENGINEERING

Teaching Scheme
Theory– 3 Hrs. /Week, 3 Credits
Laboratory– 2 Hrs. /Week, 1 Credit

Examination Scheme
Theory –ESE - 70 Marks
ISE – 30 Marks
ICA – 25 Marks

- **CourseObjectives :**

C115.O1	To introduce to student refrigeration & air conditioning system and IC engines.
C115.O2	To introduce to student power producing and power absorbing devices.
C115.O3	To make student aware of different power transmission system elements for day to day applications and fundamentals of mechanical engineering design
C115.O4	To make student aware of various machining and joining processes

- **Course Outcomes :**

At the end of this course, the student will be able to

C115.1	Determine the heat and work quantum in the area of refrigeration and I.C.engines
C115.2	Determine the heat and work for various gas processes
C115.3	Distinguish and select the type of power producing/absorbing systems for a typical application.
C115.4	Identify power transmission element for day to day applications
C115.5	Explain various design considerations in mechanical engineering design.
C115.6	Explain various machining/joining process for required in manufacturing.

- **Course Curriculum**

Section-I

Unit No 01: Thermodynamics			**Hours : 07**		**Marks: 16**
Sr.No	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
1.1	Definition of thermodynamics, thermodynamic Systems, surrounding, universe, types of systems, state of system, properties- intensive and extensive, thermodynamic equilibrium, process and cycle, Zeroth Law of thermodynamics	04	02	Explanation	Remembering understanding
1.2	Work and forms of work, heat, first law of thermodynamics, first law applied to flow processes, steady flow process, steady flow energy equation (SFEE), (numerical on first law of thermodynamics, cyclic and non cyclic processes, SFEE)	08	03	Explanation, derivations, numerical on P-V relations, work done and SFEE applications	Remembering, understanding, applying
1.3	Limitations of first law, Kelvin Plank and Clausius statements of second law ofthermodynamics.	04	02	Explanation	Remembering understanding

Unit No 02: Gas Laws & Gas Processes			**Hours : 05**		**Marks: 13**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
2.1	Ideal gas, Boyle's law, Charle's law, characteristic gas equation, universal gas constant, Avogadro's law	04	01	Explanation, derivation	Remembering, understanding
2.2	First law applied to constant volume, constant pressure, constant temperature, reversible adiabatic process and polytropic process (work done, heat transfer, P-V-T relation) (Numerical treatment)	05	02	Explanation, derivations, numerical	Remembering, understanding, applying

2.3	Refrigeration: definition of refrigeration, Vapour compression refrigeration cycle (VCRS), domestic refrigerator, air conditioning: window air conditioner, split air conditioner.	04	02	Explanation	Remembering, understanding

Unit No 03: Pumps, Compressors & Turbines			**Hours : 04**		**Marks: 12**
Sr.No	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
3.1	Power absorbing devices Pumps: definition, classification, construction, working and applications of reciprocating pump, centrifugal pump. compressors: construction, working and applications of reciprocating compressor, rotary compressors (vane blower)	08	03	Definition, explanation	Remembering Understanding
3.2	Power producing devices Turbines: construction, working and applications of Pelton wheel, Francis and Kaplan turbines	04	01	Definition, explanation	Remembering, understanding

Unit No 04: Power Plants			**Hours : 04**		**Marks: 08**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
4.1	Thermal power plant, site selection criteria, advantages, disadvantages	04*	01	Explanation,	Remembering Understanding
4.2	Hydroelectric power plant, site selection criteria, advantages, disadvantages	04*	01	Explanation,	Remembering, understanding
4.3	Nuclear power plant, BWR, PWR, site selection criteria, advantages, disadvantages	04*	02	Explanation	Remembering, understanding,
** Question will be based on any two subunits.*					

Section-II

Unit No 05: Internal Combustion Engines			**Hours : 05**		**Marks: 12**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
5.1	Definition, classification, components of IC engine	03	01	Explanation	Remembering understanding
5.2	Two stroke, four stroke engines, SI and CI engines	05	01	Comparison, explanation	Remembering, understanding
5.3	Otto and diesel cycles, thermal efficiency of Otto, diesel air standard cycle (numerical treatment)	04	03	Explanation numerical on Otto and diesel cycle	Remembering, understanding, Applying

Unit No 06: Power Transmission Systems			**Hours : 05**		**Marks: 13**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment;*	*Bloom's Level*
6.1	Belt drives: open and cross belt drives, materials of belt, types of belts, length of belt for open and cross drive, velocity ratio of simple and compound belt drive, centrifugal tension, maximum power transmitted (numerical on simple belt drive only)	09	04	Explanation, derivations, numerical on simple belt drives	Remembering understanding applying
6.2	Other Transmission Systems: chain drive, gear, types of gears (excluding gear terminology), gear trains-simple and compound, epicyclical gear train.	04	01	Explanation	Remembering, understanding

Unit No 07: Mechanical Engineering Design			**Hours : 04**		**Marks: 11**
Sr. No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
7.1	Introduction, design considerations, design process, types of stresses & strains, stress-strain diagrams, modes of failure, factor of safety, engineering materials properties	08	03	Explanation	Remembering understanding
7.2	Aesthetic considerations, ergonomic considerations (no numerical treatment)	03	01	Explanation	Remembering, understanding

Unit No 08: Manufacturing Technology			**Hours : 06**		**Marks: 13**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
8.1	Machine tools: Centre lathe - basic elements, construction, working, operations on lathe, turning, facing. Drilling machine - basic elements of pillar drilling machine, Construction and working of Horizontal Milling machine (no numerical treatment)	06	01	Explanation	Remembering understanding
8.2	Joining Processes: *Welding process*: definition, types, manual metal arc welding, spot welding, oxy acetylene welding *Brazing*: procedure, filler metals, advantages, disadvantages, applications *Soldering*: filler metals used, procedure, riveting and its Types (no numerical treatment)	07	04	Explanation	Remembering, understanding

- **In Semester Evaluation (ISE):**

  ISE shall be based upon student's performance in minimum two tests & mid-term written test conducted & evaluated at institute level

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- **In Semester Continuous Assessment (ICA):**

  *ICA shall be based on minimum **six** experiments out of below list*

  1. Hands on- domestic refrigerator and split air conditioner
  2. Hands on- 2 stroke and 4 stroke engines
  3. Hands on- gears, couplings, brakes, bearings
  4. Estimation velocity ratio and slip in simple belt drive
  5. Hand on- machine tools : lathe, drilling machine, milling machine and various operations performed on them
  6. Hands on- joining processes
  7. Hands on - pumps and compressors
  8. Survey: types and specifications of following mechanical systems - refrigerators, air conditioners, engines, pumps, compressors. Student shall make a comprehensive survey and submit a survey report comprising of – name of product chosen, image (if required), name of manufacturer, technical specifications of the product chosen, its applications

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- **Text Books :**

  1. Thermal Engineering, P.L. Ballaney, Khanna Publishers
  2. Thermal Engineering, Domkundwar, Kothandaraman, Domkundwar, Dhanpat Rai & Co.
  3. Elements of Workshop Technology, Vol-I & II, S.K. HajraChoudhury , A K HajraChoudhury, Nirjhar Roy , Media Promoters & Publishers Pvt. Ltd.
  4. Design of Machine Elements, V.B. Bhandari, Tata McGraw Hill Publications

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- **Reference Books:**

  1. Engineering Thermodynamics, P K Nag, The Tata McGraw-Hill Companies
  2. Mechanical Engineering Design, Joseph E Shigley, Charles R Mischke, The Tata McGraw-Hill Companies
  3. Production Technology Vol. I & II, O.P. Khanna, Dhanpat Ray Publications

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Solapur University, Solapur

First Year B.Tech (All Branches) Semester-I

C116 COMMUNICATION SKILLS

Teaching Scheme
Theory– 1 Hr /Week, 1 Credit
Laboratory– 2 Hrs. /Week, 1 Credit

Examination Scheme
ISE – 25 Marks
ICA– 25 Marks

- **Course Objectives :**

C116.O1	To make students understand English Grammar and its application in communication
C116.O2	To develop writing skills amongst students
C116.O3	To develop and enhance oral communication skills of students
C116.O4	To nurture reading and comprehension skills of the students.
C116.O5	To prepare students for professional written communication.
C116.O6	To prepare students for competitive exams with focus on verbal ability

- **Course Outcomes :**

At the end of this course,

C116.1	Student can frame grammatically correct sentences for day to day communication
C116.2	Student can use numerous appropriate words and sentences in written communication.
C116.3	Student can demonstrate effective oral communication skills in various situations.
C116.4	Student can read, comprehend and answer the questions based on a passage.
C116.5	Student can draft letters, emails, write paragraphs and essays with appropriate content and context.
C116.6	Students are able to solve verbal ability questions in competitive exams

- **Course Curriculum**

Unit No 01: English Grammar		**Hours : 06**		
Sr.	*Subunit*	*Hours*	*Assessment*	*Bloom's Level*
1.1	Articles, nouns, pronouns, verbs, modal verbs, auxiliary verbs & tenses	03	Sentence formation, corrections / error finding	Remembering, understanding, applying, creating
1.2	Adjectives, adverbs, prepositions, conjunctions	02	Sentence formation, corrections / error finding	Remembering, understanding, applying, creating
1.3	i. Idioms& phrases ii.Clichés iii. Redundancies	01	Identifying Meaning of the idioms, phrases and Clichés and using them appropriately. Sentence Correction/ error finding	Remembering Understanding applying , creating
Unit No 02: Vocabulary		**Hours : 02**		
Sr.	*Subunit*	*Hours*	*Assessment*	*Bloom's Level*
2.1	Synonyms & antonyms	01	Synonym / antonym of the given word	Remembering, understanding, applying
2.2	Prefixes & suffixes	01	Word formation.	Remembering, understanding, apply
Unit No 03:Oral Communication		**Hours : 02**		
Sr.	*Subunit*	*Hours*	*Assessment*	*Bloom's Level*
3.1	Situational conversation	01	Role play based on formal or informal conversation, writing a conversation based on a situation	Applying, creating
3.2	Impromptu speaking –extempore	01	extempore speech	Applying, creating, evaluating

Unit No 04: Reading Comprehension		**Hours : 02**		
Sr.	*Subunit*	*Hours*	*Assessment*	*Bloom's Level*
4.0	Reading comprehension	02	Questions based on a passage	understanding, evaluating, applying,
Unit No 05:Writing Practices-1		**Hours : 03**		
Sr.	*Subunit*	*Hours*	*Assessment*	*Bloom's Level*
5.1	Writing business letters	01	Writing a professional / business letter	Understanding, applying, creating
5.2	E-mail communication	01	Writing a professional e-mail	Understanding, applying, creating
5.3	Paragraph writing&Essay writing	01	Writing a paragraph of about 120 words & an essayof about 300 words	Understanding, applying, Creating

- **In Semester Evaluation (ISE) –**
  ISE shall be based on three theory examination conducted at institute level covering above curriculum. Examinations shall include sufficient questions covering all topics / subtopics
- **Internal Continuous Assessment (ICA) -**
  ICA shall be based on performance of the student during the laboratory sessions in Language Lab covering minimum12 exercises out of blow-

1. Grammar Exercise –I based on articles, nouns and pronouns.
2. Grammar Exercise –II based on verbs, modal verbs, auxiliary verbs & tenses
3. Grammar Exercise –III based on adjectives, adverbs, prepositions, conjunctions
4. Grammar Exercise –IVbased on idioms and phrases, clichés & redundancies
5. Vocabulary – Based on the synonym of the given word
6. Vocabulary – Find the antonym of the given word
7. Exercise on word formation (prefixes / suffixes)
8. Writing conversation based on a formal situation
9. Writing conversation based on a formal situation
10. Exercise based on reading comprehension
11. Professional / business letter writing
12. Professional / business E mail writing
13. Writing a paragraph of about 120 words / an essay of about 300 words on a given topic.
14. Extempore speech on a given topic

- **Text Books:**

1. English Grammar Just for You. RajeevanKaral. Oxford University Press
2. Technical English.Dr. M. Hemamalini. Wiley India Pvt.
3. English for Practical Purposes, Z. N. Patil, B.S. Valke, A.R. Thorat, Zeenath Merchant
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press.2006.
5. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad.Oxford University Press.
6. Communication Skills, Sanjay Kumar and PushpaLata. Oxford University Press. 2011

- **References Books:**

1. English Grammar & Composition , Wrenn& Martin, S. Chand
2. Practical English Usage . Michael Swan.OUP.1995.
3. Remedial English Grammar.F.T.Wood.Macmillan.2007.
4. On Writing Well. William Zinsser. Harper Resource Book.2001.
5. Business Communication, ShaliniKalia, ShailjaAgarwal, Wiley
6. Communication Skills for Technical Students, T. M. Farhathullah, Orient BlackSwan
7. Longman Dictionary of Contemporary English
8. Essential Activator, Longman
9. Word Power Made Easy, Norman Lewis

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Solapur University, Solapur

First Year B. Tech. (All Branches) Semester-I

C117 WORKSHOP PRACTICE

Teaching Scheme
Laboratory- 02 Hrs/Week, 1 Credit

Examination Scheme
ICA -25 Marks

- ## Course Objective:

C117.O1	To make the students acquainted with various skills involved in manufacturing and assembly.
C117.O2	To make student aware of various cutting, filling and joining processes and to have hands on for the same.

- ## Course Outcomes:

At the end of this course, the student will be able to

C117.1	Draw, design and fabricate different carpentry joints.
C117.2	Prepare different shaped metal work piece joints from the given metal blanks by selecting different tools and machines.
C117.3	Perform different types of welding of metal components.
C117.4	Select different engineering tools required to perform carpentry, fitting and welding processes.
C117.5	Carry out pipe fitting and plumbing work.

- **Course Curriculum:**

Unit No.	Unit Title	No. of Lab Sessions	Assessment	Bloom's Level
01	Carpentry job- One job on carpentry including any one type of joint	04	Carpentry job, report writing	Perception (LI), Set (L2), Mechanism(L4)
02	Fitting job :One job on fitting, to size, male-female fitting including, marking, cutting, shearing, chipping sizing of metals, drilling and tapping to know concept of inter changeability.	04	Fitting job, report writing	Perception (LI), Set (L2), Mechanism(L4)
03	Welding: demonstration and hands on- arc welding, gas welding, resistance welding, gas cutting, spot welding.	01	Explaining, report writing	Perception (LI), Set (L2), Guided response(L3)
04	Plumbing: demonstration and hands on of pipe fittings using different types of pipe fittings like socket, elbow, bend, tee, four way cross, valves, pipe union, socket reducer etc. by using different tools in plumbing.	01	Explaining, report writing	Perception (LI), Set (L2), Guided response(L3)
05	Assembly: assembly of one or more of the below assemblies/sub-assembly- 1. Mechanical: three jaw chuck/bicycle/centrifugal pump. 2. Computer Science and Engineering & Allied: CPU of PC. 3. Electrical: electrical motor / 3 pin wire change / domestic wiring 4. Electronics & Allied: mobile handset/UPS/ stabilizer 5. Other: Any similar assembly from other applications of engineering. • *Note- Assembly work shall be carried out as a group activity with a group of not more than 4 students.*	03	Assembly job, team working, report writing	Perception (LI), Set (L2), Guided response(L3), Mechanism (L4)

- **In Semester Continuous Assessment (ICA) :**

ICA shall be based on completion five tasks/jobs given below along with the report writing. The report writing shall include job drawing, process plan of the job in brief, sketches of tools and equipments required to complete the tasks/jobs

1. Carpentry Job of any one type of joint
2. Fitting job of male-female type
3. Hands on for different types of welding
4. Plumbing- Hands on for different types of pipe fittings by using tools in plumbing
5. Hands on assembly

- **Text Books:**

1. Engineering Practices, M Karthik.

2. Workshop Technology, Raghuvanshi,

3. Workshop Technology, HajraChowdhary, Media Promoters & Publishers Pvt. Ltd.

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Solapur University, Solapur

First Year B. Tech. (All Branches) Semester-II

C122 ENGINEERING MATHEMATICS -II

Teaching Scheme
Theory – 3 Hrs. /Week, 3 Credits
Tutorial– 1 Hr. /Week, 1 Credit

Examination Scheme
Theory – ESE -70 Marks
ISE - 30 Marks
ICA – 25 Marks

- **Course Objectives :**

C122.O1	To introduce to student some methods to find the solution of first order & first degree ordinary differential equations with its applications.
C122.O2	To introduce to student awareness of concept of convergence of sequences and series.
C122.O3	To introduce the tools of differentiation of functions of complex variable that are used in various techniques dealing engineering problems.
C122.O4	To make familiar to tracing of Cartesian, polar and parametric curves.
C122.O5	To acquaint the student with mathematical tools needed in evaluating improper integrals, multiple integrals and their usage

- **Course Outcomes :**

At the end of this course, student will be able to

C122.1	Solve first order ordinary differential equation and able to apply in different engineering applications
C122.2	Test divergence & convergence of infinite series
C122.3	Use the tools of differentiation of functions of a complex variable that are used in various techniques dealing engineering problems.
C122.4	Draw approximate shape of planer curve with justification.
C122.5	Evaluate improper and multiple integrals and their usage.

- **Course Curriculum**

Section I

Unit No 01: ODE of First order and Degree and Application			**Hours : 08**		**Marks: 22**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
1.1	Order, degree and general solution of differential equations, non homogeneous differential equations.	04	02	Solution of differential equations.	Remembering, understanding,
1.2	Exact differential equations, non- exact reducible to exact, linear differential equations, non linear reducible to linear.	09	03	Solution of differential equations.	Understanding, applying
1.3	Applications to orthogonal trajectories, electrical and mechanical engineering (projectile motion and Newton's law of cooling)	09	03	Application of ordinary differential equations.	Remembering, understanding, applying
Unit No 02: Infinite Series			**Hours : 05**		**Marks: 13**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
2.1	Infinite sequences , infinite series, types of series	01	01	Examine	Remembering, understanding,
2.2	Test of convergence, absolute and conditional convergence,	05	02	Apply standard results	Remembering, applying
2.3	Cauchy test, comparison test and De Alembert's test	07	02	Numerical, apply standard results	Remembering, understanding, applying
Unit No 03:Complex Variable (Differentiation)			**Hours : 08**		**Marks: 17**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
3.1	Statement of De-Moivre's Theorem (without proof), application of De-Moivre's theorem –roots of algebraic equations,	04	02	Numerical example, evaluate, applications	Remembering, understanding Applying
3.2	Circular and Hyperbolic functions	01	01	Definition,	Remembering, applying

3.3	Differentiation, Cauchy Riemann Equations(Without Proof), Analytic Functions, Elementary Analytic Functions(Exponential, Trigonometric and Logarithmic function)	06	02	Simplification , applications	Remembering, applying
3.4	Harmonic Functions and Conjugates, Construction of Analytic Function	06	03	Definition, Evaluate, applications	Remembering, applying

Section II

Unit No 04: Integral Calculus			**Hours : 06**		**Marks: 16**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
4.1	Gamma function and properties,	04	02	Evaluate/numerical,	Remembering, understanding, applying
4.2	Beta function and properties, duplication formula with proof.	09	02	Evaluate/numerical,	Remembering, understanding, applying
4.3	Differentiation under integral sign with constant limit	03	02	Evaluate/numerical,	Remembering, understanding, applying
Unit No 05: Curve Tracing			**Hours : 06**		**Marks: 13**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
5.1	Tracing of Cartesian curves-	05	02	Trace of curve	Understanding, applying
5.2	Tracing of polar curves	04	02	Trace of curve	Understanding, applying
5.3	Tracing of parametric curves	04	02	Trace of curve	Remembering, understanding, applying

Unit No 06: Multivariable Integral Calculus		**Hours : 09**			**Marks: 23**
Sr.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
6.1	Direct evaluation of Double integral, Evaluation over the given region,	05	02	Evaluate/numerical,	Understanding, applying
6.2	Change of order of integration, change to polar, triple integration	09	04	Evaluate/numerical,	Understanding, applying
6.3	Application of double integral to find area and mass of lamina.	09	03	Application/numerical	Remembering, understanding, applying

- **In Semester Evaluation (ISE):**
  ISE shall be based upon student's performance in minimum two tests & mid-term written test conducted & evaluated at institute level

- **In Semester Continuous Assessment (ICA):**
  ICA shall be based on student's performance during tutorial sessions and on completion of minimum six assignments based on above curriculum.

- **Text Books:**
  1. A Text Book of Applied Mathematics, P.N. and J.N. Wartikar, Vol.1, Pune Vidyarthi Griha Prakashan.
  2. Advanced Engineering Mathematics, H. K. Dass, S. Chand Publications, Delhi.
  3. Engineering Mathematics (Volume I), ITL Education, Cengage Learning.
  4. Engineering Mathematics, Ravish R Sing and Mukul Bhatt, McGraw Hill.
  5. Applied Mathematics-I,II, Kreyzig's, Wiley.
  6. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications, 2008.

- **Reference Books**:

  1. Higher Engineering Mathematics (42nd Edition), B.S. Grewal Khanna Publications, Delhi.
  2. Engineering Mathematics, Srimanta Pal and Subodh C. Bhunia, Oxford Higher Education.
  3. Mathematics for Engineering Applications, Kuldip S. Rattan and Naathan W. Klingbeil Wiley. (Modeling and Core Engineering Application)
  4. Higher Engineering Mathematics, Ramana B.V., Tata McGraw Hill New Delhi, 2010.

Solapur University, Solapur

First Year B. Tech. (All Branches) Semester-II

C123 ENGINEERING GRAPHICS AND DRAFTING

Teaching Scheme
Theory– 3 Hrs. /Week, 3 Credits
Laboratory–4 Hrs. /Week, 2 Credits

Examination Scheme
Theory –ESE -70 Marks
ISE – 30 Marks
ICA – 50 Marks

- ## Course Objectives :

To make student

C123.O1	Draw the projections of oblique lines and planes
C123.O2	Interpret and draw the cut sections of solids.
C123.O3	Visualize and draw the orthogonal views.
C123.O4	Draw the developments of truncated solids and construct the solids from given developed surface.
C123.O5	Draft the machine components and related parts by using commercial drafting software

- ## Course Outcomes :

At the end of this course, student will be able to

C123.1	Draw projection of lines and planes for engineering applications
C123.2	Draw regular and sectional views of various types of solids
C123.3	Draw the 2 D view (orthogonal views) given 3D drawing
C123.4	Draw the development of the regular and truncated solids
C123.5	Draft the 2-D drawing of machine components.

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- **Course Curriculum:**

Section I

Unit No 01:Projections of Lines			**Hours : 09**		**Marks: 20**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
1.1	Introduction to first and third angle method of projection, Projections of points on Principal reference planes and on auxiliary planes including coordinate system of points.	--	02	Explanation, drawing	Remembering Understanding(L2), Applying(L3)
1.2	Horizontal, frontal, profile and oblique lines, true length of line. Projections of lines with its inclination to one reference plane and with two reference planes (oblique lines). True length and inclination with the reference planes, point view of line.	07	03	Graphical problem horizontal , frontal and oblique lines , problems on TL of line	Remembering(L1) Understanding(L2), Applying(L3)
1.3	Grade and bearing of line.	06	02	Graphical problem on grade and bearing of lines	Remembering(L1) Understanding(L2), Applying(L3)
1.4	Angle between lines, intersecting, skew, parallel and Perpendicular lines	07	02	Problems on intersecting, skew, parallel lines and perpendicular lines	Remembering(L1) Understanding(L2), Applying(L3)

Unit No 02: Projections of Planes			**Hours : 07**		**Marks: 18**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
2.1	Projections of planes (regular polygons, circle, Isosceles triangle, Rhombus and Rectangle)	--	01	Explanation , graphical problem,	Remembering(L1) Understanding(L2), Applying(L3)
2.2	Plane inclined to one reference plane and with two reference planes	11	03	Graphical problem on oblique planes by three stage and auxiliary plane methods	Remembering(L1) Understanding(L2), Applying(L3)

2.3	True shape, edge view ,angle with reference plane dip & strike of plane (for objective type question only)	07	03	Graphical problem	Remembering(L1) Understanding(L2), Applying(L3)
Unit No 03: Projections of Solids			**Hours : 05**		**Marks: 20**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
3.1	Classification of solids, projections of solids (cylinder, cone, pyramid and prism)	--	01	Explanation , graphical problem	Remembering(L1) Understanding(L2), Applying(L3)
3.2	Solid inclination to one reference plane and with two reference planes (excluding composite solids)	20	04	Graphical problem on oblique planes by three stage and auxiliary plane methods	Remembering(L1) Understanding(L2), Applying(L3)

Section-II

Unit No 04: Orthographic Projections			**Hours : 09**		**Marks: 14**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
4.1	Fundamental of projection along with classification, type of lines used in drawing, conventions used in sectional drawings	--	02	Explanation, graphical problem	Remembering(L1) Understanding(L2) Applying(L3)
4.2	Projections from the pictorial - view of the objects on the principal planes by viewing from front, top and sides using first angle projection method ,full sectional view	14	05	Graphical problemto draw principal views of objects.	Remembering(L1) Understanding(L2) Applying(L3)
4.3	Introduction to Computer aided drafting to draft 2-D drawings for simple object using Draw and Modify Commands.	---	02	For ICA only	Remembering(L1) Understanding(L2) Applying(L3)

Unit No 05: Sections of Solids			**Hours : 06**		**Marks: 14**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
5.1	Sections of above solids by cutting planes inclined to one reference plane and perpendicular to other	--	01	Explanation	Remembering(L1) Understanding(L2) Applying(L3)
5.2	Auxiliary inclined plane, auxiliary vertical plane, true shape of section	14	05	Drawing views of solids cut by section plane inclined to one reference plane	Remembering(L1) Understanding(L2) Applying(L3)

Unit No 06: Development of plane and curved surface			**Hours : 06**		**Marks: 14**
Sr.No.	*Subunit*	*Marks*	*Hours*	*Assessment*	*Bloom's Level*
6.1	Introduction to development of lateral surfaces of solids.	--	01	Explanation	Remembering(L1) Understanding(L2)
6.2	Development of lateral surfaces of of simple and truncated solids	14	05	Graphical Problemson DLS of simple and truncated solids	Remembering(L1) Understanding(L2) Applying(L3)

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- **In Semester Evaluation (ISE):**

  ISE shall be based upon student's performance in minimum two tests & mid-term written test conducted & evaluated at institute level

- **In Semester Continuous Assessment (ICA):**

  ICA shall be based on below drawing assignments

Sr. No.	***Name of Sheet***	***No. of Sheets***
1	Projection of lines	01
2	Projection of planes	01
3	Projection of solids	01
4	Section of solids	01
5	Orthographic projections	01
6	Development of lateral surfaces	01
7	Computer aided drafting: Introduction to computer aided drafting package to make 2-D drawings. (For simple object using Draw and Modify Commands)	02

- **Text Book:**

1. Engineering Drawing, D.N. Jolhe, TATA McGraw Publishing Co-Ltd.
2. Engineering drawing, N.D. Bhatt, Charotar Publishing House Pvt. Ltd.
3. Natarajan, K. V., A text book of Engineering Graphics, Pub.: Dhanalakshmi Publishers, Chennai, 2006
4. Engineering Graphics - I, M. L. Dabhade, Vision Publication

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- **Reference Book:**

1. Engineering Drawing, N. S. Parthasarathy& Vela Murali, Oxford Publication.
2. Engineering Drawing, K. L. Narayana & P. Kannaiah , Scitech Publication.
3. Engineering Graphics, A. M. Chandra, New Age International Publishers.
4. Venugopal, K. and Prabhu Raja, V., Engineering Drawing and Graphics + AutoCAD, Pub.: New Age International, 2009.

Solapur University, Solapur
First Year B. Tech. (All Branches) Semester-II
C125 BASIC CIVIL ENGINERING

Teaching Scheme
Theory – 3Hrs. /Week, 3 Credits
Laboratory– 2Hrs. /Week, 1 Credit

Examination Scheme
Theory – ESE -70Marks
ISE – 30Marks
ICA- 25 Marks

- **Course Objectives:**

C124.1	To acquaint students with the relevance of Civil Engineering for various applications in different branches of Engineering and Technology
C124.2	To acquaint students with various methods of Land Survey and to make them use basic surveying instruments
C124.3	To introduce students to the Environment & Water Resources Management and transportation engineering
C124.4	To introduce students to the various elements of buildings and construction materials
C124.5	To introduce students to concepts of Green Buildings, Remote sensing Techniques, GIS & GPS.

- **Course Outcomes**:

At the end of course, students will be able to

C124.1	Describe the role of civil engineer in the development of the society and relationship of civil engineering with other branches of engineering and technology.
C124.2	Measure heights, distances and angles on ground using basic surveying instruments.
C124.3	Explain various elements of Environmental and water supply systems such as dam, canal and elements of transportation structures.
C124.4	Classify types of buildings depending upon use and select suitable materials of construction.
C124.5	Explain need of Green building, remote sensing techniques, GIS and GPS for Civil Engineering applications.

Section I

Unit No. 01: Introduction to Civil Engineering				**Hours:04**	**Marks:07**
Sr. No	***Subunit***	***Marks***	***Hours***	***Assessment***	***Bloom's Level***
1.1	Definition and various sub domains of civil engineering.	02	01	Explanation	Remembering understanding
1.2	Relevance of Civil Engineering branch with other branches of engineering.	03	02	Explanation	Remembering, understanding,
1.3	Role of civil engineer in various construction activities in society	02	01	Explanation	Remembering, understanding

Unit No 02: Surveying				**Hours : 11**	**Marks: 22**
Sr. no.	***Subunit***	***Marks***	***Hours***	***Assessment***	***Bloom's Level***
2.1	Definition, general principles of surveying, classification of surveying.	04	02	Definition, explanation	Remembering, understanding
2.2	Introduction to measurement of horizontal distances using chain and tapes.	02	01	Explanation, numerical examples	Remembering, understanding, applying
2.3	Measurement of horizontal angles: types of bearing, calculation of included angles, study and use of Prismatic compass, local attraction.	08	04	Explanation, numerical examples	Remembering, understanding, applying
2.4	Leveling: Various terms used in leveling, use of dumpy level, auto level, temporary adjustments of leveling instruments, methods of reduction of levels, Advanced Instruments - Theodolite, total station (Introduction only), contouring, and characteristics of contours and uses of contour maps.	08	04	Explanation, numerical examples	Remembering, understanding, applying

Unit No 03: Environmental Engineering & Water Management				**Hours : 05**	**Marks: 12**
Sr. No	***Subunit***	***Marks***	***Hours***	***Assessment***	***Bloom's Level***
3.1	Environmental Engineering: Water treatment systems; Effluent treatment systems; Solid waste management	04	02	Definition, explanation	Remembering, understanding
3.2	Sources of water, Dams and storage reservoirs, rain water harvesting	04	01	Definition, explanation	Remembering, understanding
3.3	Introduction to gravity dam and earthen dam (typical cross sections), Irrigation, methods of water applications to crops, Irrigation canals.	04	02	Definitio n, explanati on	Remembering, understanding
Unit No. 04: Transportation Engineering				**Hours : 04**	**Marks: 08**
Sr. No	***Subunit***	***Marks***	***Hours***	***Assessment***	***Bloom's Level***
4.1	Introduction to roads, IRC classification, typical functional cross sections.	04	02	Explanation	Remembering, understanding
4.2	Various modes of transportation, Bridges, tunnels, railways, airports, docks and harbors.	04	02	Explanation	Remembering, understanding

Section II

Unit No 05: Components of Building				Hours : 06	Marks: 14
Sr.	***Subunit***	***Marks***	***Hours***	***Assessment***	***Bloom's Level***
5.1	General idea about substructure, super structure and their various elements and their functions (Foundation types, plinth, lintel, chajja, roof, parapet, spout etc.)	06	03	Definition, explanation	Remembering, understanding
5.2	Superstructure**:** principle of load transfer, frame action, loads bearing wall action.	04	02	Definition, explanation	Remembering, understanding
5.3	Requirements of earthquake resistant buildings	04	01	Explanation	Remembering, understanding

Unit No. 06: Building Planning				Hours : 03	Marks: 08
Sr	***Subunit***	***Marks***	***Hours***	***Assessment***	***Bloom's Level***
6.1	Principles of planning, introduction to building bylaws regarding building line, open space, carpet area, built up area requirements, floor area ratio (F.A.R.) and height of building.	08	03	Explanation, numerical example on F.A.R.	Remembering, understanding, applying

Unit No 07: Building Materials & Concrete				Hours : 05	Marks: 11
Sr. No	***Subunit***	***Marks***	***Hours***	***Assessment***	***Bloom's Level***
7.1	Stones, bricks, mortars, roofing material, Structural Steel, High Tensile Steel.	05	02	Explanation	Remembering, understanding
7.2	Concrete: plain and reinforced cement concrete, water cement ratio, curing of concrete, requirements of good quality concrete, various grades of concrete and their uses	06	03	Explanation	Remembering, understanding

Unit No 08: Advances in Civil Engineering				Hours : 08	Marks: 16
Sr. No	***Subunit***	***Marks***	***Hours***	***Assessment***	***Bloom's Level***
8.1	Green Building: concept of planning and construction of green building, Sustainable development	06	03	Explanation	Remembering, understanding
8.2	Fundamentals of remote sensing and its application in various fields	04	02	Explanation	Remembering, understanding
8.3	Geo Informatics, introduction to Geographic Information system (GIS), Fundamentals of Global Positioning System (GPS)	06	03	Explanation	Remembering, understanding

- **In Semester Evaluation (ISE):**

  ISE shall be based upon student's performance in minimum three tests conducted and evaluated at institute level.

- **In Semester Continuous Assessment (ICA):**

  ICA shall be based on below eight experiments. Any other appropriate experiments based on above curriculum may also be added to the list. Student shall record them in a field book. As a part of the completion of ICA, student shall submit completed field book and drawing sheets at the end of the course.

  1. Sign conventions
  2. Chaining, ranging and offsetting
  3. Study of prismatic compass
  4. Observation of bearings and measurement of included angles
  5. Determination of reduced levels by using dumpy level
  6. Drawing plan, elevation and section for a single room indicating various elements of buildings such as column footing, plinth and superstructure
  7. Site visit and its report

- **Text books:**

1. Elements of Civil Engineering, S. S. Bhavikatti, New Age International Publishers.
2. Surveying and Leveling, N. N. Basak, Tata McGraw Hill Publications.
3. Basic Civil Engineering, L. G. Gole, Mahalaxmi Publications
4. Building Construction and Drawing, Bindra and Arora, Dhanpat Rai Publications

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- **Reference Books:**

1. Building Planning and Design-Shah & Kale, Tata McGraw Hill Publications.
2. Manual on Green Building, Kolhatkar.
3. Energy-efficient buildings in India, Mili Majumdar, TERI Press.
4. Building Planning and Design, Y.S. Sane, Allies Book Stall, Engineering Books Publishing Company, Pune.

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Solapur University, Solapur

First Year B. Tech. (All Branches) Semester-II

C125 PROGRAMMING FOR PROBLEM SOLVING

Teaching Scheme
Theory – 2 Hrs. /Week, 2 Credits
Laboratory– 4 Hrs. /Week, 2 Credits

Examination Scheme
ESE – 50 Marks
ISE – 25 Marks
ICA – 50 Marks

- **Course Objectives:**

C125.O1	To introduce to student the concepts of algorithm & flowchart for problem solving
C125.O2	To introduce to student the fundamentals of structured programming
C125.O3	To make student to formulate simple C programs using various control structures & loop structures
C125.O4	To make student to apply the concept of functions & pointers to solve the problems
C125.O5	To make student to apply the concept of arrays to solve the problems
C125.O6	To make student to apply concept of structures & unions to solve the problems

- **Course Outcomes :**

At the end of this course, students will be able to

C125.1	Design the flowcharts and algorithms for the given problem
C125.2	Translate the algorithms into C programs and test & execute the programs.
C125.3	Design & develop C programs by appropriately selecting control and loop structures.
C125.4	Design & develop C programs using functions and pointers.
C125.5	Design & develop C programs using arrays, structure and unions
C125.6	Develop small applications using C Programming concepts

- **Course Curriculum**

Unit No 01: Introduction			**Hours : 07**			**ICA Marks: 08**
Sr.	*Subunit*	*ISE Marks#*	*Hours*	*Assessment*	*Bloom's Level (Cognitive)*	*Bloom's Level (Affective)*
1.1	Techniques for Problem Solving: algorithm, flow chart, examples. Algorithms specifications, Formulation of simple algorithms and logical problems. Structure of C program, building blocks of C program (preprocessor , compilation and execution & debugging of C program), IDE	02	03	Explanation, Formulation	Remember, Understand, Apply	Receive Respond
1.2	Variables and Data Types, C character set, tokens, constants, keywords , primitive data types , C operators (arithmetic, unary, binary , ternary, logical, assignment, relational, increment and decrement, conditional, bit wise, sizeof), printf(), scanf() functions	02	02	Explanation, Formulation	Remember, Understand	Receive Respond
1.3	Operator precedence, expressions, type casting and type conversion, formatting input and output getchar(), putchar()	01	02	Explanation Application	Understand Apply	Receive Respond

Unit No 02: Control Structures			**Hours : 05**			**ICA Marks: 12**
Sr.	*Subunit*	*ISE Marks#*	*Hours*	*Assessment*	*Bloom's Level (Cognitive)*	*Bloom's Level (Affective)*
2.1	Control statements: if, if-else, nested if - else, else-if ladder	02	02	Programming	Understand, Apply,	Receive Respond
2.2	Loops: while, do-while, for, nested loops	02	02	Programming	Understand, Apply	Receive Respond
2.3	Break, continue, goto statement, switch-case statement	01	01	Programming	Understand, Apply	Receive Respond

Unit No 03: Functions			**Hours : 04**			**ICA Marks: 07**
Sr.	*Subunit*	*ISE Marks#*	*Hours*	*Assessment*	*Bloom's Level (Cognitive)*	*Bloom's Level (Affective)*
3.1	Declaration & definition of functions, scope of variables, return Statement	02	03	Programming	Understand, Apply	Receive, Respond
3.2	Function using call by value	02	01	Programming	Understand, Apply	Receive, Respond

Unit No 04: Pointers			**Hours : 04**			**ICA Marks: 08**
Sr.	*Subunit*	*ISE Marks#*	*Hours*	*Assessment*	*Bloom's Level (Cognitive)*	*Bloom's Level (Affective)*
4.1	Declaration of pointer , initialization, accessing pointer	01	01	Programming	Understand, Apply	Receive, Respond
4.2	Pointer to basic data types, pointer arithmetic,	01	02	Programming	Understand, Apply	Receive

4.3	Function using call by Reference, Recursion	02	01	Programming	Understand, Apply	Receive

Unit No 05: Array and String			**Hours : 04**			**ICA Marks: 09**
Sr.	*Subunit*	*ISE Marks#*	*Hours*	*Assessment*	*Bloom's Level (Cognitive)*	*Bloom's Level (Affective)*
5.1	Declaration and initialization of one dimensional array, accessing elements, array handling	01	02	Programming	Understand, Apply	Receive, Respond
5.2	String handling functions strlen(), strcpy(),strcmp(), strcat(), gets(), puts()	01	01	Programming	Understand, Apply	Receive, Respond
5.3	Declaration and initialization of two dimensional array, accessing elements, array handling, Matrix operations	02	01	Programming	Understand, Apply	Receive, Respond Value

Unit No 06: Structures and Unions			**Hours : 04**			**ICA Marks: 06**
Sr.	*Subunit*	*ISE Marks#*	*Hours*	*Assessment*	*Bloom's Level (Cognitive)*	*Bloom's Level (Affective)*
6.1	Definition of structure and union, declaration	01	02	Programming	Understand, Apply	Receive, Respond Value
6.2	Accessing elements, Difference between structure and union.	02	02	Programming	Understand, Apply	Receive, Respond Value

 # indicates contribution for ISE of 25 marks.

- **End Semester Evaluation (ESE):**

  University 'Practical and Oral Examination' at the end of the semester, assessing student's programming skills.

- **In Semester Evaluation (ISE):**

  ISE shall be based upon student's performance in minimum three tests conducted & evaluated at institute level

  Test-I – Written paper based on Unit-I of minimum of 30 marks

  Test-II & Test-III – Practical & Oral Examination based on remaining units.

- **In Semester Continuous Assessment (ICA):**

ICA shall be based on the following programming assignments.

1. Assignment based on fundamentals of algorithm & flowcharts
   - Formulate simple algorithms & flowcharts for arithmetic and logical problems

2. Fundamentals of C programming & IDE
   - Programming, debugging and execution
   - Structure of C program (documentation section, header section, main function, declaration of variables, set of instructions)
   - C character set, tokens, constants , variables , keywords
   - C operators

3. Formatted input output functions in C
   - Programs based on simple arithmetic & logical operators
   - Programs based on getchar() and putchar() functions

4. Different operators in C
   - Programs based on multiple arithmetic operations (+, - , / , * and %)
   - Programs based on left shift (<<), right shift (>>), and(&) , or(|) and xor(^) bitwise operators.
   - Programs based on increment, decrement operators.
   - Programs based on type casting using cast operator.
   - Programs based on sizeof () operator.

5. Decision control statement (if, if-else , nested if-else, else if ladder)
   - Programs based on use of single control statement
   - Programs based on multiple control statement
   - Programs based on nested control statements combined with other operators

6. Loop statement (for, while, do-while, nested loop)
   - Programs based on for loop.
   - Programs based on while loop.
   - Programs based on do-while loop.
   - Program demonstrating difference in while & do-while loop.
   - Programs based on nested loops.
   - Programs demonstrating use of break, continue & goto statements.

7. Switch-case statement
    - Programs based on switch-case statement.
    - Programs demonstrating variations in switch-case statement.
    - Menu driven programs.

8. Functions
    - Programs based on simple use of functions.
    - Programs demonstrating function call by passing parameters by value.
    - Programs on iterative and recursive functions
    - Programs on customized string handling functions

9. Pointers
    - Program demonstrating basics of pointers.
    - Programs based on pointer arithmetic & operations.
    - Program based on pointers & array

10. Arrays
    - Programs based on single dimension array manipulations.
    - Programs based on two dimension array manipulations & matrix operations.
    - Programs based on string handling & manipulations.

11. Structures & Unions
    - Programs based on Structure & its manipulation operations.
    - Programs demonstrating use of Unions.
    - Program demonstrating the difference between structure & union.

12. Programs based on functions & pointers: pass by reference.

13. To develop small application (mini project) using C Programming concepts.

- **Text Books:**

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. Simplifying C – Harshal Arolkar & Sonal Jain, Dreamtech (For Unit-01)
3. Let s 'C' – Yaswant Kanetkar ,BPB Publication
4. Programming in ANSI C- C Balgurusamy, Tata McGraw Hill

- **Reference Books:**

1. The C Programming Language (ANSI C Version), Brian W. Kernighan, Dennis M. Ritchie, PHI Publications
2. Programming in C – B.L.Juneja, Cengage Learning
3. Projects using C- PVN Varalaxmi, Scitech Publications
4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

- **Web resource for reference:**

https://onlinecourses.nptel.ac.in/noc18_cs31/preview

Solapur University, Solapur

First Year B.Tech (All Branches) Semester-II

C127 PROFESSIONAL COMMUNICATION

Teaching Scheme
Theory– 1 Hr /Week, 1 Credit
Laboratory– 2 Hrs. /Week, 1 Credit

Examination Scheme
ISE – 25 Marks
ICA - 25 Marks

- **Course Objectives :**

C127.O1	To nurture student's effective presentations skills
C127.O2	To equip student with skills for participating effectively in group discussion.
C127.O3	To equip student with skills for performing effectively in personal interview
C127.O4	To develop resume writing skills of students
C127.O5	To develop and enhance the report writing skills of the students
C127.O6	To inculcate soft skills in students for personal and professional success.

- **Course Outcomes :**

At the end of this course, student will able to

C127.1	Prepare good quality presentation and deliver it effectively.
C127.2	Participate effectively in group discussion
C127.3	Perform effectively in personal interview
C127.4	Prepare effective resume for job interviews
C127.5	Draft and write various reports professionally.
C127.6	Demonstrate various soft skills like team skills, leadership, creativity, etc. in different situations.

- **Course Curriculum**

Unit No 01: Presentation Skills		**Hours : 02**		
Sr.	*Subunit*	*Hours*	*Assessment*	*Bloom's Level*
1.1	Pronunciation, Intonation, Stress and Rhythm	01	Making a Presentation	Understanding, applying, evaluating, creating
1.2	Presentation- effective planning, preparing & delivering	01	Preparing and delivering presentations	Understanding, applying, evaluating, creating
Unit No 02: Group Discussion		**Hours : 02**		
Sr.	*Subunit*	*Hours*	*Assessment*	*Bloom's Level*
2.0	Group Discussion- introduction, traits evaluated, types, tips for successful participation, individual Traits	02	Mock group discussion	Remembering, understanding, applying, evaluating, creating
Unit No 03: Personal Interview		**Hours : 02**		
Sr.	*Subunit*	*Hours*	*Assessment*	*Bloom's Level*
3.0	Introduction, types of interviews, preparatory steps for employment interviews, skill tips, frequently asked questions during interviews	02	Mock personal interview	Remembering, understanding, applying, evaluating, creating
Unit No 04: Writing Practices -II		**Hours : 03**		
Sr.	*Subunit*	*Hours*	*Assessment*	*Bloom's Level*
4.1	Resume Writing	01	Writing resume for campus placement	Remembering, understanding, applying, evaluating, creating
4.2	Technical report writing- types, structures, data collection, content, form	01	Write a report on event / industrial visit / project	Remembering, understanding, applying, evaluating, creating
4.3	Précis Writing	01	Précis Writing	Remembering, understanding, applying, evaluating, creating

Unit No 05: Induction to Soft Skills		**Hours : 06**		
Sr.	*Subunit*	*Hours*	*Assessment*	*Bloom's Level*
5.1	Personal SWOCanalysis	06	Assessment through presentation, exercise, case study, role play, skit and group activity	Remembering, understanding, applying, evaluating, creating
5.2	Goal setting			
5.3	Motivation			
5.4	Leadership and team working			
5.5	Ethical values			
5.6	Stress management			
5.7	Emotional intelligence			
5.8	Positive thinking and attitude			
5.9	Decision making			
5.10	Creativity			

- **In Semester Evaluation (ISE) –**
  ISE shall be based on three theory examination conducted at institute level covering above curriculum. Examinations shall include sufficient questions covering all topics / subtopics

- **Internal Continuous Assessment (ICA) -**
  ICA shall be based on performance of the student during the laboratory sessions in language Lab covering minimum12 exercises out of the following exercises:

1. Power point presentation and a delivery
2. Writing views on a topic for group discussion in about 180 words
3. Participation in a group discussion
4. Writing responses to the frequently asked questions in personal interview
5. Mock personal interview.
6. Resume writing for campus placement
7. Industrial visit report writing
8. Other technical report writing
9. Self SWOC analysis
10. Oral presentation on self-short term and long term goals
11. Writingself-short term and long term goals
12. Role play on leadership and team working
13. Exercise on Précis Writing
14. Case study on decision making, stress management, success stories, positive thinking, entrepreneurship, etc.

✓ *Note – Students shall be encouraged to use ICT tools for compilation, analysis, report writing and presentation.*

- **Text Books:**

7. Soft Skills: An Integrated Approach to Maximize Personality, Gajendra Singh Chauhan & Sangeeta Sharma, Willy Indian Pvt. Ltd.
8. On Writing Well. William Zinsser. Harper Resource Book.2001.
9. Technical English. Dr. M. Hemamalini, Willy Indian Pvt. Ltd
10. Professional Speaking Skills. Aruna Koneru. Oxford University Press

- **References Books:**

1. Soft Skills. K. Alex., S. Chand Publications
2. Soft Skills – A Text book for Undergraduates. Ajay R Tengse, Orient Black Swan
3. Communication Skills Sanjay Kumar Pushpa Lata Oxford University Press
4. Managing Soft Skills for Personality Development, B N Ghosh- McGraw Hill Publication
5. Soft Skills for Everyone Jeff Butterfield, Cengage Learning
6. Soft Skills for Mangers. Dr. T. Kalyana Chakravarthi & Dr. T. Ltha Chakravarthi Biztantra Publication

सोलापूर विद्यापीठ
॥ विद्यया संपन्नता ॥

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science and Technology

CHOICE BASED CREDIT SYSTEM

Structure and Syllabus: Computer Science & Engineering

Name of the Course: S.Y. B. Tech. Sem III and Sem IV

(Syllabus to be implemented from w.e.f. June 2021)

Programme Educational Objectives and Outcomes

A. Program Educational Objectives

1. To make students competent for professional career in Computers, IT & allied fields.
2. To build strong fundamental knowledge amongst student to pursue higher education and continueprofessional development in Computers, IT & other fields
3. To imbibe professional ethics, develop team spirit and effective communication skills to besuccessful leaders and managers with a holistic approach.
4. To nurture students to be sensitive to ethical, societal & environmental issues while conductingtheir professional work.

B. Program Outcomes Engineering Graduate will be able to –

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities withan understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7.Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

C. Program Specific Outcomes (PSOs)

1. Graduate has an ability to use technical skills necessary for design, maintenance, developmentand implementation of database systems and networking applications.
2. Graduate has an ability to provide IT solutions, develop mobile applications in multidisciplinaryareas using standard tools and techniques.
3. Graduate has an ability to utilize and apply software engineering tools for design and realizationof projects in various domains of Computer Science and Engineering.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
FACULTY OF SCIENCE AND TECHNOLOGY
Structure of S.Y. B.Tech.(CSE) wef. 2021-2022

Semester – III

Course Code	Theory Course Name	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
CS211	Applied Mathematics-I	3	1		4	70	30	25	125
CS212	Discrete Mathematical Structures	3	1		4	70	30	25	125
CS213	Data structures	3			3	70	30		100
CS214	Computer Graphics	3			3	70	30		100
CS215	Microprocessors	3			3	70	30		100
CS216	Python Programming	2			2		25		25
	Sub Total	**17**	**2**		**19**	**350**	**175**	**50**	**575**
	Environmental studies	2				50			50
	Laboratory/Workshop					**ESE** / **POE**			
CS213	Data structures			2	1	50		25	75
CS214	Computer Graphics			2	1			25	25
CS215	Microprocessors			2	1			25	25
CS216	Python Programming			2	1	50		25	75
	Sub Total			**8**	**4**	**100**		**100**	**200**
	Grand Total	**19**	**2**	**8**	**23**	**450**	**175**	**150**	**775**

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
FACULTY OF SCIENCE AND TECHNOLOGY
Structure of S.Y. B.Tech.(CSE) wef. 2021-2022

Semester – IV

Course Code	Theory Course Name	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
CS221	Applied Mathematics-II	3	1		4	70	30	25	125
CS222	Theory of Computation	3	1		4	70	30	25	125
CS223	Computer Organization and Architecture	3			3	70	30		100
CS224	Computer Networks	3			3	70	30		100
CS225	OOP using Java	2			2		25		25
	Total	**14**	**2**		**16**	**280**	**145**	**50**	**475**
	Environmental studies	2				50			50
	Laboratory/Workshop					**ESE** / **POE**			
CS223	Computer Organization and Architecture			2	1			25	25
CS224	Computer Networks			2	1	50		25	75
CS225	OOP using Java			4	2	50		25	75
	Total			**8**	**4**	**100**		**75**	**175**
	Grand Total	**16**	**2**	**8**	**20**	**380**	**145**	**125**	**650**

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Second Year B.Tech (Computer Science & Engineering)
Semester-III
CS211 APPLIED MATHEMATICS-I

Teaching Scheme:
Lectures-3 Hours/week,3 Credits
Tutorial- 1 Hours/ week,1 Credit

Examination Scheme
ESE-70 Marks
ISE - 30 Marks
ICA-25 Marks

Introduction:
This course includes mathematical theory and concepts required by the computer engineer. The course consists of linear differential equations which can be used for mathematical model which are appearing in computer engineering, where these variables are dynamically related. This course introduces Z-transform which provide a mathematical framework for a series of mathematical conversions that are useful for digital filters. Laplace transforms is another powerful mathematical tool for engineering problems in Computer Science and Engineering. This course also introduces Fourier series, which plays an important role in designing, and analyzing communication system. This course also introduces fundamentals of probability distributions which are useful for digital communication. This course introduces Queuing systems which are prevalent throughout society. There are applications of queuing theory in several disciplines.

Course Prerequisite:
Fundamentals of trigonometry, method of finding roots of algebraic equations, differentiation, integration, partial fraction, sum of sequence and methods of solving definite integrations, basics of statistics and probability theory.

Course Objectives:
1. To introduce to student method of solving higher order linear differential equations
2. To introduce to student Laplace and inverse Laplace transforms
3. To introduce to student Fourier series of periodic functions
4. To make student understand Z transform and its properties
5. To introduce to student various probability distributions
6. To introduce to student Queuing theory and its model.

Course Outcomes:
1. Student can solve higher order linear differential equation with constant coefficient.
2. Student can apply Laplace and inverse Laplace transforms for solving linear differential equations.
3. Student can express a function in terms of sine's and cosines components so as to model simple periodic functions.
4. Student can solve problems on Z transform and explain its properties
5. Student can find the relation between two variables for the given data using regression and explain various probability distribution functions.
6. Student can solve problems based on queuing theory.

SECTION – I

Unit1: Linear differential equations with constant coefficients: (07)

Basic definition, differential operator, complimentary functions, particular integral,Shortcut methods for standard functions like e^{ax}, sin($ax+b$), cos($ax+b$), x^m, $e^{ax}VandxV$, particular integral by general method (without method of variation of parameters) for other functions.

Unit2:Z-Transform: (05)

Introduction, Z-Transform of standard sequence, properties of Z-transform – linearity, change of scale, shifting property, multiplication by k, division by k, inverse Z-transform –power series method, partial fraction method

Unit 3:Laplace transform: (09)

Definition, Laplace transform of standard functions, properties-first shifting, change of scale, multiplication of power t and division by t, Laplace transform of derivative and integral, Laplace transform of periodic functions, unit step functions and unit impulse functions, properties of inverse Laplace transforms- linear property, first shifting theorem, partial fraction, inverse transform of logarithmic & inverse trigonometric functions and convolution theorem, solution of differential equations by Laplace transform.

SECTION-II

Unit4:Fourier series: (07)

Introduction, Definition, Euler's formula, Fourier series of periodic functions with period 2□and2L, Dirichlet's theorem (only statement),even and odd functions, half range sine and cosine series.

Unit 5: Statistics and probability: (08)

Coefficient of correlation by KarlPearson's method and lines of regression of bivariate data, random variable, discrete and continuous random variable, probability density function, Binomial, Poisson, Normal distribution

Unit 6:QueuingTheory: (06)

Introduction, Queuing system, Distributions in Queuing systems, Kendall's notation, classification of queuing models, M/M/1: ∞/∞ models, M/M/1: N/∞ models.

Internal ContinuousAssessment(ICA):

ICA shall consist of minimum six to eight assignments based on entire curriculum

Text books:

1. A textbook of Applied Mathematics Vol. II and Vol. III, J.N. and P.N. Wartikar,Vidyarthi Grah Prakashan, Pune.
2. Higher Engineering Mathematics, Dr.B.S.Grewal, KhannaPublications, Delhi.
3. A Textbook of Applied Mathematics, N.P. Bali, Ashok Saxena and N.Ch. S.N.Iyengar,Laxmi Publications, Delhi.
4. Advanced Engineering Mathematics, Kreyzig-JohnWiley&SMS, NewYork.

Reference Books:

1. Advanced Engineering Mathematics, Peter O'Neil, Cengage Learning.
2. Engineering Mathematics, Srimanta Pal, Subodh Chandra Bhunia, Oxford University Press

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Second Year B.Tech (Computer Science & Engineering)

Semester-III

CS212-DISCRETE MATHEMATICAL STRUCTURES

Teaching Scheme	**Examination Scheme**
Lectures–3 Hours/week,3 Credits	ESE –70 Marks
Tutorial–1 Hour/week,1 Credits	ISE – 30 Marks
	ICA – 25 Marks

Introduction:

This course introduces discrete mathematics which deals with fundamentals of mathematical reasoning and set theory. The course also introduces theoretical and mathematical aspects of relations, functions, algebraic system & Boolean algebra.

Course Prerequisite: Student shall have knowledge of basic mathematics.

Course Objectives:

1. To get acquainted to basic connectives and find equivalent formulas and normal forms.
2. To draw implications from basic primitives.
3. To introduce set theory and relations with illustrations.
4. To introduce the concepts of functions and its types through scenarios.
5. To define types of algebraic systems and applications.

Course Outcomes:

Students will be able to:

1. Arrive at inference from the given premises applying mathematical logic
2. Select the associated operations and terminologies to solve logical problems for sets, functions, and relations.
3. Classify algebraic systems based on its properties and Select an appropriate for given application

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SECTION-I

UNIT-1 Mathematical logic **(06)**

Introduction, statements and Notation, Connectives-negation, conjunction, disjunction, conditional, bi conditional, statement formulas and truth tables, well-formed formulas, Tautologies, Equivalence of formulas, Duality law, Tautological implications, functionally complete sets of connectives, other connectives.

UNIT-2 Representation of expressions **(04)**

Normal & Principle normal forms, completely parenthesized infix & polish notations, Theory of inference for statement calculus.

UNIT-3 Set theory **(04)**

Basic concepts of set theory, types of operations on sets, ordered pairs, Cartesian product.

UNIT-4 Relations **(07)**

Relations, Properties of binary relations, Matrix and graph representation, Partition and covering of set, Equivalence relation, Composition, POSET and Hasse diagram.

SECTION II

UNIT-5 Functions **(04)**
Function-types, Composition of functions, Inverse functions.

UNIT-6 Algebraic systems **(07)**
Algebraic systems, semi groups and monoids, properties and example.

UNIT-7 Groups **(06)**
Polish expressions and their compilation, Groups, group codes.

UNIT-8 Lattices and Boolean algebra **(07)**
Lattice as POSETs, definition, examples and Properties, Special Lattices, Boolean algebra definition and examples, Boolean functions.

Internal Continuous Assessment (ICA):
In tutorial session, students of different batches should be assigned exercise problems and should be guided for the solution. Minimum one tutorial per unit is expected.

Text books:
1. Discrete mathematical structures with applications to computer science -- J. P. Tremblay & R. Manohar (MGH International)

ReferenceBooks:

1. Discrete Mathematics with combinatorics and graph theory- S. SNTHA (CENGAGE Learning)
2. Discrete Mathematical Structures –Bernard Kolman, Robert C. Busby (Pearson Education)
3. Discrete mathematics-Liu (MGH)
4. Theory and problems in Abstract algebra--Schaums outline series (MGH)
5. Discrete Mathematical Structures-Y N Singh (WILEY)
6. Discrete Mathematics and Its Applications, Chakraborty & Sarkar, Oxford
7. Discrete Structures, S.B.Singh, Khanna Book Publishing, Delhi
8. Discrete Mathematics, T.Veerarajan, TataMcGraw-Hill

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Second Year B.Tech (Computer Science & Engineering)
Semester-III
CS213 -DATA STRUCTURES

Teaching Scheme
Lectures:3 Hrs/Week,3Credits
Practical:2 Hrs/Week,1Credits

Examination Scheme
ESE:70 Marks
ISE:30 Marks
ICA:25 Marks
POE: 50 Marks

Introduction:

This course introduces various data structures like searching sorting, stack, queue, linked list, trees, graphs and hashing techniques. Course includes implementation of various operations of these data structures and some applications.

Course prerequisites:

This course requires prior knowledge of any basic programming language.

Course Objectives:

1. To introduce students to various data structures.
2. To develop programming skills to implement and analyze linear and nonlinear data structures.
3. To identify and apply the suitable data structure for problem solving.

Course Outcome:

Students will be able to

1. Describe linear and non-linear data structures
2. Implement abstract data structures
3. Analyze and Implement Tree and Graph data structures
4. Identify appropriate usage of data structures for a given problem

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UNIT 1 : Introduction to Data Structures & Searching-Sorting (05)

What is Data Structure, types of data structures – static, dynamic, primitive, non-primitive, linear, non-linear

Study and Implementation of Searching Algorithms- Linear search and Binary search.

Study and Implementation of Sorting Algorithms-Bubblesort, Insertion sort, Merge sort, Quick sort, Selection sort, Shell sort and Radixsort, Heap sort.

UNIT 2 : Hashing (05)

Different Hash Functions, choosing a hash function Collision Resolution by Open Addressing : Linear probing, quadratic probing, double hashing, Collision Resolution by Chaining

UNIT 3 : Stack and Queue (05)

Stack: Definition, representation, Operations, Implementation and applications like conversion of polish notations, evaluation of postfix expressions.

Queue: Definition, representation, Operations, Implementation of Linear Queue, Circular Queue, Priority Queue.

UNIT 4 : Lists **(06)**

Definition, representation, Operations, Types of Lists: Singly Linked list, Doubly Linked list, Circular Linked list, Stack using linked list, Queueusing Linked list, Application of Linked list : Addition and Subtraction of two polynomials

SECTION –II

UNIT 5 : Trees **(06)**

Definition, Traversal, Linked implementation, Operations on: Binary trees and Binary Search Trees, Introduction to Threaded Binary trees

UNIT 6 : Multiway Trees **(06)**

Multiway search Trees, Balanced Multiway Trees, Traversing a Multiway Tree, Insertion in Multiway Tree : BTrees, B+ Trees

UNIT 7 : Height Balance Trees **(06)**

AVL Trees : Definition, Height of an AVL Tree, Insertion, Deletion of node in AVL Trees, Single and Double rotation of AVL Trees.

UNIT 8 : Graphs **(06)**

Definition, Undirected and Directed Graphs, Graph Terminologies, Computer Representation of Graphs, Graph Traversal methods : Depth First and Breadth First Search, Application : Shortest Path using Dijkstra's algorithm.

Internal Continuous Assessment(ICA):

ICA shall consist of minimum 15 practical assignment problems based on all above topics in line with course outcome. Practical problem statements should cover all topics mentioned in syllabus.

Text Books:

1. Data Structure and Program Design in C by Robert Kruse/C.L.Tonda/Bruce Leung second edition, Pearson Education, Prentice Hall.
2. Data Structures: A Pseudo Approach with C. by Richard.F.Gilberg & Behrouz A. Forouzan, second edition, Cengage Learning
3. Data Structure using C and C++ by Rajesh.K.Shukla,Wiley Publication

Reference Books:

1. Data Structures using C and C++, second edition by Yedidyah Langram, Moshe J, Augensteen, Aason. M. Tanenbaum.
2. Data Structures and Algorithms by Prof. Maria S. Rukadikar, Shroff Publications.
3. Data Structures Through C in Depth by S.K. Shrivastava, Depali Shrivastava, BPB Publications
4. Fundamentals of Data Structures, Sartaj Sahni, University Press
5. Data Structures, R S Salaria, Khanna Publishing House
6. Data Structures through C,Yashwant Kanetkar, BPB Publications
7. Expert Data Structures with C++, R B Patel, Khanna Publications

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Second Year B.Tech (Computer Science & Engineering)

Semester-III

CS214-COMPUTER GRAPHICS

Teaching Scheme	**Examination Scheme**
Lectures:3 Hrs/week,3 credits	ESE:70 Marks
Practical:2 Hrs/Week,1 credit	ISE: 30 Marks
	ICA: 25 Marks

Introduction:

This course introduces the basic of computer graphics and different basic graphics functions. It also develops ability for implementation of different algorithms. With this course student can acquire computer graphics techniques, its uses and implementation details.

Course Prerequisite: Knowledge of C Programming & Mathematics.

Course Objectives :

1. To introduce basics elements of computer graphics and graphic devices.
2. To demonstrate the line, circle and polygon filling algorithms.
3. To demonstrate 2D and 3D transformations.
4. To use clipping algorithms.
5. To introduce hidden and visible surfaces, different types of curves.

Course Outcome:

Student will able to

1. Draw graphical elements using built-in graphic functions in‘C’.
2. Differentiate different graphical devices.
3. Drawlines, Circles and fill polygons.
4. Apply simple 2D and 3D transformations to given object and create simple 2D animations
5. Demonstrate different clipping algorithms, surfaces and different types of curves.

SECTION I

UNIT-1Basic Concepts & Devices (06)

Introduction to computer graphics, Application of Computer Graphics, pixel,frame buffer, resolution, aspect ratio, Video display devices: Refresh CRT,Raster scan display, Random scan display, color CRT monitors, Interactivedevices:joysticks, touchpanels, lightpens.

UNIT-2 Rasterscan Graphics (08)

Line drawing algorithms : DDA, Bresenham’s algorithm, Bresenhams Circle generation algorithm, Run Length Encoding, Polygon filling : Scan converting polygon, Edge fill, Edge flag, Seed fill.

UNIT-3 Geometric Transformations (09)

2DTransformation: Translation, Rotation, Reflection, Scaling, Shearing, Combined transformation, Rotation about an arbitrary point, Reflection through an arbitrary line.

3DTransformation: Scaling, Shearing, Rotation, Reflection, Translation, Multiple Transformation, Rotation about axis parallel to coordinate axis.

SECTION II

UNIT-4 Clipping&Display FileCompilation (07)

Sutherl and-Cohenline clipping algorithm, Midpoint subdivision algorithm, Viewing transformation, Window transformation, segmented display file, Display file compilation.

UNIT-5 Visible Lines &Visible Surfaces (08)

Hidden surfaces : introduction, back-face removal algorithm : Painter‘s algorithm, Warnock algorithm, Z–buffer. Antialiasing and antialiasing techniques, Halftoning.

UNIT-6 Plane curves & Space curves (07)

Introduction to curve generation, Curvere presentation, interpolation, Nonparametric & parametric curves, Beziercurves, B-splinecurves, Introduction to fractals, Fractal lines and surfaces.

Internal continuous assessment(ICA):

Student should perform 8 to10 experiments based on following guidelines.

1. To Study Basic graphics functions.
2. Implementation of DDA line drawing algorithm.
3. Implementation of Bresenham’s line drawing algorithm.
4. Implementation of Bresenham’s Circle generation algorithm.
5. Implement Polygon filling algorithms.
6. Implement 2D transformation.
7. Implementation of 3D transformation.
8. Implement Sutherl and–Cohen line clipping algorithm.
9. Implementation of Warnock algorithm.
10. Case study of OpenGL
11. Implement a small animation package.

Text Books:

1. Computer Graphics**(Chapter 1)**-Donald Hearn, Baker (second edition)PHI publications.
2. Procedural elements for Computer Graphics **(Chapter 2,4,5)** - David F. Rogers (second edition) Tata McGraw Hill publications.
3. Mathematical elements for Computer Graphics **(Chapter 3,6)** - Rogers, Adams (second edition)McGraw Hill Publishing Company.

Reference Books:

1. Computer Graphics with virtual reality systems -Rajesh K. Maurya.
2. Principals of Interactive Computer Graphics - William Newman, Sproull (second edition) McGraw-Hill Publication.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Second Year B.Tech (Computer Science & Engineering)

Semester-III

CS215 – MICROPROCESSORS

Teaching Scheme	**Examination Scheme**
Lectures:3 Hrs/week,3Credits	ESE:70 Marks
Practical:2 Hrs/week,1Credit	ISE:30 Marks
	ICA:25 Marks

Introduction:

This course introduces to develop an in-depth understanding of the operation of microprocessor, machine language programming and interfacing techniques.

Course Prerequisite: Knowledge of Digital Techniques and Basic Electrical Engineering

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Course Objectives

1. To introduce 8085 and 8086 microprocessor architectures and their functionalities.
2. To develop microprocessor based programs for various applications.
3. To build the interfacing between microprocessor and various peripherals.
4. To introduce basics of 80286, 80386 and 80486 microprocessors.

Course Outcomes :

Students will be able to

1. Describe the basic building blocks, operations & the addressing modes of microprocessors.
2. Write an assembly language program for 8086 micropocessor.
3. Implement interfacing programs for different peripheral devices with microprocessor

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SECTION-I

UNIT-1 Introduction to Microprocessor **(04)**

Introduction to microprocessor, Features and pin diagram of 8085, 8085 MPU architecture

UNIT-2 8086 Microprocessor **(06)**

8086 Architecture, Internal Operation, Machine Language Instructions : Addressing Modes, Instruction Execution Timing

UNIT-3 Assembly Language Programming **(06)**

Assembler Instruction Format, 8086 instruction set,Directives

UNIT-4 System Bus Architecture **(04)**

Introduction, Basic 8086 Configurations : Minimum Mode, Maximum Mode, System Bus Timing

SECTION-II

UNIT-5 Interrupts **(06)**

Introduction,Types of 8086 Interrupts, Interrupt and Interrupt service Routine, Maskable and Non-maskable Interrupt, Programmable Interrupt Controller (8259), Programmable, Features and Block Diagram of DMA Controller 8257, Operating modes of 8257.

UNIT-6 Programmable peripheral Interface **(04)**

Programmable peripheral Interface 8255,Modes of Operation

UNIT-7 Programmable Communication Interface and 8087 NDP **(04)**

8087 numeric data processor. NDP data types, process or architecture

UNIT-8 The 80286, 80386 and 80486 Microprocessor (05)

Introduction to 80286 Microprocessor, Architecture, Real Address Mode Operation, Protected Mode operation, 80386 Architecture, 80486 Architecture

Internal Continuous Assessment(ICA):

Student should perform 8 to 10 experiments using MASM/TASM / 8086 Emulator based on following guidelines.

1. Addition and subtraction of two 16 bit numbers
2. Addition and subtraction of two 32 bit numbers
3. 16 bit multiplication of unsigned numbers.
4. 8 bit division of unsigned numbers
5. Find factorial of number
6. Generate a Fibonacci series.
7. Program for block transfer
8. Program to arrange numbers in ascending and descending order
9. Program to find Largest No. in a block of data.
10. Program to display the string.
11. Program to implement keyboard sensing using 8255
12. Implementation of 7-segment display using 8255

Text Books:

1. Microprocessor Architecture, Programming, and Applications with the 8085 - Ramesh Gaonkar, Fifthedition. (UNIT -1)
2. Lice& Gibson,―MicrocomputerSystem8086 /8088‖PHI,2nd Edition. (Unit2, 3,4, 7)
3. D.V.Hall,―Microprocessor and Interfacing Programming &Hardware‖TMH–2 Edition-(Unit8)
4. AK Ray & K M Bhurchandi―Advanced Microprocessorsand Peripherals. 2nd Edition (Unit 5,6)

ReferenceBooks:

1. Barry B.Brey- The Intel Microprocessors : Architecture, Programming & Interfacing PHI, 6th Edition.
2. Uffenback- The 8086 Family Design, PHI, 2nd Edition.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Second Year B.Tech (Computer Science & Engineering)
Semester-III
CS216 PYTHON PROGRAMMING

Teaching Scheme
Lectures: 2 Hours/week, 2 Credits
Practical: 2 Hour/week, 1 Credit

Examination Scheme
ISE - 25 Marks
POE - 50 Marks
ICA - 25 Marks

Introduction: Python is a popular, general-purpose, multi-paradigm, open-source, scripting language. It is designed to emphasize code readability – has a clean syntax with high level data types. It is suited for interactive work and quick prototyping, while being powerful enough to write large applications. This course introduces the python language which has simple syntax, powerful set of libraries and robust debugger and profiler.

Course Prerequisite:
Student should have knowledge of basic programming.

Course Objectives:
1. To introduce the core components of Python programming language.
2. To study library packages to write applications using python
3. To study GUI, exception handling and debugging python program.

Course Outcomes :
At the end of this course, students will be able to
1. Write Python scripts using procedure oriented approach of writing a computer program.
2. Write Python scripts using Object oriented approach of writing a computer program
3. Exhibit ability to use Python's standard library packages to provide solution to a given problem.

SECTION - I

Unit 1 - Introduction to Python (02)
Introducing the Python Interpreter, Program Execution, Execution Model Variations, The Interactive Prompt, System Command Lines and Files

Unit 2 - Introduction to Python Programming Constructs (08)
Data types and variables, Collection data types, Control structures, loops and functions, Lambdas, Generators, Exception Handling, String handling, Scope of variables, Modules, Packages, Command line arguments. Built-in: Functions, Constants, Types, Exceptions.

Unit 3 - Introduction to Object Oriented Programming in Python (05)
Classes, Instance Objects, Method Objects, Class and Instance Variables, Attributes and methods, Inheritance and polymorphism

SECTION - II

Unit 4 - Python Standard Library Modules and Packages (08)
Regular expression operations, Basic date and time types, General calendar-related functions, Container datatypes, NumPy, Shallow and deep copy operations, Mathematical functions, Generate pseudo-random numbers, File and Directory Access
Data Persistence: CSV File Reading and Writing, Configuration file parser, Logging facility for Python.

Unit 5 – Multithreading and Introduction to GUI programming (04)
Concurrent Execution: Thread-based parallelism, Process-based parallelism, Context Variables, Asynchronous I/O.
Introduction to GUI programming in python.

Unit 6 – Testing and Debugging **(03)**

Testing output, Unit tests in Python, Handling Multiple exceptions, Creating custom exceptions, Debugging programs, Unit testing, Measure execution time of small code snippets.

ISE Evaluation for the course will consists of three programming (hands on) tests.

Internal Continuous Assessment (ICA):

Minimum 12 assignments based on above topics.

- The assignments should test and develop student's practical proficiency and ability to use Python standard library modules and packages efficiently in writing effective code for varied applications scenarios & requirements, use cases.
- Use of IDEs like PyCharm, Eclipse with PyDev, Jupyter Notebook for Interactive development and debugging of Python applications is highly recommend to enhance hands on skills in Python Programming of Students.
- Every assignment shall be performed under Python 2.x or 3.x runtime environment configured using any of the following tools 1) pyenv 2) virtualenv3)Anaconda

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Text Book:

Programming in Python 3, Mark Summerfield, Second Edition

Reference Books:

1. Python Cookbook, David Beazley and Brian K. Jones, Third Edition, Shroff Publishers & Distributors Pvt. Ltd., ISBN :978-93-5110-140-6
2. Learning Python, MarkLutz, 5th edition
3. Programming Python (English), MarkLutz, 4th Edition
4. Testing Python, David Sale, Wiley India (P) Ltd., ISBN :978-81-265-5277-1

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e-resources :

1. Python 2.7.16 documentation - https://docs.python.org/2/
2. Python 3.7.3 documentation - https://docs.python.org/3/

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Second Year B.Tech (Computer Science and Engineering)
Semester-IV
CS221 : APPLIED MATHEMATICS-II

Teaching Scheme	**Examination Scheme**
Lectures–3 Hours/week,3 Credits	ESE–70 Marks
Tutorial–1 Hour/week,1 Credit	ISE – 30 Marks
	ICA- 25 Marks

Introduction:
This course introduces numerical methods (Unlike analytical methods) to solve algebraic and transcendental equations, simultaneous systems of linear equations and numerical integrations. This course also introduces the fuzzy set theory in brief which deals with characterizing the concept of uncertainty and its relationship to the increasingly important concept of information and complexity. This course also introduces simplex method to solve LPP and assignment problems.

Course Prerequisite:
Student shall have knowledge of basic notions of classical set theory and probability theory. Studentshall have to be familiar with some analytical method for solving equations, simultaneous equations &analyticalmethods to solvedefiniteintegrations.

Course Objectives:
1) To make students familiar with the uncertainty.
2) To give students comprehensive coverage ofoperations on fuzzysets.
3) To make student use of numerical methods for the problems that cannot be solved analytically.
4) To enable students to solve Linear Programming Problems and Assignment Problems.

Course Outcomes:
1) Student can solve nonlinear algebraic and transcendental equations.
2) Student can solve simultaneous linear and nonlinear equations.
3) Students can apply numerical methods to evaluate definite integrals.
4) Student can apply knowledge of basics of fuzzy set theory to solve the problems.
5) Student can solve the fuzzy equations
6) Students can solve a particular kind of problems arises in day to day life using simplex method and Assignment Problems.

SECTION-I

Unit1: Solution of algebraic and transcendental equation (07)
Basic properties of equations, False position method, Newton-Raphson method, Multipleroots, Newton's iterative formula for obtaining square root, system of non-linear equations by Newton Raphson method.

Unit 2: Solution of linear simultaneous equations (07)
Direct methods–Gauss Elimination method, Gauss Jordan methods, Method of factorization Iterative methods–Jacobi's method, Gauss-seidal method, power method to find eigen value and eigen vector.

Unit 3:Numerical Integration (07)
Integration using Newton's cote's formulae–Trapezoidal rule, simpson's $1/3^{rd}$ rule, Simpson's 3/8th rule, Weddel's rule, Romberg integrations, Double integrations.

SECTION-II

Unit 4:Classical (Crisp) sets of fuzzy sets: (06)

Crisp sets, Basic types of fuzzy sets, Basic concepts of fuzzy sets, fuzzy sets vs Crisp sets:Additional properties of $\alpha-$cuts,representationoffuzzysetsandextensionprincipleoffuzzysets.

Unit 5:Fuzzy arithmetic. (08)

Fuzzy number, arithmetic operations on intervals, arithmetic operations on fuzzy numbers, fuzzy equations, lattice of fuzzy numbers.

Unit6:LPP and Assignment Problems (07)

Introduction of LPP, Simplex method for LPP, Assignment problem : introduction mathematical formulation of Assignment Problem, Hungerian method to solve Assignment Problem.

Internal Continuous Assessment (ICA):

ICA shall consist of minimum six to eight assignments based on entire curriculum

Text Books:

1) B.S. Grewal, Numerical methods, Khanna publication, New Delhi.
2) George J Klir and BoYuan, Fuzzy sets and Fuzzy logic– PHI India.
3) Fundamental of statistics, S.C.Gupta, Himalaya house publication.

ReferenceBooks:

1) George J. Klir and Tina A. Folger, Fuzzysets, uncertainity and information, PHI India.
2) Robert J. Schiling, SandraL.Harris, Applied Numerical methods for Engineers.
3) M.K.Jain, S.R.K.Iyengar, R.K.Jain, Numerical methods for scientific and engineering computations– New Age International ltd.
4) Pundir & Pundir, Fuzzysets and their applications – Pragati Publications.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Second Year B.Tech (Computer Science and Engineering)
Semester-IV
CS 222 – THEORY OF COMPUTATION

Teaching Scheme	**Examination Scheme**
Lectures–4Hours/week,4credits	ESE–70Marks
Tutorial–1Hour/week,1credit	ISE – 30 Marks
	ICA-25Marks

Introduction:

Theory of computation lays a strong foundation for a lot of abstract areas of computer science. TOC teaches you about the elementary ways in which a computer can be made to think. Any algorithm can be expressed in the form of a finite state machine and can serve as a really helpful visual representation of the same. Sometimes, the finite state machines are easier to understand thus helping the cause furthermore.

Prerequisite: Students should have prior knowledge of Discrete Mathematical Structure

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Course Objectives:

1. To introduce the computational principles to build regular expressions for given regular language.
2. To introduce different types of automata.
3. To explain regular and non-regular languages.
4. To introduce context free grammar.
5. To introduce different types of Pushdown automata and Turing machine.

Course Outcome:

Students will be able to

1. Build regular expression for a given language.
2. Design different types of automata.
3. Classify languages as regular and non regular language.
4. Detect ambiguity in a grammar and convert into unambiguous grammar and normal forms.
5. Design pushdown automata and Turing machine for a given language.

SECTION-I

UNIT-1 Regular Expressions **(08)**

Regular expressions & corresponding regular languages, examples and applications, unions, intersection & complements of regular languages

UNIT-2 Finite Automata **(08)**

Finite automata definition and representation, Non-deterministic F.A.,NFA with^ transitions, Equivalence of DFA & NFA

UNIT-3 Kleen's Theorem **(08)**

Statements & proofs, minimizing number of states in an FA, Basics of Moore and Mealy Machines

UNIT– 4 Grammars & Languages **(08)**

Definition and types of grammars and languages, derivation trees and ambiguity, CNF notations, Union, Concatenation and*'s of CFLs, Eliminating ^ production and unit productions from a CFG, Eliminating useless variables from a Context Free Grammar.

SECTION-II

UNIT– 5 Pushdown Automata **(07)**
Definition, deterministic PDA & types of acceptance, equivalence of CFGs & PDAs.

UNIT– 6 CFL's & Non CFL's **(06)**
Pumping Lemma & examples, inter section and complements.

UNIT– 7 Turing machines **(10)**
Models of computation, definition of TM as language Acceptors, Combining Turing machines, computing function with a TM

UNIT-8 Variations in TM **(05)**
TMs with doubly infinite tapes, Multitape, Non-deterministic TM and universal TM.

Internal Continuous Assessment (ICA):

Students should solve assignments based on the topics below:

1. Regular Expression & Corresponding Languages
2. Union, Intersection & Complements of Regular languages
3. Design & Simulation of Simple Finite Automata
4. Nondeterministic Finite Automata & NFA with ^transitions ,Conversion of NFA to DFA
5. Draw NFA using Kleens theorm
6. DFA minimization
7. Grammer, Removing ambiguity from a grammar, Conversion to BNF & CNF form
8. Push Down Automata
9. Pumping Lemma & Examples for regular sets & regular languages
10. Turing Machine

Text Books:

1. Introduction to languages & theory of computation--John C.Martin(MGH)
2. Formal Languages & Automata Theory-- Basavraj S. Anami, Karibasappa K.G., Wiley Precise Textbook-Wiley India

References:

1. Theory of Computation—Rajesh K Shukla (CENGAGE Learning)
2. Introduction to Automata theory, languages and computations – John E. Hopcraft, Rajeev Motwani, Jeffrey D. Ullman (Pearson Edition).
3. Discrete mathematical structures with applications to Computer science - J.P.Tremblay & R.Manohar (MGH)
4. Theory of Computer Science:Automata, Languages and Computation, Mishra, Phi
5. Theory of Computation, R B Patel & Prem Nath, Khanna Publications

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Faculty of Science and Technology
Second Year B. Tech (Computer Science & Engineering)
Semester – IV

CS223 - COMPUTER ORGANIZATION AND ARCHITECTURE

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hrs/Week, 3 Credits	ESE: 70 Marks
Practicals 2 Hrs/Week, 1 Credit	ISE: 30 Marks
	ICA : 25 Marks

Introduction: Computer Organization and Architecture (COA) course provide students with an understanding of the design of fundamental blocks used for building a computer system and interfacing techniques of these blocks to achieve different configurations of an "entire computer system". It introduces detailed understanding of various processor micro architectural designs, which include pipeline design, and multi-core processor design.

Course Prerequisite: Student shall have undergone a course on Digital Logic Design and Operating system.

Course Objective:

1. To impart basic concept of computer organization and architecture.
2. To help student to understand various memory module.
3. To facilitate student in understanding in learning IO communication.
4. To develop deeper understanding of instruction and multiprocessor level parallelism.

Course Outcomes: At the end of the course students will be able to

1. Describe the functional architecture of computing systems.
2. Analyse various parallel programming model.
3. Use ARC Processor based instructions to write assembly language program.
4. Demonstrate the design aspects of memory, instruction level parallelism and multiprocessors.

SECTION-I

Unit 1 - Introduction (05)

A Brief History of Computing, The Von Neumann Model, Generations of Computers, The System Bus Model, Levels of Machines: Upward Compatibility, The Levels of computer, A Typical Computer System.

Unit 2 - The Instruction Set Architecture and Memory (06)

Hardware Components of the Instruction Set Architecture, ARC - A RISC Computer , Pseudo Operations, Synthetic Instructions, Examples of Assembly Language Programs, Accessing Data in Memory-Addressing Modes, The Memory Hierarchy, Cache Memory.

Unit 3: Parallel Models, Languages and Compilers (07)

Parallel Programming Models: Shared variable model, Message passing model, Data Parallel Model, Object Oriented Model, Functional and Logic Models. Parallel Languages and Compilers: Language Features for parallelism, Parallel Language Constructs, Optimizing Compilers for Parallelism

SECTION-II

Unit 4 - Input/ Output Organization (05)

External devices, I/O module, Programmed I/O, Interrupt driven I/ O, Direct memory access, I/O channels and processors, External interface.

Unit 5 - Fundamentals of Pipeline: (05)
Introduction to Pipelining, The Major Hurdle of Pipelining: Pipeline Hazards, linear pipeline and Nonlinear pipeline, MESI protocol.

Unit 6 - Instructions –Level Parallelism (07)
ILP: Concepts and challenges, Basic Compiler Techniques for exposing ILP, Reducing Branch costs with prediction, Overcoming Data hazards with Dynamic scheduling, Hardware based Speculation, Exploiting ILP using multiple issues and static scheduling,

Unit 7 - Multiprocessors and Thread –Level Parallelism: (05)
Introduction, Symmetric Shared-Memory architectures, Performance of symmetric shared–memory multiprocessors, Distributed shared memory and Directory-based coherence.

Internal Continuous Assessment (ICA):
Student should perform 8 to 9 Experiments. Refer the following virtual lab link

1) http://vlabs.iitkgp.ernet.in/coa/exp7/index.html
2) http://cse11-iiith.vlabs.ac.in/List%20of%20experiments.html?domain=Computer%20Science

Text Books:

1. Computer Architecture and Organization AN INTEGRAGATED APPROACH, Miles Murdocca and Vincent Heuring (WILEY).
2. Computer Architecture, A Quantitative Approach, John L. Hennessey and David A. Patterson: 4thEdition, Elsevier, 2007.
3. Computer Organization & Architecture, Rajaraman, PHI Learning 4. Advanced Computer Architecture - Parallelism, Scalability, Programmability-Kai Hwang-Tata McGraw Hill

Reference books:

1. Computer Organisation, HamacherZaky (MGH)
2. Computer Architecture and Organization, John P. Hayes
3. Computer Organization and Architecture, William Stallings
4. Digital Logic and Computer Design, M. Morris Mano. Pearson Education - Prentice Hall

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Second Year B.Tech (Computer Science and Engineering)
Semester-IV
CS224–COMPUTER NETWORKS

Teaching Scheme	**Examination Scheme**
Lectures–3 Hours/week,3Credits	ESE–70 Marks
Practical–2 Hour/week,1Credits	ISE–30 Marks
	ICA–25 Marks

Introduction:
This course introduces OSI reference model and TCP/IP protocol in detail and ital so covers the IPv4 Addressing, Socket Programming, Transport layer and Application layer protocols.

Course Prerequisite: Student should have the knowledge of Basics of Computer Networks and networking devices.

Course Objectives:
1. To Introduce OSI reference model, TCP/IP protocol and different classes of IPv4 addressing.
2. To analyze client-server paradigm for socket interfaces and Transport layer protocols like TCP, UDP and SCTP.
3. To explore different application layer protocols like DNS,FTP and TELNET.

Course Outcomes:
Student will be able to
1. Understand the basic principles of OSI reference model and TCP/IP protocol suite for Network-communication.
2. Identify the different classes of IP address for network set-up.
3. Implement client-server paradigm using transport layer protocols.
4. Select and use appropriate Application Layer Protocols for a given problem.

SECTION-I

UNIT-1 Basics of Computer Networks (08)
OSI Reference model, TCP/IP protocol, Internet Protocol : Introduction, IP Datagram, fragmentation, Addressing : Physical, Logical, Port & Application Specific Addresses. Introduction To IPv4 Addresses: Classful addressing, Classless addressing, Special addresses,NAT

UNIT-2 Transport Layer (07)
UDP: Introduction, User Datagram, UDP Services, UDP Applications.
TCP: TCP Services, TCP Features, Segment, A TCP Connection, Flow Control, Error Control, Congestion Control,TCP Timers.
SCTP:Introduction, SCTP Services, SCTP Features, Packet Format

UNIT-3 Client Server Model and Socket Interface (08)
Client Server Paradigm: Server, Client, Concurrency, Concurrency in Clients, Concurrency in Servers, Socket, Byte Ordering Functions. Socket System Calls, Connectionless Iterative Server, UDP Client Server Programs, and Connection-oriented Concurrent Server.

SECTION-II

UNIT-4 Host Configuration & Domain Name System (07)

Host Configuration : BOOTP Operation, Packet format, DHCP : Introduction, DHCP Operation and Configuration.

Domain Name System: Need for DNS, Name Space, DNS in the Internet, Resolution, DNS Messages, Types of Records.

UNIT-5Remote Login and TELNET (07)

TELNET Concept, Time-Sharing Environment, Network Virtual Terminal, Embedding, Options, Symmetry, Suboption Negotiation, Controlling the Server, Out-of-Band Signaling, Escape Character, Mode of Operation, User Interface.

SSH:Components, Port Forwarding, Format of SSH Packets.

UNIT-6 File Transfer and Electronic Mail (08)

FTP: Introduction**,** control & data connections, Communication over data and control connection, Command Processing

TFTP: Messages, Connection, Data Transfer, UDP Ports, TFTP Applications.

Electronic Mail: Architecture, UserAgent, Message Transfer Agent, SMTP, Message Access Agent: POP and IMAP

Internal Continuous Assessment(ICA):

Students should perform minimum 8 experiments based on the following guidelines and preferably conducted on Unix/Linux platform using C language.

1. Configuration of Network-Assigning IP Address, Subnet-Mask, Default Gateway, DNS Server Addresses & Testing Basic Connectivity.
2. Connectionless Iterative Server : C Implementation of Client-Server Programs Using Iterative UDP Server.
3. Connection-oriented Iterative Server : C Implementation of Client-Server Programs Using Iterative TCP Server.
4. Connection-oriented Concurrent Server : C Implementation of Client-Server Programs Using Concurrent TCP Server.
5. Implementation of Simple Network Chatting Application.
6. Remote Login : TELNET
    a. Logon to a remote computer from client using TELNET.
    b. After logging on executes few commands at remote server from client. For example userwants a server to display a file (hello.txt) on a remote server then he/she types: *cathello.txt*.
    c. Logon to a remote computer from client using TELNET and Putty terminal emulator. After logging on execute few commands. Here Client and Server are on heterogeneous systems, for example client is on windows and server is on Linux.
7. Remote Login : SSH
    a. Log on to a remote computer from client using SSH.
    b. After logging on executes few commands at remote server from client. For exampleuser wants a server to display a file (hello.txt) on a remote server then he/she types:*cathello.txt*.
    c. Log on to a remote computer from client using SSH and Putty terminal emulator.After logging on execute few commands. Here Client and Server are on heterogeneous systems for example client is on windows and server is on Linux.
8. Installation and configuration of DHCP
9. Installation and configuration of FTP.

Text Books:

1. TCP/IP Protocol Suite:Behrouz A.Forouzan (Fourth Edition) (Unit 1,2,3,5,6)
2. TCP/IP Protocol Suite:BehrouzA.Forouzan (Third Edition) (Unit 4)
3. TCP/IP Protocol Suite:BehrouzA.Forouzan (Second Edition) (Unit 3)
4. ComputerNetworking:ATop-Down Approach Featuring the Internet, International Edition: James F.Kurose and Keith W.Ross

Reference Books:

1. Internet working with TCP/IPVol. III.Client-Server Programming & Applications : Douglas E. Comer
2. Data and Computer Communications :William Stallings
3. Data Communication and Networking : Behrouz A.Forouzan
4. Computer Networks, M.Dave,Cengage
5. An Engineering Approach to Computer Networking, Keshav,Pearson
6. An Integrated Approach to Computer Networks, Bhavneet Sidhu, Khanna Publications
7. Telecommunication Switching System and Networks,Viswanathan,PHI

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Faculty of Science and Technology

Second Year B.Tech. (Computer Science & Engineering)

Semester – IV

CS225 - Object Oriented Programming Using JAVA

Teaching Scheme	**Examination Scheme**
Lectures: 2 Hrs/Week, 2 Credits	ISE: 25 Marks
Practical: 4 Hrs/Week, 2 Credits	ICA: 25 Marks
	POE: 50 Marks

Introduction :

The course introduces Java language's syntax and object-oriented programming paradigms from the perspective of Java language. Further, the course thoroughly touches upon the vital aspects of the usage of Java runtime library packages' classes and methods.

Course Outcomes :

At the end of this course students will be able to

1. Implement Object Oriented Programming paradigm using Java language.
2. Exhibit the ability to use Java runtime library APIs to provide a solution to a given problem.
3. Test and debug a Java program for a given problem.

Unit 1 - Basics of Java and Strings in Java (02)

Basics: Java Runtime Environment (Oracle JDK, OpenJDK), Naming Conventions and Java profilers. Variables, Operators, Expressions, Statements, Blocks, Control flow Statements, Input and Output, Data Types, Arrays, Type Casting.

Fundamentals: String Class and Methods, Immutability of Strings, String Buffer Class and Methods, String Builder class and Methods.

Unit 2 - Classes, Objects and Methods (04)

Class, Object, Object reference, Constructor, Constructor Overloading, Method Overloading, Recursion, Passing and Returning object form Method, new operator, this and static keyword, finalize() method, Access control, modifiers, Nested class, Inner class, Anonymous inner class, Abstract class, Wrapper classes, Object Life time & Garbage Collection.

Unit 3 - Inheritance and Interfaces (06)

Use of Inheritance, Inheriting Data members and Methods, constructor in inheritance, Multilevel Inheritance – method overriding, hnadling multilevel constructors – super keyword, Final keywords, Creation and Implementation of an interface, Interface reference, instance of operator, Interface inheritance, Dynamic method dispatch ,Understanding of Java Object Class, Comparison between Abstract Class and interface

Unit 4 - Exceptions, Error Handling and Basic IO (06)

Exceptions and Error Handling: Exceptions and Errors, Catching and Handling Exceptions, The try Block, The catch Blocks, The finally Block, Throwing Exceptions, Chained Exceptions, Custom Exceptions. JUnit Testing Framework.

Basic I/O: I/O Streams, Byte Streams, Character Streams, Buffered Streams, Scanning and Formatting, Data Streams, Object Streams , File I/O Classes: Reading, Writing, and Creating Files and Directories.

Unit 5 - Java Collections Framework and Package (06)

Introduction, The Arrays Class, Searching and sorting arrays of primitive data types, Sorting Arrays of Objects, The Comparable and Comparator Interfaces, Sorting using Comparable & Comparator, Collections: Lists, Sets, Maps, Trees, Iterators and Collections, The Collection Class.

Package: Use of Package, CLASSPATH, Import statement, Static import, Access control

Unit 6 - Multithreading and Networking **(06)**

Multithreading: Creating Threads, Thread scheduling and priority, Thread interruptions and synchronization.

Network Programming: InetAddress, URLs, Socket (TCP & UDP) communication in Java, Servlet Programming

Unit 7 - GUI Programming using Swing: Swing package, Layouts, Events, Listeners and Event handling, and Swing Components. **(03)**

ISE Evaluation: ISE Evaluation for the course will consist of three programming (hands on) tests.

Internal Continuous Assessment (ICA):

ICA shall consist of minimum 15 practical assignment problems.

The assignments should test and develop student's practical proficiency and ability to use Java API Classes correctly for writing code for varied applications scenarios & use case requirements.

Use of IDEs like BlueJ, Eclipse, Netbeans or any other FOSS alternative for Interactive development and debugging of Java applications is highly recommend to enhance hands on skills in Java Programming of Students.

Text Books:

1. Head First Java, Kathy Sierra, Bert Bates, O'Reilly Publication
2. The JavaTM Programming Language, Ken Arnold, James Gosling, David Holmes, Pearson Publication
3. Core Java for Beginners, Rashmi Kanta Das, Vikas Publishing House Pvt Ltd.
4. Programming with Java, Balaguruswamy, TMH
5. Internet and Java Programming, TanweerAlam, Khanna Publishing House

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Reference Books:

1. The Java Language Specification, Java SE 8 Edition Book by James Gosling, Oracle Inc.
1. Java: The Complete Reference 8 Edition - Herbert Schildt , Tata McGraw - Hill Education
2. Head First Servlets and JSP – Bryan Bosham, Kathy Sierra, Bert Bates, O'Reilly Publication
5. The JavaTM Tutorials. Oracle Inc.
4. Java Server Programming for Professionals - Ivan Bayross, Sharanam Shah, Cynthia Bayross and Vaishali Shah, Shroff Publishers and Distributors Pvt. Ltd, 2nd Edition

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e-resources :

1. http://docs.oracle.com/javase/specs/
2. http://docs.oracle.com/javase/tutorial/

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-
2015'B' Grade
(CGPA 2.62)

Name of the Faculty: Engineering & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: ELECTRICAL ENGINEERING

Name of the Course: S.Y. B.Tech

(Syllabus to be implemented from w.e.f. June 2021)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Engineering & Technology
B.Tech (Electrical Engineering)
PROGRAMME: BACHELOR OF ELECTRICAL ENGINEERING
PROGRAMME OBJECTIVES

A. PROGRAM EDUCATIONAL OBJECTIVES

1. Deliver fundamental as well as advanced knowledge with research initiatives in the field of electrical engineering with emphasis on state-of-the-art technology.
2. Graduates will demonstrate measurable progress in the fields they choose to pursue.
3. Design and develop technically feasible solutions for real world applications which are economically viable leading to societal benefits.
4. To nurture Graduates to be sensitive for ethical, societal and environmental issues while conducting their professional work.

B. PROGRAMME OUTCOMES

Students attain the following outcomes: -

1 **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2 **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3 **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4 **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5 **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6 **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7 **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9 **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10 **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11 **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12 **Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

C. PROGRAMME SPECIFIC OUTCOMES

1 An ability to specify, design and analyze Power System, Electrical Machinery, Electronic Circuits, Drive Systems, Lightning Systems and deliver technological solution by adapting advances in allied disciplines.

2 Apply knowledge of electrical engineering to meet the desired needs within realistic constraints viz. economical, ethical, and environmental and safety.

3 Apply modern software tools for design, simulation and analysis of electrical systems to successfully adapt in multi-disciplinary environments.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Engineering & Technology
S.Y. B Tech. (Electrical Engineering

Choice Based Credit System Syllabus Structure of S.Y. B. Tech. Electrical Engineering W.E.F. 2021-22 ***Semester I***

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
EL 211	Engineering Mathematics-III	2	1		3	30	70	25	125
EL 212	Electrical Machines-I	3	-		3	30	70	-	100
EL 213	Electrical Measurement and Instrumentation	3	-		3	30	70	-	100
EL 214	Power System I	3	1		4	30	70	25	125
EL 215	Electronic Devices and Circuits	3	-		3	30	70	-	100
EL 216	Object Oriented Programming with C++	1	-		--	--	--	-	--
Sub Total		**15**	**2**	**-**	**16**	**150**	**350**	**50**	**550**
Environmental Science		1							
Laboratory Course Name									
							ESE		
							POE	OE	
EL 212	Electrical Machines-I	-	-	2	1	-	50	-	25	75
EL 213	Electrical Measurement and Instrumentation	-	-	2	1	-	50	-	25	75
EL 215	Electronic Devices and Circuits	-	-	2	1	-		-	25	25
EL 216	Object Oriented Programming with C++	-	-	2	1	-	50	-	25	75
Sub Total		**-**	**-**	**8**	**4**		**150**		**100**	**250**
Grand Total		**15**	**2**	**8**	**20**	**150**	**500**		**150**	**800**

- *Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE- In semester Exam, ESE - End Semester Exam, ICA- Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)*

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Engineering & Technology
S. Y. B. Tech. (Electrical Engineering)

Choice Based Credit System Structure of S.Y.B.Tech. Electrical Engineering W.E.F. 2021-2022 ***Semester II***

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
EL 221	Numerical Methods and Linear Algebra	2	1	-	3	30	70	25	125
EL 222	Electrical Machines-II	3	-	-	3	30	70	-	100
EL 223	Power System II	3	1	-	4	30	70	25	125
EL 224	Analog & Digital Integrated circuits	3	-	-	3	30	70	-	100
EL 225	Network Analysis	3	-	-	3	30	70	-	100
Sub Total		**14**	**2**	**-**	**16**	**150**	**350**	**50**	**550**
Environmental Science		1	-	-	-	-	-	-	-
Laboratory Course Name									
							ESE		
							POE	OE		
EL 222	Electrical Machines-II	-	-	2	1	-	50	-	25	75
EL 225	Network Analysis	-	-	2	1	-	50	-	25	75
EL 224	Analog & Digital Integrated circuits	-	-	2	1	-	-	-	25	25
EL 226	Computer Aided Design and Simulation	-	-	2	1	-	50	-	25	75
Sub Total		**-**	**-**	**8**	**4**	**-**	**150**		**100**	**250**
Grand Total		**14**	**2**	**8**	**20**	**150**	**500**		**150**	**800**

- *Abbreviations: L - Lectures, P –Practical, T - Tutorial, ISE - In Semester Exam, ESE - End Semester Exam, ICA - Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)*

Note –

- Batch size for the SE practical /tutorial shall be of 20 students. On forming the batches, if the strength of remaining student exceeds 9, then a new batch shall be formed.
- Vocational Training (evaluated at B.E. Part-I) of minimum 15 days shall be completed in any vacation after S.E. Part-II but before B.E. Part-I & and evaluated on the basis of presentation as well as training report.
- Student shall select one Self Learning Module at T.E. Part I and T.E. Part II each from Technical and Humanities and Social
- Sciences Group with at least one Self Learning Module from the Humanities and Social Sciences Group
- Curriculum for Humanities and Social Sciences Self Learning Modules is common for all under graduate programmes of faculty of Engineering and Technology
- Minimum four assignments for Self-Learning Modules at T.E. Part I and T.E. Part II shall be submitted by the students which shall be evaluated by a Module Coordinator assigned by institute / department
- Project group for T.E.(Electrical) Part II Mini Project shall not be of more than three student
- Project group for B.E. (Electrical) Part I and Part II shall not be of more than FOUR students.
- ICA shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. Electrical Engineering Semester-I
Engineering Mathematics III

Teaching Scheme	Examination Scheme
Theory: - 2 Hrs/Week,2 Credits	**ESE –** 70 Marks
Tutorial: - 1 Hrs/Week, 1 Credit	**ICA-**25Marks
	ISE- 30Marks

This course introduces linear differential equation and its applications in Electrical Engineering Problems, Partial differential equations, Laplace transform, Fourier series, Z transform and Complex Variable theory.

- **Course Prerequisite:**

Student shall have knowledge of Ordinary differential equation, Partial differentiation, Complex number and also to have basic knowledge of functions, intervals. He shall also have basic knowledge of derivatives and Integration.

- **Course Objectives:**

- To make student understand basics of solving differential equation to electrical circuits.
- To introduce to student basics of Laplace Transform and its applications.
- To make student to have knowledge of partial differential equations under different conditions.
- To make student understand theory and mathematical forms of Z transform and Fourier Series
- To make student understand functions complex variable.

- **Course Outcomes:**

- Student can solve problems of linear differential equation.
- Students can apply Laplace transform to solve problems of electrical fields.
- Student can apply Z transform under different conditions and can derive equation from them.
- Student can able to understand Fourier series.
- Student can analyze the functions of complex variable.

SECTION-I

Unit 1– Linear Differential Equations with Constant Coefficients No of lectures – 04

- **Prerequisite:**

Trigonometry, differentiation, integration.

- **Objectives:**

1. Revise of concepts of derivatives
2. To introduce different forms of differential equation
3. To make students to understand different techniques
4. To make students to understand applications of linear differential equations

- **Outcomes:**
  After completing this unit, students -

1. Can apply these methods to solve electric circuit problems
2. Can calculate parameters of electrical circuits (current, resistance, time etc.)
3. Can convert the problems to simple forms to analyze

Unit Content:
Basic definition, differential operator, complimentary functions, particular integral shortcut method for standard functions like , e^{ax} sinax, cosax, x^m ,e^{ax} V, XV and particular integral general method (without method of variation of parameters) for other functions

- **Content Delivery**
  Methods: Chalk and talk

- **Assessment Methods:**
  Electrical problems and derivation related to linear differential equation.

Unit 2–Homogeneous and Legendre's Linear Differential equations No of lectures – 04

- **Prerequisite:**
  Linear differential equation with its different functions

- **Objectives:**

1. To make students to understand concepts of homogenous differential equation.
2. To make students to analyze Legendre differential equation.
3. To make students to derive homogenous differential equation from Legendre differential equations

- **Outcomes:**
  After completing this unit, students –

1. Can convert difficult problems to simple form.
2. Can solve problems of homogenous and Legendre differential equations.

Unit Content:
Cauchy's & Legendre's Linear equations, Applications to Electrical Engineering Problems

- **Content Delivery**
  Methods: Chalk and talk.

- **Assessment Methods:**
  Problems related to Cauchy's & Legendre's Linear equations, Applications Electrical Engineering Problems.

Unit 3–Laplace Transform No of lectures – 06

Prerequisite
Concepts of function, intervals, differentiation, integration

- **Objectives:**

1. To make students to derive Laplace at different conditions and for different functions.
2. To make students to apply Laplace for getting solution for electric circuits.
3. To introduce concept of derivative and integral.

4. To make students to understand shifting and change of scalar properties.
5. To make students to derive inverse Laplace at different conditions and for different functions.

- **Outcomes:**
  After completing this unit, students –

1. Can apply Laplace Transform to electrical circuit theory
2. Can apply Laplace transforms to convert integral and differential equations into algebraic equations.
3. Can convert time domain signal into frequency domain signal
4. The Laplace transforms converts integral and differential equations into algebraic equations.

- **Unit Content:**
  Definition, Laplace Transform of standard functions, Properties First shifting, change of scale, multiplication of powers of t and division by t, Laplace Transform of derivative and integral, Unit step functions and unit Impulse functions, Methods of finding Inverse Laplace transforms by Convolution Theorem only.

- **Content Delivery Methods:**
  Chalk and talk, power point presentation, videos

- **Assessment Methods:**
  Numerical problems and derivation related to above Content

SECTION-II

Unit 4- Partial Differential Equations **No of lectures – 04**

- **Prerequisite:**
  Concepts of function of two variables, differentiation, integration

- **Objectives:**

1. To introduce to student concept of partial differential equation
2. To make students able to solve partial differential equations
3. To introduce concept of application of partial differential equations for different fields

- **Outcomes:**
  After completing this unit, student –

1. Can analyze difference between solutions to ordinary and partial differentiation
2. Can derive solutions partial differential with its different forms
3. Can apply to evaluate partial differential equations for different electric fields

- **Unit Content:**
  Four standard forms of Partial Differential equations of first order, Solution of partial differential equations by method of separation of variables

- **Content Delivery**
  Methods: Chalk and talk

- **Assessment Methods:**
  Numerical problems and derivation related to above Content

Unit 5 -Functions of Complex variables **No of lectures – 04**

Prerequisite:
Concepts of complex Number, Partial Derivatives, Integration, Concepts of Analytic functions, Cauchy's Riemann equations, Harmonic functions.

- **Objectives:**

1. To make students to understand analytic function
2. To understand Cauchy-Riemann equations and harmonic function
3. To make students to understand Cauchy integration

- **Outcomes:**
  After completing this unit, students –

1. Can derive analytic function wave equation using Maxwell equation for different media
2. Can derive Cauchy-Riemann equations and harmonic function
3. Can solve Cauchy integral problems
4. Can solve complex Integration
5. Can find Residue

Unit Content:
Line integral, Cauchy's integral theorem, Cauchy's integral formula, Cauchy Residue theorem (without proof)

- **Content Delivery**
  Methods: Chalk and talk

- **Assessment Methods:**
  Numerical problems and derivation related to above Content

Unit 6- Z-Transform **No of lectures – 06**

- **Prerequisite:**
  Sequence and Series, convergence

- **Objectives:**

1. To make students to understand Z - transform and Inverse Z – Transform
2. To make students to convert discrete time Domain into a complex frequency domain
3. To make students to understand region of convergence
4. To make students to understand Fourier series for different functions

- **Outcomes:**
  After completing this unit, students –

1. Can find Z - transform to different functions
2. Can used to finding frequency response
3. Can calculate Inverse Z - Transform to different functions
4. Can use for circuit analysis

- **Unit Content:**
  Z - Transform of elementary Functions, Properties of Z - Transform and Inverse Z Transform

- **Content Delivery**
  Methods: Chalk and talk

- **Assessment Methods:**
  Numerical and derivation related to above Content

- **Internal Continuous Assessment (ICA):**
  ICA shall consist of minimum eight assignments based upon above curriculum.
  Tutorial/Assignments shall include numerical problems

- **Text Books:**

1. "A textbook of Applied Mathematics Vol II", Vidyarthi Grah Prakashan, Pune, JN and PN Wartikar
2. "Higher Engineering Mathematics", Khanna Publications, Delhi, B S Grewal
3. "Advanced Engineering Mathematics", Wiley & SMS, Newyork, Kreyzig-John

- **Reference Books:**

1. "Advanced Engineering Mathematics", Cengage Learning, Peter O'Neil
2. "Higher Engineering Mathematics", Tata McGraw-Hill Education, BV Ramana

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. Electrical Engineering Semester-I
ELECTRICAL MACHINES – I

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week,3 Credits	**ESE –** 70 Marks
Practical: - 2 Hrs/Week, 1 Credit	**ICA-**25Marks
	ISE- 30Marks
	POE: 50Marks

This course introduces Electrical machines like DC Machines and Transformer includingtheir theoretical and analytical performance

Course Prerequisite:

Student shall have knowledge of Magnetic Circuit, DC Circuit, AC Fundamentals and AC Circuit

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Course Objectives:

- To get detailed knowledge of construction, operating principles of DC machines and transformer
- To find equivalent circuit parameters and performance parameters for transformer and DC machines
- To understand different testing methods of DC Machines

Course Outcomes:

Upon successful completion of this course:

- Student will be able to analyze performance of DC generators and motors
- Student will be able to examine performance of single phase and three phase transformers
- Students will be able to identify applications of DC machines & transformer in power sector

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SECTION-I

Unit 1: DC Generators: **No of lectures – 08**

- **Prerequisite:**
  Concepts of magnetic flux and basics of AC circuit
- **Objectives:**
  1) To make students understand operation of dc generator
  2) To make students analyze operating parameters of dc generator
- **Outcomes:**
  After completing this unit, student -
  1. Can apply operation of DC generator
  2. Can find different operating parameters of DC generator
- **Unit Content:**

Construction, Basic Principle of working, EMF equation, Types of Armature windings, Characteristics and applications of different types of DC Generators, EMF built up process in DC Shunt Generator, Armature reaction- Demagnetizing and Cross magnetizing MMFs and their estimations, Remedies to overcome the armature reaction, Commutation Process

- **Delivery Methods:**
  Chalk and talk, Video lectures
- **Assessment Methods:**

  Numerical problems and derivation related to Armature reaction, EMF equation and Types of DC generator.

Unit 2: DC Motors: **No of lectures – 09**

- **Prerequisite:**
  Concepts of magnetic flux and basics of AC circuit

- **Objectives:**

1. To make students understand operation of DC motor
2. To make students analyze operating parameters of DC motor

- **Outcomes:**
  After completing this unit,
  students –

1. Can apply operation of DC motor
2. Can find different operating parameters of DC motor

- **Unit Content:**

  Principles of working, Significance of Back EMF, Torque Equation, Types of DC motors, Losses and efficiency, Condition for maximum efficiency, Characteristics and selection of DC motors for various applications, Starting of DC motors (3-point, 4-point starters), Speed control of DC shunt and series Motors

- **Content Delivery Methods:**

  Chalk and talk, Video lectures, Animations
- **Assessment Methods:**
  Numerical problems and derivations related to torque equation, losses and efficiency

Unit 3: Testing of DC Machines: **No of lectures – 04**

- **Prerequisite:**
  Necessity of testing

- **Objectives:**
  1) To make student understand concepts and operation of various testing methods
  2) To make student analyze various testing methods

- **Outcomes:**
  After completing this unit, students –
  Can analyze various testing methods

- **Unit Content:**
  Direct and indirect methods of testing, brake test, Swinburne's test, Hopkinson's test

- **Content Delivery**
  Methods: Chalk and talk

- **Assessment Methods:**
  Numerical problems on brake test and Swinburne's test

SECTION- II

Unit 4: Single Phase Transformer: **No of lectures – 11**

- **Prerequisite:**
  Basics of magnetic flux and AC circuit

- **Objectives:**
  1. To make students understand operation of single-phase transformer
  2. To make students analyze operating parameters of single-phase transformer

- **Outcomes:**
  After completing this unit, students –
  - Can understand operation of single-phase transformer
  - Can find different operating parameters of single-phase transformer
- **Unit Content:**

  Transformer construction and types, EMF equation, Voltage ratio, KVA rating, Transformer on no-load and on-load condition with phasor diagrams, Losses and Efficiency, Condition for maximum efficiency, Transformer equivalent circuits, Effect of load on power factor, Testing- Polarity test, Open Circuit Test (OC), Short Circuit Test (SC), Parallel operation, Auto-Transformer

- **Content Delivery Methods:**
  Chalk and talk, Video lectures, Animations

- **Assessment Methods:**
  Numerical problems on losses, efficiency and regulation, equivalent circuit parameters, Auto-Transformer

Unit 5: Three Phase Transformers: **No of lectures – 10**

- **Prerequisite:**
  Basics of magnetic flux and ac circuit

- **Objectives:**
  1. To make students understand operation of three phase transformer
  2. To make students analyze operating parameters of three phase transformer
- **Outcomes:**
  After completing this unit, students -
1. Can understand operation of three phase transformer
2. Can find different operating parameters of three phase transformer

- **Unit Content:**

  Special constructional features, Three phase transformer connections, Labeling of transformer terminals, Star/Star connection, Delta/Delta Connection, Star/Delta, Delta/Star connection, Delta/Zigzag Star, Star/Zigzag Star, Vector groups, Choice of transformers connections, Magnetizing inrush current, Three winding transformers and its equivalent circuits, Open delta connection, Three/Two phase conversion (Scott connection), On-Off Load tap changing transformers.

- **Content Delivery Methods:**
  Chalk and talk, Video lectures, Animations

- **Assessment Methods:**
  Numerical problems on transformer connections, Parallel operation of transformers

- **Internal Continuous Assessment (ICA) :**

  ICA shall consist of minimum **eight** experiments from following list

  1. Determination of magnetization, external and internal characteristics of DC Generator
  2. Determination of efficiency and voltage regulation of DC Shunt generator by direct loading
  3. Speed control of D C shunt motor by armature and field control
  4. Determination of efficiency and speed regulation of DC shunt motor by direct loading
  5. Determination of efficiency and speed regulation of DC Shunt motor by indirect loading
  6. Determination of efficiency of a DC series motor by load test
  7. Determination of efficiency of a DC machine by performing Swinburne's test
  8. Determination of efficiency of a DC machine by performing Hopkinson's test
  9. Determination of efficiency of single-phase transformer by Back to Back test
  10. Parallel operation of Single-phase transformer
  11. Determination of equivalent circuit parameters of single-phase transformer
  12. Scott connection of three phase transformers
  13. Direct load test on three phase transformers for various connections

- **Text Books:**

1. Electric Machines, Third Edition, Tata McGraw Hill Publication, I J Nagrath, D P Kothari Electrical Machines, Third Edition, Tata McGraw Hill Publication, S K Bhattacharya Theory and Performance of Electrical Machines, S K Kataria& Sons , J B Gupta
2. A Text Book of Electrical Technology Volume II, S Chand, B L Theraja

- **Reference Books:**

1. Electrical Machinery, Sixth Edition 2002, Tata McGraw Hill, AEFitzgerald, CKingsley SDUmans
2. Electrical Machinery, Khanna Publishers, P S Bhimbhra
3. Electrical Machines, Dhanpat Rai & Sons, Ashfaq Hussain
4. Theory and Performance of Electrical Machines, S K Kataria and sons, J B Gupta
5. Principles of electronic machines & Power electronics, Wiley India,P.C.Sen

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. Electrical Engineering Semester-I
ELECTRICAL MEASUREMENT AND INSTRUMENTATION

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week,3 Credits	**ESE –** 70 Marks
Practical: - 2 Hrs/Week, 1 Credit	**ICA-**25Marks
	ISE- 30Marks
	POE: 50Marks

This course introduces different types of meters and instruments for measurement of various electrical parameters like resistance, inductance, capacitance, voltage, current, power, energy etc Also this course include display and recording techniques of various electrical parameters

Course Prerequisite:
Student shall have knowledge of magnetic circuit, circuit theory

Course Objectives:

- To impart in depth knowledge of the operating principle, construction, mechanismsused in Measuring instruments used for the measurement of electrical quantities
- To introduce the concept of accuracy and precision in the measurement of electrical quantities
- To make the students capable of selecting the proper instrument for the measurement

Course Outcomes:

- The students will be able to use Analog instruments in practical applications
- The students will be able to apply potentiometer & bridges for measurements ofresistance, Inductance & capacitance
- The students will be able to find the applications of instrument transformer and dataacquisition system for sensing & control of electrical quantities
- The students will be able to use digital instruments for various measurements.

SECTION-I

Unit -1 Basic Concept of Measurement **No of lectures – 05**

- **Prerequisite:**
  Magnetic flux and its properties, Basics of torques

- **Objectives:**
  To make student understand different types of instruments and their characteristics

- **Outcomes:**
  After completing this unit, students –
  can able to apply the characteristics of measuring instruments

- **Unit Content:**
  Standards & their classification, Types of errors, Characteristics of measuring instruments (static & dynamic) - accuracy, linearity, speed of response, dead zone, repeatability, resolution, span, reproducibility, drifts, need for calibration
  Content Delivery Methods: Chalk and talk

- **Assessment Methods:**
  Theoretical questions related to various characteristics of measuring instruments

Unit -2 Analog Instruments **No of lectures – 08**

- **Prerequisite:**
  Concept of electromechanical energy conversion, Mutual induction, Concept of induced torque

- **Objectives:**

1. To make student understand construction and operation of different measuring instruments
2. To make student analyze operation and performance parameters of different measuring Instruments

- **Outcomes:**
  After completing this unit, students –

1. Can able to analyze various parameters of different measuring instruments
2. Can draw the construction and working of measuring instruments.

- **Unit Content:**
  Classification of instrument- absolute & secondary, Types of secondary instrument- indicating, recording, analog, digital, Essentials of indicating instrument; PMMC, PMMI, Electrodynamometer instrument- operating principle, torque equation, Measurement of power in AC(Two Wattmeter) and DC Circuits, Shunts & multipliers, ohmmeter, Megger, Earth tester
  1-Φ & 3-Φ Electro dynamo meter & moving iron type power factor meter, Weston type Frequency meter, Synchro scope

- **Content Delivery Methods:**
  Chalk and talk, Analogy, Power point presentation

- **Assessment Methods:**
  Numerical problems related to PMMC, PMMI and Electrodynamometer instrument

Unit- 3 Potentiometer & Bridges **No of lectures – 08**

- **Prerequisite:**
  Concepts of circuit networks, resistance, inductance and capacitance

- **Objectives:**
  1. To make student understand various methods for measurement of resistance, inductance and capacitance
  2. To make student analyze various measuring bridges

- **Outcomes:**
  After completing this unit, students –
  1. Can analyze various measuring bridges
  2. Can apply operation and construction of various measuring bridges

- **Unit Content:**
  Principle of DC potentiometer, Crompton's type DC Potentiometer; principle of AC potentiometer
  DC bridges-Wheatstone's, Kelvin's double bridge for measurement of resistance; AC bridges-Maxwell's, Hey's, Anderson's bridges for inductance measurement, Desauty, Schering bridges for capacitance measurement

- **Content Delivery Methods:**
  Chalk and talk Power point presentation

- **Assessment Methods:**
  Numerical problems on Bridge circuits.

SECTION- II

Unit 4– Transducers and Instrument Transformers **No of lectures – 09**

- **Prerequisite:**
  Basic Concepts of transformer

- **Objectives:**
  - To make student understand applications of transformer in instrumentation
  - To make student understand analysis of instrument transformer

- **Outcomes:**
  After completing this unit, students –
  1. Can find applications of instrument transformer
  2. Can analyze instrument transformer

- **Unit Content:**
  Resistance Temperature Co-efficient, Classification of transducers, Electric Transducers-RTD, RVDT, LVDT, Construction and theory of instrument transformers (CT & PT), equations for ratio and phase angle error, turns compensation

- **Content Delivery Methods:**
  Chalk and talk, Power point presentation

- **Assessment Methods:**
  Derivations and numerical related to CT and PT

Unit – 5 Digital Instruments **No of lectures – 06**

- **Prerequisite:**
  Basics of digital electronics

- **Objectives:**
  To make student understand operation of digital instruments

- **Outcomes:**
  After completing this unit, students–
  Can find suitable application of digital instruments

- **Unit Content:**
  Digital voltmeter, Types of digital voltmeter, Digital multi-meter, Electronic counter, Q- meter, Electronic energy meter, LED and

- **Content Delivery Methods:** Chalk and talk, animations

- **Assessment Methods:**
  Theoretical questions related to above content

Unit – 6 Oscilloscopes **No of lectures – 06**

- **Prerequisite:**
  Basics of oscilloscope

- **Objectives:**
  - To make student understand working operation of various oscilloscopes

- **Outcomes:**
  After completing this unit, students –
  Can apply operation of various oscilloscopes

- **Unit Content:**
  Introduction, Block diagram of CRO & working of each block, CRT features, Basics of digital storage oscilloscope, Use of DSO for voltage, current, phase, frequency & time measurement

- **Content Delivery**
  Methods: Chalk and talk,
  Animations

- **Assessment Methods:**
  Theoretical questions related to above contents

- **Internal Continuous Assessment (ICA) :**
  ICA shall consist of minimum eight experiments from following list.

1. Measurement of low resistance by using Kelvin's double bridge
2. Measurement of high resistance by using Whetstone's bridge
3. Measurement of inductance by using Maxwell's bridge
4. Measurement of capacitance by using Schering Bridge
5. Measurement of power in 3-ph circuit by 2-wattmeter method for balanced load
6. Measurement of power in 3-ph circuit by 2-wattmeter method for unbalanced load
7. C T & P T testing
8. To measure the insulation resistance by Megger
9. To measure the power factor of single-phase load by PF meter and verifying through current, voltage & power measurement
10. Measurement of unknown voltage & resistance by DC potentiometer
11. Measurement of CT, PT Ratio and phase angle error

12. Energy Measurement using energy meter
13. Measurement of various parameters like voltage, current, frequency, time period using oscilloscope
14. Measurement of Q-factor by Q-meter

- **Text Books:**

1. HS Kalsi "Electronics instrumentations", Tata McGrew Hill, 3rd Edition, HS Kalsi
2. "Electrical & Electronics Measurements", Dhanpat Rai & Sons 9th Edition, AK Sawhney
3. "Electrical Measurements & Measuring Instruments", S chand, 2010 Edition, RKRajput
4. "Instrument Devices & Systems", Tata McGrew Hill, 2 Edition, Rangan, Mani, Sharma

- **Reference Books:**

1. "Principles of measurement system", 3rd Edition, Pearson Education 2000, John P Beately
2. "Modern electronic instrumentation & measuring techniques", PHI, 2009 Edition, Cooper D & A D Helfrick
3. "Electronic Instrumentation & Measurement", Oxford Publication, 2nd Edition 2009, David A Bell
4. "Electrical Measurement & Measuring Instruments", Pitman, Golding & Widdies

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. Electrical Engineering Semester-I
POWER SYSTEM-I

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week,3 Credits	**ESE –** 70 Marks
Tutorial: - 1 Hrs/Week, 1 Credit	**ICA-**25Marks
	ISE- 30Marks

This course introduces power plant which deals with generation of electrical energy The course also introduces economic aspects of different power plants

Course Prerequisite:

Knowledge of Basic Electrical Engineering, simple mathematical calculations Student shall have knowledge of energy conversion Student shall also have basic knowledge types of energy sources

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Course Objectives:

- To develop conceptual understanding of operation of different power plants
- To learn economic aspects of power system.
- To study necessity and types of non-conventional energy sources
- To make students understand overhead structure of power system.

Course Outcomes:

After successful completion of this course,

- Student will be able to understand operation of different power plants
- Student will be able to analyze economic aspects of power system
- Student will be able to investigate need and areas of application for non-conventionalenergy sources
- Students will be able to understand overhead structure of power system.

SECTION-I

Unit 1 Economic Aspects of Power Generation **No of lectures-08**

- **Prerequisite:**
  Knowledge of Basic Electrical Engineering, simple mathematical calculations

- **Objectives:**
  1. To introduce to student basic terms used in power system operation
  2. To make student understand load curve
  3. To introduce student to types of loads
  4. To familiarize the students with the tariff methods for electrical energy consumptions

- **Outcomes:**
  After completing this unit, students –

1. Can define different terms in power system operation
2. Can analyze selection of generating units
3. Can calculate usage of electrical power & tariff

- **Unit Content:**
  Review of terms commonly used in system operations, Variable load on power station, Peak load, Base load, Diversity factor, Plant utility factor, Maximum demand, Load curves, load duration curves, Types of loads, Selection of generation units, Interconnected grid systems, Cost of electrical energy, Tariff & different types of tariff

- **Content Delivery Methods:**
  Chalk and talk, power point presentation

- **Assessment Methods:**
  Numerical problems related to cost of electrical energy and tariff, Theory questions related to above content

Unit 2 Base Load Power Plants **No of lectures-08**

- **Prerequisite:**
  Energy sources, Energy conversion methods

- **Objectives:**

1. Revision of Energy Sources.
2. To introduce student to different Conventional & non-Conventional Energy sources.
3. To make student understand different base load power plants.

- **Outcomes:**
  After completing this unit, students -

1. Can define conventional & non-conventional sources
2. Can compare different base load power plants

- **Unit Content:**
  Different types of conventional and non-conventional energy sources, Structure of power industry,
  Hydro Power Plant: Typical layout, Site selection, Classification, Hydrograph, Flow duration curves, Hydrology, Types of turbines.
  Thermal Power Plant: Typical layout, Site selection, Fuels & their handling, Combustion process, Ash handling, Dust collection.
  Nuclear Power Plant: Typical layout, Site selection, Nuclear reaction, Classification of nuclear reactor (AGR, PWR, BWR), Nuclear waste disposal, Environmental Aspects

- **Content Delivery Methods:**
  Chalk and talk, Power point presentations on Energy Sources

- **Assessment Methods:**

Theory questions related to above content.

Unit 3 Peak Load Power Plants **No of lectures-5**

- **Prerequisite:**
  Knowledge of Basic Electrical Engineering & nuclear reaction

- **Objectives:**

1. To introduce student to Diesel & Gas Turbine Power Plants
2. To introduce student to solar & Wind Power Plants
3. To make student analyze typical layout of solar & Wind Power Plants

Outcomes:
After completing this unit, students –

1. Can apply the operation of Diesel & Gas Turbine Power Plants
2. Can apply the operation of solar & Wind Power Plants

- **Unit Content:**
  Review of Diesel Plants (advantages & disadvantages), Typical layout of power plant, site selection, Review of Gas Turbine Plants (advantages & disadvantages), Typical layout of power plant, Site selection, Review of Solar Energy (advantages & disadvantages), Typical layout of solar thermal power plant, Site selection, Review of wind energy (advantages & disadvantages), Typical layout of wind power plant, Site selection

- **Content Delivery Methods:**
  Chalk and talk, power point presentation

- **Assessment Methods:**
  Theory questions related to above content

SECTION - II

Unit 4– General structure of power system **No of lectures – 08**

- **Prerequisite:**
  DC system, single phase & three phase systems, ohms law

- **Objectives:**
  1. To learn basic structure of power systems
  2. To make student understand different transmission systems

- **Outcomes:**

After completing this unit, students -

1. Can distinguish between different supply systems
2. Can compare between AC and DC transmission System.
3. Can compare between overhead and underground System.

Unit Content:
Review of Electrical supply system, typical AC power supply scheme, Comparison DC and AC systems, comparison between overhead and underground system

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**
  Theory questions related to above content

Unit 5– Economic Aspects of Transmission System **No of lectures – 08**

- **Prerequisite:**
  DC system, single phase & three phase systems, ohms law

- **Objectives:**
  1) To make student understand conductor cost of different AC transmission systems
  2) To make student understand Economics of power transmission

- **Outcomes:**
  After completing this unit, students -
  1. Can calculate voltage, conductor cost for various transmission systems
  2. Can calculate Economic conductor size for given transmission system (Kelvin's law)

- **Unit Content:**
  Comparison of conductor cost for various Overhead AC transmission systems, comparison of conductor cost for various Underground AC transmission systems, Economic choice of conductor size by kelvins law

- **Content Delivery Methods:**
  Chalk and talk, power point presentations

- **Assessment Methods:**

  Numerical problems and derivation related to conductor cost for different transmission systems and Kelvin's law Theory questions related to above content

Unit 6– Mechanical design of overhead lines **No of lectures – 05**

- **Prerequisites:**
  Electrical Material**s** & their properties**,** Capacitance

- **Objectives:**
  1. To introduce concept of overhead transmission line
  2. To introduce different conducting material & their application
  3. To introduce different insulators & their application
  4. To make student understand string efficiency & methods to improve it

- **Outcomes:**
  After completing this unit, students -
  1. Can describe construction and use of different insulators, conductor, line supports
  2. Can calculate string efficiency of given string insulators

- **Unit Content:**
  Review of overhead transmission line, main components, conductor materials, line supports, overhead line insulators, types- pin type, suspension type, strain type insulators, string efficiency, methods of improving string efficiency

- **Content Delivery Methods:**

Chalk and talk, power point presentations, videos lectures on insulators, line supports

- **Assessment Methods:**
  Numerical problems and derivation related to string efficiency, Theory questions related to above content

- **Internal Continuous Assessment (ICA):**
  ICA shall consist of Minimum **FOUR** drawing Sheets on above syllabus and **report on visit** to any one of the generating power plant

- **Text Books:**

1. "A course in Electrical Power", S K Kataria & Sons, J B Gupta
2. "Generation of Electrical Energy", S Chand Publication, B R Gupta
3. "Power System Engineering", Laxmi Publications, R K Rajput
4. "Power Plant Engineering", New Age International Publication, A K Raja

- **Reference Books:**

1. "Power Plant Technology", Tata Mc Graw Hill,MMEI-Wakil
2. "Power Plant Engineering", S Chand Publications, Samsher Gautam

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. Electrical Engineering Semester-I
ELECTRONIC DEVICES & CIRCUITS

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week,3 Credits	**ESE –** 70 Marks
Practical: - 2 Hrs/Week, 1 Credit	**ICA-**25Marks
	ISE- 30Marks

This course introduces the basics concepts and application of Electronic Devices

Course Prerequisite:

Basics of Semiconductor, KVL, KCL, Basics of Inductor and Capacitor

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Course Objectives:

- To develop conceptual & analytical understanding of BJT
- To develop conceptual & analytical understanding of Field effect transistors
- To make student understand the concepts of various Power amplifiers, feedback amplifiers and Oscillator circuits
- To develop the design procedures for unregulated power supplies

Course Outcome:

- Students will be able to design transistorized circuits based on their conceptual and analytical understanding of BJT
- Students will be able to analyze FET circuits
- Students will be able to analyze the Power amplifiers, feedback amplifiers, oscillator's concepts
- Students will be able to design unregulated power supplies for practical applications

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SECTION-I

Unit 1 Bipolar Junction Transistor: **No of lectures-06**

- **Prerequisite:**
  Semiconductor diode, KVL-KCL
- **Objective:**
  To develop conceptual & analytical understanding of Bipolar Junction Transistor (BJT)
- **Outcomes:**
  After completing this unit-
  Students will be able to design transistorized circuits based on their conceptual understanding

- **Unit Content:**
  Biasing circuits- DC circuit analysis, load line, thermal runaway, stability factor analysis, Biasing circuits (fixed, collector to base, self bias), compensation techniques BJT as an amplifier, AC & DC equivalent circuit of CE amplifier, Darlington pair

- **Content Delivery Methods:**
  Chalk and talk, Power point presentation, Video lectures

- **Assessment Methods:**
  Derivation, Numerical, Theoretical questions

Unit 2 Frequency response of BJT amplifier: **No of lectures-05**

- **Prerequisite:**
  Basics of Capacitance

- **Objective:**
  To analyze the frequency response of BJT

- **Outcomes:**
  After completing this unit-
  Students will be able to analyze the performance of BJT at different frequency

- **Unit Content:**
  Low & high frequency response of CE amplifier, effect of C_e, C_c & C_i on frequency response of RC coupled CE amplifier, Design of driver circuits- design of single stage RC coupled BJT amplifier

- **Content Delivery Methods:**
  Chalk and talk, Power point presentation, Video lectures

- **Assessment Methods:**
  Design, Numerical and Theoretical questions

Unit 3 Hybrid Model of BJT: **No of lectures-05**

- **Prerequisite:** Transistor parameters

- **Objective:**
  To define and analyze Hybrid model of BJT

- **Outcomes:**
  After completing this unit-
  Students will be able to analyze transistor using Hybrid model

- **Unit Content:**
  Determination & meaning of h parameters, hybrid equivalent circuit of CE,CB,CC, Determination of amplifier parameter(A_v, A_i ,R_o, R_i)

- **Content Delivery Methods:**
  Chalk and talk, Power point presentation, Video lectures
- **Assessment Methods:**
  Derivation, Numerical and Theoretical questions

Unit 4 Field Effect Transistor: **No of lectures-05**

- **Prerequisite:** Semiconductors knowledge
- **Objective:**
  To develop conceptual & analytical understanding of Field effect transistors
- **Outcomes:**
  After completing this unit-
  Students will be able to analyze Field effect transistors circuits
- **Unit Content:**
  Junction Field Effect Transistor (JFET) construction, characteristics, small signal JFET parameters, Metal Oxide Semiconductor Field Effect Transistor (MOSFET)- construction & characteristics of depletion type & Enhancement type
- **Content Delivery Methods:**
  Chalk and talk, Power point presentation, Video lectures
- **Assessment Methods:**
  Derivation, Numerical and Theoretical questions

SECTION-II

Unit 5 Design of Unregulated power supply: **No of lectures-07**

- **Prerequisite:**
  Basics of Inductor & Capacitor
- **Objective:**
  To develop the design procedures for unregulated power supplies
- **Outcomes:**
  After completing this unit-
  Students will be able to design unregulated power supplies for practical applications
- **Unit Content:**
  Various types of filters C, L, LC & π, derivation of ripple factor of C & L type filter, Design of unregulated power supply, Fixed voltage Regulator IC 78XX, & 79XX
- **Content Delivery Methods:**
  Chalk and talk, Power point presentation, Video lectures
- **Assessment Methods:**
  Derivation, Numerical and Theoretical questions

Unit 6 Feedback Amplifier: **No of lectures-07**

- **Prerequisite:**
  Transistor
  Basics

- **Objective:**
  To analyze different topologies of feedback amplifier

- **Outcomes:**
  After completing this unit-
  Students will be able to analyze different topologies of feedback amplifier

- **Unit Content:**
  Introduction to positive & negative feedback, types of negative feedback (current series, current shunt, voltage series & voltage shunt), its effect on input and output impedance, voltage gain, current gain & bandwidth

- **Content Delivery Methods:**
  Chalk and talk, Power point presentation, Video lectures

- **Assessment Methods:**
  Derivation, Numerical and Theoretical questions

Unit 7 Power Amplifier: **No of lectures-07**

- **Prerequisite:**
  Conduction Angle of Transistor, VI Characteristics of Transistor

- **Objective:**
  To make student understand the types of power amplifier

- **Outcomes:**
  After completing this unit-
  Students will be able to classify various types of power amplifier

- **Unit Content:**
  Classification of large signal amplifiers, circuit operation, waveforms, derivation of efficiency for Class A, Class B, Class AB amplifier, Crossover distortion in power amplifier

- **Content Delivery Methods:**
  Chalk and talk, Power point presentation, Video lectures

- **Assessment Methods:**
  Derivation, Numerical and Theoretical questions

- **Text Books:**

1. Electronic Devices and Circuits, Allen Mottershead , PHI Publication
2. Electronic Devices & Circuit Theory, Robert Boylestad, Louis Nashelsky, Pearson Education

3. Electronic Devices and circuits, Jacob Milman, ChristosHalkias, McGraw-Hill publication
4. Electrical Technology Volume IV , B L Theraja&A K Theraja , S Chand Publication
5. Applied Electronics , R S Sedha, S Chand Publication

- **Reference Books:**

1. Electronic Devices, Floyd, Pearson Education
2. Electronic Devices and circuits , S Salivahan, N Sureshkumar, Avallavraj, Tata Mc-Graw Hill Publication
3. Electronic Devices and circuits, Mantri and Jain
4. Electronic Devices and circuits, Wiley India ,Anil K Maini & Varsha Agrawal

- **Internal Continuous Assessment (ICA) :**

ICA shall consist of minimum eight experiments, out of which minimum five experiments will be Hardware Based and Minimum three experiments will be simulation based.

1. To design single stage BJT CE amplifier circuit for given gain factor and measure its gain performance
2. To measure the bandwidth of single stage RC coupled BJT CE amplifier
3. To design JFET amplifier and measure its gain performance
4. To design MOSFET amplifier and measure its gain performance
5. To find out the gain with & without feedback, for negative feedback amplifiers
6. To measure the Bandwidth of with & without feedback for negative feedback amplifiers
7. To design unregulated power supply
8. To design Positive voltage regulator using 78XX
9. To design Negative Voltage Regulator Using 79XX

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. Electrical Engineering Semester-I
OBJECT ORIENTED PROGRAMMING WITH C++

Teaching Scheme	Examination Scheme
Theory: - 1 Hrs/Week	**ICA-**25Marks
Practical: - 2 Hrs/Week, 1 Credit	**POE:** 50Marks

Course Prerequisite:
Student shall have knowledge of C Fundamentals

Course Objectives:
- To learn fundamental concepts and principles of Object-Oriented Programming (OOP) with basic C++ syntax and convention
- To apply the OOP concepts for writing simple object-oriented programs

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Course Outcomes:
After learning the course
- Students will be able to read, understand and analyze simple C++ program
- Students will be able to apply principle of OOP concept and explore theirskill to develop Complex C++ program
- Students will be able to write the simple object-oriented programs in C++ using objects and classes
- Students will be able to develop the applications using object-oriented programming with C++

SECTION-I

Unit 1 – Concepts of OOP **No of lectures – 02**

- **Prerequisite:**
  Basics of C
- **Objectives:**
  To make student understand the basic concepts of object-oriented programming
- **Outcomes:**
  After completing this unit, students -
  Can compare Procedural vs Object Oriented Programming
- **Unit Content:**
  Review of OOP, Procedural Vs object-oriented programming, Principles of OOP, Benefits and applications of OOP
- **Content Delivery Methods:**
  Chalk and talk
- **Assessment Method:**
  Apply programing skill in C and C++

Unit 2 – C++ Programming Basics **No of lectures – 01**

- **Prerequisite:** Concept of C
- **Objectives:**

1. To make student understand basics of C++
2. To make student analyze small C++ programs

- **Outcomes:**
  After completing this unit, students –
  Can write small C++ programs
- **Unit Content:**
  Overview, Program structure, Namespace, Identifiers, Variables, Constants, Enum, Operators, Typecasting, Control structures
- **Content Delivery Methods:**
  Chalk and talk, Power point presentation
- **Assessment Method:**
  Apply programing skill in C and C++

Unit 3 –Functions **No of lectures – 02**

- **Prerequisite:**
  Concepts of C, C++ and OOP
- **Objectives:**
  To make student understand various OOP functions
- **Outcomes:**
  After completing this unit, students –
  Can apply various functions in programs
- **Unit Content:**
  Simple functions, Call and Return by reference, Inline functions, Macro Vs Inline functions, Overloading of functions, Default arguments, Friend functions
- **Content Delivery Methods:**
  Chalk and talk Power point presentation
- **Assessment Method:**
  Apply programing skill in C and C++

Unit 4 – Arrays and Strings **No of lectures – 02**

- **Prerequisite:**
  Concepts of C, C++ and OOP
- **Objectives:**
  To make student understand concepts of Arrays and Strings

- **Outcomes:**
  After completing this unit, students –
  Can apply arrays and strings in small programs

- **Unit Content:**
  Array fundamentals, Arrays as class member data, Arrays of objects, C- strings, arrays of strings, C++ string class, modifying string objects

- **Content Delivery Methods:**
  Chalk and talk Power point presentation

- **Assessment Method:**
  Apply programing skill in C and C++

SECTION- II

Unit 5 – Objects and Classes **No of lectures – 03**

- **Prerequisite:**
  Concepts of C, C++ and OOP

- **Objectives:**
  To make student understand concepts of objects and class in C++, Private and public members and various constructors

- **Outcomes:**
  After completing this unit, students –
  Can write programs with the help of private and public members and various constructors

- **Unit Content:**
  Basics of object and class in C++, Private and public members, Static data and function members, Constructors and their types, Destructors, Operator overloading, Type conversion

- **Content Delivery Methods:**
  Chalk and talk Power point presentation

- **Assessment Method:**
  Apply programing skill in C and C++

Unit 6 - Inheritance **No of lectures – 02**

- **Prerequisite:**
  Concepts of C, C++ and OOP

- **Objectives:**
  To make student understand concepts of various inheritance and their applications

- **Outcomes:**
  After completing this unit, students –
  Can write programs by using various inheritance

- **Unit Content:**
  Concept of Inheritance, Types of inheritance: single, multiple, multilevel, hierarchical,

- **Prerequisite:**
  Concepts of C, C++ and OOP

- **Objectives:**
  To make student understand concepts of pointers and its applications
  Outcomes:
  After completing this unit, students –
  Can write programs by using pointers
  Unit Content:
  Pointers in C++, Pointes and Objects, This pointer, Virtual and pure virtual functions, implementing polymorphism

- **Content Delivery Methods:**
  Chalk and talk Power point presentation

- **Assessment Method:**
  Apply programing skill in C and C++

Unit 7 – Streams and Files **No of lectures – 02**

- **Prerequisite:**
  Concepts of C, C++ and OOP

- **Objectives:**
  To make student understand concepts of streams and files and its applications

- **Outcomes:**
  After completing this unit, students–
  Can write programs by using streams and files

- **Unit Content:**
  Concept of streams, cin and cout objects, C++ stream classes, Unformatted and formatted I/O, manipulators, File stream, C++ File stream classes, File management functions, File Modes, Binary and random Files

- **Content Delivery Methods:**
  Chalk and talk Power point presentation

- **Assessment Method:**
  Apply programing skill in C and C++

- **Internal Continuous Assessment (ICA) :**

ICA shall consist of minimum ten programming assignments based on following

1. Introduction & Implementation of class & object
2. Implementation of Function Overloading & Inline Function
3. Implementation of Friend Function
4. Implementation of Constructor Overloading
5. Implementation of Destructor
6. Implementation of Operator Overloading
7. Implementation of Single & Multiple Inheritance
8. Implementation of Multilevel & Hierarchical Inheritance
9. Implementation of Hybrid Inheritance
10. Implementation of Virtual Function
11. Implementation of program of Function Overriding structure
12. Implementation of control structure
13. Implementation of polymorphism

- **Text Books:**

1. Object Oriented Programming with C++, TMH , E Balagurusamy,
2. Object Oriented Programming with C++, BPB Publication Yashwant Kanetkar,
3. Thinking in C++, prentice Hall, Bruce Eckel,Object Oriented Programming in C++, SAMS Publications, Robert Lafore

- **Reference Books:**

1. C++ Programming, Black Book, Steven Holzner, dreamtech
2. Object Oriented Programming with ANSI and Turbo C++, Pearson, Ashok Kamthane,
3. The Compete Reference C++, TMH , Herbert Schlitz
4. Object Oriented Programming with C++, Oxford, Saurav Sahay
5. A Complete Guide to Programming in C++, Bartlett Publishers,Ulla Kirch-Prinz, Jones

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Semester-II

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

S. Y. B. Tech. Electrical Engineering Semester-II

Numerical Methods and Linear Algebra

Teaching Scheme	Examination Scheme
Theory: - 2 Hrs/Week,2 Credits	**ESE –** 70 Marks
Tutorials: - 1 Hrs/Week, 1 Credit	**ICA-**25Marks
	ISE- 30Marks

This course introduces Numerical methods for solving linear, non linear equations and evaluating definite integrals, and also introduces linear algebra, matrix theory

Course Prerequisite:

Student shall have knowledge of linear equation, types of matrix, Matrix Algebra, Ordinary differential equation He shall also have basic knowledge of Integration

Course Objectives:

- To make student understand of how a method works, aids in choosing a method It can Also provide an indication of what will go wrong and of the accuracy which may Be obtained by students
- To provide students with mathematics fundamental, necessary to formulate, solve and analyze engineering problems
- To make student understand to develop a simple model by using matrix method
- To introduce numerical techniques that can be used on computer

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Course Outcomes:

- Student can solve numerical problems on to find roots of algebraic and transcendental equations
- Student will demonstrate understanding and implementation of numerical solution algorithms
- Student will be able to solve differential equations and eigen value problems numerically
- Student will demonstrate an ability to identify, formulate and solve electrical Problems using matrix method

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SECTION-I

Unit 1–Solution of Algebraic and Transcendental Equations **No of lectures – 03**

- **Prerequisite:**
  Basic properties of equations, Non-linear equations, derivative

- **Objectives:**

1. Revision of concepts of properties of equations
2. To introduce to student to solve algebraic and transcendental equations by using various methods
3. To make student understand a numerical method to solve non-linear equations

- **Outcomes:**
  After completing this unit, students -

1. Can apply numerical techniques that can be used on computer
2. Can calculate roots of algebraic and transcendental equations numerically
3. Will be able to solve the problems with accuracy

- **Unit Content:**
  Introduction, Basic properties of equations, Newton-Rapshon Method, Multiple roots, Newton's iterative formula for obtaining square root only, System of non-linear equations by Newton-Rapshon method

- **Content Delivery Methods:**
  Chalk and talk, power point presentations

- **Assessment Methods:**
  Numerical problems related to above Content

Unit 2–Solution of linear simultaneous Equations No of lectures – 03

- **Prerequisite:**
  Linear equations, Types of matrix, matrix operations

- **Objectives:**

1. To make student understand concepts of how to solve linear equations by matrix methods
2. To make student to solve linear simultaneous equations with its applications
3. To provide a detailed treatment of accuracy or stability

- **Outcomes:**
  After completing this unit, students –

1. Can evaluate the solution of simultaneous linear equations by matrix method
2. Can use the concepts for to solve various electrical circuit examples
3. Can solve the simultaneous linear equations by approximate methods

- **Unit Content:**
  Direct Methods-Gauss Elimination Method, method of Factorization, Iterative Methods-Jacobi's method, Gauss –Seidal Method

- **Content Delivery Methods:**
  Chalk and talk, power point presentations

- **Assessment Methods:**
  Numerical problems related to above Content

Unit 3–Numerical solutions of Ordinary Differential Equations No of lectures – 03

- **Prerequisite:**
  First order differential equation, Basic Integration formulae

- **Objectives:**

1. To make student to solve first order differential equation by various methods
2. To expose students to techniques of solving simultaneous differential equation
3. To introduce to student concept first order differential equation for electrical network problems

- **Outcomes:**

After completing this unit, students –

1. Can evaluate the solution of Ordinary differential Equations numerically
2. Can solve the simultaneous differential equations by approximate methods
3. Can apply the method to solve simultaneous differential equations of related circuit problems

- **Unit Content:**

First order differential equation by and Runge – Kutta method (Fourth order), Simultaneous first order differential equation by Picard's method and Runge – Kutta method (Fourth order)

- **Content Delivery Methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Numerical problems related to above Content

Unit 4-Numerical Integration **No of lectures – 05**

- **Prerequisite:**

Basic integration formulae

- **Objectives:**

1. To introduce the numerical methods for evaluating definite integrals
2. To make student to solve double integrations numerically
3. To introduce to student concept of integration in various electric fields

- **Outcomes:**

After completing this unit, students–

1. Can analyze difference between actual integration method and numerical integration method
2. Can find error of solution of answer by actual method and approximate method
3. Can evaluate double integration using numerical methods

- **Unit Content:**

Numerical Integration using Newton's-Cotes's formulae-Trapezoidal rule, Simpson's $1/3^{rd}$ rule, Simpson's $3/8^{th}$ rule, Weddels rule, Gaussian quadrature, Romberg integration

- **Content Delivery Methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Numerical problem related to above Content

SECTION-II

Unit 5- Linear Equations and Matrix Theory **No of lectures – 03**

Prerequisite:

Linear equations, Types of matrix, matrix operations

- **Objectives:**

1. To develop the skills essential for solving matrix equations
2. To make the students to find linear transformation
3. To make student to understand matrix factorization
4. To impart the knowledge of invertible matrices

- **Outcomes:**

After completing this unit, students –

1. Can solve the problems related to simultaneous linear equations
2. Can find the solution to linear models
3. Can able to classify the linear independent set and dependent set
4. Can find inverse matrix

- **Unit Content:**

Echelon forms, vector equations, the matrix equations AX=B and AX=0, Linear independence, linear transformations, applications of linear models

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Numerical problems related to above Content

Unit 6-Vector Spaces **No of lectures – 03**

- **Prerequisite:**

Linear equations, matrix row operations

- **Objectives:**

1. To make student understand vector space
2. To make student understand the theory of null spaces and column spaces
3. To introduce to student to classify the Linear independent set and dependent set

- **Outcomes:**
  After completing this unit, students –

1. Can identify null spaces and column spaces
2. Can find change of bases
3. Can calculate the dimension of vector space, rank

- **Unit Content:**
  Vector spaces and subspaces, null spaces, column spaces and linear transformations, linearly independent sets and bases, coordinate systems, the dimension of vector space, Applications to difference equations

- **Content Delivery Methods:**
  Chalk and talk, power point presentation

- **Assessment Methods:**
  Numerical and problems to above Content

Unit 7-Eigen values and Eigen Vectors **No of lectures – 03**

- **Prerequisite:**
  Matrix theory and Types of matrix

- **Objectives:**

To introduce to student the theory of eigen values and eigen vectors
To make student understand the concept of application to differential equations
To make student understand iterative method to estimate eigen vector

- **Outcomes:**
  After completing this unit, students –
  1. Can find eigen vales and eigen vectors
  2. Can diagonalize the matrix
  3. Can find eigen value and eigen vector by power method

- **Unit Content:**
  Eigen values and Eigen vectors, the characteristic equation, diagonalization, Eigen vectors and linear transformations, complex eigen values, discrete dynamical systems, application to differential equations, iterative estimates for eigen values(Power method)

- **Content Delivery Methods:**
  Chalk and talk, power point presentations

- **Assessment Methods:**
  Numerical problems related to above Content

Unit 8-Inner product and Orthogonality **No of lectures – 05**

- **Prerequisite:**
  Matrix theory and Types of matrix

- **Objectives:**
  1. To introduce to student orthogonality property and inner product concept
  2. To make student understand quadratic forms
  3. To introduce to student concept diagonalization of symmetric matrices

- **Outcomes:**
  After completing this unit, students –
  1. Can solve least square problems
  2. Can solve quadratic forms
  3. Can find orthogonal sets

- **Unit Content:**
  Orthogonality, symmetric matrices and quadratic forms, Inner product and orthogonality, orthogonal sets , least square problems, diagonalization of symmetric matrices

- **Content Delivery Methods:**
  Chalk and talk, power point presentations

- **Assessment Methods:**
  Numerical problems related to above Content

- **Internal Continuous Assessment (ICA) :**
  ICA shall consist of Minimum ten tutorials based on above curriculum, Tutorial and Assignment shall include numerical problems.

- **Text Books:**
  1) "Numerical Methods", Khanna publications-New Delhi, BSGrewal
  2) "Introductory methods of Numerical Analysis"-PHI Learning Publication ,SSShastry
  3) "Linear algebra and Its applications", Peasson Education Inc, David C Lay
  4) "Linear Algebra", 4thedition,PhI learning Pvt Ltd , StephenhFriedberg Arnold,JInsel,
     a. Lawrence E Spence
- **Reference Books:**
  1) "Numerical Methods" SChand Publication, DrP Kandasamy
  2) "Numerical methods for scientific and engineering computations"-New age International Ltd MKJain,SRKIyengar, RKJain
  3) V. Krishnamurthy, V.P. Mainra and J.L. Arora, "An introduction to Linear Algebra" Affiliated East–West press, Reprint 2005.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. Electrical Engineering Semester-II
ELECTRICAL MACHINES – II

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week,3 Credits	**ESE –** 70 Marks
Practical: - 2 Hrs/Week, 1 Credit	**ICA-**25Marks
	ISE- 30Marks
	POE: 50Marks

This course introduces electrical machines, which works on AC supply including theoretical and analytical aspects of both three phase and Single-phase types

Course Prerequisite:

Student shall have knowledge of Magnetic Circuit, AC Fundamentals and AC series Circuits He/ She shall also have basic knowledge of complex Numbers and Vectors

Course Objectives:

- To get detailed knowledge of construction and operating principles of Electro Mechanical AC Machines
- To make student understand equivalent circuit parameters and performance parameters of both synchronous and asynchronous AC Machines
- To enable student to understand starting and control techniques of AC Motors

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Course Outcomes:

After Successful completion of this course-

- Students will be able to analyze performance of three phase as well as single phase Induction Motors
- Students will be able to identify applications of Induction Motors in industries & power sector
- Students will be able to analyze performance of synchronous machines
- Students will be able to identify applications of synchronous machines in industries & power sector

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SECTION-I

Unit 1– Introduction to AC Machines **No of lectures – 05**

- **Prerequisite:**
  Magnetic flux and its properties, AC Fundamentals and vectors

- **Objectives:**
  1. To Revise basic concepts of Magnetic Field
  2. To make student understand Generation of rotating magnetic field

- **Outcomes:**
  After completing this unit, students -
  Can define the nature of flux produced with different types of supply

- **Unit Content:**
  Classification of AC Machines, Principle of Operation, Production of two phase rotating magnetic field, Production of three phase rotating magnetic field, Speed of rotating magnetic field

- **Content Delivery Methods:**
  Chalk and talk, Animated Videos

- **Assessment Methods:**
  Concept understanding and derivation related to two phase and three phase rotating magnetic field

Unit 2– Introduction to Three Phase Induction Motor **No of lectures – 06**

- **Prerequisite:**
  Concept of electromechanical energy conversion, mutual induction, concept of induced torque and Basics of AC Circuit

- **Objectives:**
  1. To make student understand Construction of different Induction Motors (cage and wound)
  2. To make student analyze operation and characteristics of Induction Motor

- **Outcomes:**
  After completing this unit, students –
  1. Can analyze various parameters of Induction Motor
  2. Can draw nature of torque slip characteristics at various conditions

- **Unit Content:**
  Construction- Stator, Rotor (Squirrel cage, Wound Type), Principle of operation, Concept of Slip, Rotor current frequency, Rotor current and Power factor, Power flow diagram, Losses and efficiency, Torque Equation, Condition for maximum torque, starting torque, full load torque and their ratios, Torque slip characteristics, Effect of rotor resistance on torque slip characteristics, Crawling and cogging effects

- **Content Delivery Methods:**
  Chalk and talk, Analogy, Power point presentation

- **Assessment Methods:**
  Numerical and derivations related to torque equation and their ratios, numerical related to losses and efficiency, frequency, slip and rotor current and power factor

Unit 3– Starting and Speed Control of Induction Motor **No of lectures – 05**

- **Prerequisite:** Concepts of circuit networks, Torque slip Characteristics

- **Objectives:**

1. To make student understand starting methods of Induction Motors
2. To make student understand speed control methods of Induction Motors

- **Outcomes:**
  After completing this unit, students –

1. Can analyze various types of starters for Induction Motor
2. Can understand different speed control techniques of Induction Motor

Unit Content:
Necessity of starters, Types of starters (DOL, star delta, auto transformer, rotor resistance), Speed control of three phase *Induction Motor*-stator side control methods (applied voltage, frequency, pole changing), Rotor side speed control methods (rotor resistance, slip power recovery)

- **Content Delivery**
  Methods: Chalk and talk

- **Assessment Methods:**
  Numerical related to starters

Unit 4– Performance of Three Phase Induction Motor **No of lectures – 05**

- **Prerequisite:**
  Concept of open circuit and short circuit**,** Equivalent circuit of transformer

- **Objectives:**
  1. To make student understand circle diagram and impact of different tests on circle diagram
  2. To make student understand analysis of *Induction Motor* through circle diagram

- **Outcomes:**
  After completing this unit, students –
  1. Can draw circle diagram of Induction Motor at different operating conditions
  2. Can analyze Induction Motor performance through circle diagram

- **Unit Content:**
  Equivalent circuit of Induction Motor, Stator resistance test, No load and blocked rotor test, construction of circle diagram, determination of performance parameters from circle diagram, Double cage Induction Motor and its equivalent circuit, Induction generator

- **Content Delivery Methods:**
  Chalk and talk, Power point presentation

- **Assessment Methods:**
  Numerical related to Circle Diagram and Double cage Induction Motor

SECTION-II

Unit 5-Single Phase Induction Motor **No of lectures – 07**

- **Prerequisite:**
  Principle of operation of three phase Induction Motor, Torque slip characteristics of three phase Induction Motor

- **Objectives:**
  1. To make student analyze behavior and operation of single-phase Induction Motor
- **Outcomes:**
  After completing this unit, students –
  Can find suitable application of various single-phase Induction Motor as per their torque speed requirement

- **Unit Content:**
  Principle of operation, Concept of double field revolving theory & cross field theory, Types of single-phase IM based on method of self-starting and their Torque-slip characteristics, Equivalent circuit, Determination of equivalent circuit parameters using OC & SC Tests

- **Content Delivery Methods:**
  Chalk and talk, Video lectures, Animations

- **Assessment Methods:**
  Numericals related to equivalent circuit of Single-phase Induction Motor

Unit 6-Synchronous Generator **No of lectures – 07**

- **Prerequisite:**
  Construction of three phase Induction Motor, Concepts of vector diagrams

- **Objectives:**
  1. To make student understand working operation of synchronous generator
  2. To make student understand various performance analysis methods of synchronous generator

- **Outcomes:**
  After completing this unit, students –

  1. Can find performance parameters through various methods like EMF and MMF Method
  2. Can analyze operation of synchronous generator under parallel operation

- **Unit Content:**
  Construction (Salient and Non – Salient type), Principle of operation, Winding factors, EMF Equation, Armature reaction, Equivalent circuit and Vector diagram, Voltage regulation, determination of voltage regulation (EMF Method, MMF Method, ZPF Method), Parallel operation of alternators, Methods of synchronization

- **Content Delivery Methods:**
  Chalk and talk, Video lectures

- **Assessment Methods:**
  Numerical related to EMF, MMF and ZPF Methods, EMF Equation, and Synchronizing Power

Unit 7-Synchronous Motor **No of lectures – 07**

- **Prerequisite:**
  Operation and Construction of three phase Induction Motor, concepts of vector diagrams

- **Objectives:**
  1. To make student understand working operation of synchronous Motor
  2. To make student understand various performance analysis methods of synchronous Motor
- **Outcomes:**
  After completing this unit, students –
  1. Can find performance parameters through various methods like Equivalent circuit and vector Diagrams at different excitations
  2. Can analyze operation of synchronous Motor under different operating conditions

- **Unit Content:**
  Principle of operation, Methods of starting, Equivalent circuit, Performance and vector diagram with different excitations, Losses and Efficiency, V and inverted V curves, Hunting- its causes and remedies

- **Content Delivery Methods:**
  Chalk and talk, Video lectures, Analogies

- **Assessment Methods:**
  Numerical related to equivalent circuit and performance under various excitations

Internal Continuous Assessment (ICA) :

ICA shall consist of Minimum EIGHT experiments from following list

1. Determination of efficiency & speed regulation of 3 Phase IM by direct loading method
2. Determination of efficiency & speed regulation of 3 Phase IM by indirect loading method
3. Determination of equivalent circuit parameters of 3 Phase SCIM by conducting No Load & Blocked Rotor Test
4. Speed control methods of 3 Ph SCIM
5. Speed control methods of 3 Ph SRIM
6. Determination of efficiency & speed regulation of 1 phases Induction Motor
7. Determination of efficiency of alternator by direct loading
8. Determination of Voltage regulation of an alternator by EMF method
9. Determination of Voltage regulation of an alternator by MMF method
10. Parallel operation of alternators
11. Determination of V and Inverted V curves of a synchronous motor
12. Determination of efficiency of synchronous motor by indirect loading
13. Determination of efficiency of synchronous motor by direct loading

- **Text Books:**
    1) Theory and Performance of Electrical Machines, J B Gupta, S K Kataria & Sons
    2) A Text Book of Electrical Technology Vol 2, B L Theraja, S Chand
    3) Principles of Electrical Machines, V K Mehta, Rohit Mehta, S Chand
    4) Electrical machinery, PS Bhimbra, Khanna Publishers

- **Reference Books:**
    1) Electrical Machinery, AE Fitzgerald, C Kingsley, S D Umans, Tata McGraw Hill
    2) Electrical Machines, Ashfaq Hussain, Dhanpat Rai & Sons
    3) Performance and design of AC Machines, MG Say, ELBS Publication

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. Electrical Engineering Semester-II
POWER SYSTEM-II

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week,3 Credits	**ESE –** 70 Marks
Tutorial: - 1 Hrs/Week, 1 Credit	**ICA-**25Marks
	ISE- 30Marks

This course introduces elements of power systems which deals with structure of power system & constants of Transmission lines The course also introduces theoretical and analytical aspects of overhead & underground transmission lines, DC & AC distribution systems and substation

Course Prerequisite:
Student shall have knowledge of circuit theory Student shall also have basic knowledge of Transformers, single phase & three phase systems

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Course Objectives:
- To learn basic structure of power systems and mechanical design of overhead lines
- To study various effects related to overhead transmission lines
- To gain knowledge about need of power transmission using underground cables, types of underground cables
- To understand DC & AC distribution systems and substations

Course Outcomes:
- Students will be able to understand overall structure of power system
- Students will be able to understand mechanical design of transmission lines
- Students will be able to implement the knowledge to design underground power distribution system
- Students will be able to analyze various performance parameters of transmission lines

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SECTION-I

Unit 1– Corona & Sag in overhead lines **No of lectures – 07**

- **Prerequisites:**
  Electric field Intensity, phasor addition rule, concept of moment & force
- **Objectives:**
  1. To introduce corona phenomenon and its effects
  2. To introduce concept of sag in design of transmission line
  3. To make student understand about corona & sag in overhead lines
  4. To introduce concept of stringing chart
- **Outcomes:**
  After completing this unit, students -
  1. Can describe phenomenon of corona & sag
  2. Can describe factor affecting corona & method's to reduce corona
  3. Can calculate sag & different voltages related to corona

- **Unit Content:**
  Corona-principle, terms- definitions and empirical formulae related corona, factor affecting corona, advantages and disadvantages of corona, methods of reducing corona effect Sag in overhead lines, calculation of sag

- **Content Delivery Methods:**
  Chalk and talk, power point presentations, animation on corona phenomenon

- **Assessment Methods:**
  Numerical problems and derivation related to sag & corona, Theory questions related to above content

Unit 2– Constants of transmission lines **No of lectures – 07**

- **Prerequisite:**
  Resistance, inductance, capacitance, fundamental electrical concepts

- **Objectives:**
  1. To introduce constants of transmission lines
  2. To analyze transmission lines by its constants
  3. To introduce concept of GMR and GMD

- **Outcomes:**
  After completing this unit, students-
  1. Can describe constants of transmission lines
  2. Can derive and calculate resistance, inductance, and capacitance of transmission lines

- **Unit Content:**
  Resistance of line, skin effect and proximity effect, inductance of single phase 2 wire line, GMR and GMD, inductance of three phase line with equilateral spacing, unsymmetrical spacing, effect of transposition, line capacitance, capacitance of 1ph and 3ph line, effect of earth on the capacitance of overhead lines

- **Content Delivery Methods:**
  Chalk and talk, power point presentations

- **Assessment Methods:**
  Numerical problems and derivation related resistance, capacitance, and inductance of transmission lines, Theory questions related to skin effect and proximity effect

Unit 3– Underground cables **No of lectures – 07**

- **Prerequisite:**
  Electrical Materials, resistance, capacitance

- **Objectives:**
  1. To introduce construction and classification of cable
  2. To make student understand effect of voltage on performance of cable
  3. To introduce economic size of conductor in cable

- **Outcomes:**
  After completing this unit, students -
  1. Can describe construction and classification of cable
  2. Can describe insulation resistance, capacitance & advantages of grading of cable
  3. Can derive and calculate resistance, capacitance, and potential gradient of cable

- **Unit Content:**
  General construction of cables, insulating materials for cables, classification of cables, insulation resistance of a single core cable, capacitance of a single core cable, dielectric stress in a single core cable, grading of cables, and capacitance of 3-phase cables

- **Content Delivery Methods:**
  Chalk and talk, power point presentations, video lectures on types of cable

- **Assessment Methods:**
  Numerical problems and derivation related resistance, capacitance, dielectric stress, grading of cables, Theory questions related to above content

SECTION-II

Unit 4– Performance of transmission lines **No of lectures – 07**

- **Prerequisite:**
  AC circuits, Power Factor, complex notations, phasor representation

- **Objectives:**
  1. To analyze performance of transmission lines
  2. To make student understand types of transmission lines
  3. To make student understand power factor improvement

- **Outcomes:**
  After completing this unit, students –
  1. Can describe performance of different transmission line
  2. Can describe generalized constants of different transmission line
  3. Can calculate parameters of different transmission lines

- **Unit Content:**
  Review of transmission line, classification of overhead transmission lines, important terms, performance of short transmission line, effect of load PF on regulation and efficiency, medium transmission lines-end condenser method, nominal T method, nominal π method, long transmission lines-rigorous solution, generalized circuit constants of a transmission line, Ferranti effect, derivations of generalized constants (A, B,C,D) of short, medium & long transmission lines

- **Content Delivery Methods:**
  Chalk and talk, power point presentations

- **Assessment Methods:**
  Numerical problems and derivation related to different types transmission line, generalized Constants, power factor improvement

Unit 5– Distribution systems **No of lectures – 07**

- **Prerequisite:**
  DC circuits, Kirchhoff's laws, generator, transformer

- **Objectives:**
  1. To make student understand types of Distribution systems
  2. To analyze performance of Distribution systems

- **Outcomes:**
  After completing this unit, students -
  1. Can describe performance of different Distribution systems
  2. Can calculate parameters of different Distribution systems
- **Unit Content:**
  Classification & types, connection schemes of distribution systems, DC distribution calculations-DC distributor fed at one end and both ends with concentrated load, Ring main distributor, AC distribution and its calculations, 3phase 3wire and 3 phase 4 wire connected loads

- **Content Delivery Methods:**
  Chalk and talk, power point presentations

- **Assessment Methods:**
  Numerical problems and derivation related to different types Distribution systems**,** Theory questions related to above content

Unit 6– Substations and Grounding **No of lectures – 07**

- **Prerequisite:**
  Transformer, bus bar, generator, Earthing, electrical safety measures

- **Objectives:**
  1. To introduce student to substation and its types
  2. To make student understand substation equipment
  3. To make student understand Grounding & its types
  4. To make student understand about importance of Grounding

- **Outcomes:**
  After completing this unit, students –
  1. Can describe different equipment used in substation
  2. Can describe different types of Grounding

- **Unit Content:**
  Substations: classification, symbols for equipment in substations, equipment's in substation
  Grounding: Introduction, Grounding of transformer neutral, resistance grounding, reactance grounding, solid grounding

- **Content Delivery Methods:**
  Chalk and talk, power point presentations, videos on Substations installation & working

- **Assessment Methods:**
  Theory questions related to Substation, Grounding

- **Internal Continuous Assessment (ICA):**
  ICA shall consist of one substation visit related to syllabus and report based on it and Any 6 drawing sheets from the following
  1. Typical AC power supply system
  2. Types of line supports
  3. Types of insulators
  4. Classification of cables
  5. Connection schemes of Distribution system
  6. Substation equipment's and symbols
  7. Types of Substation
  8. Methods of grounding

- **Text Books:**
  1. "A course in Electrical power", S K Kataria and sons, J B Gupta
  2. "Principles of power system", S Chand Publication V K Mehta, Rohit Mehta
  3. "Power system engineering", Dhanpat Rai and sons , M L Soni, P V Gupta, U S Bhatnagar
  4. "*Power System Engineering"*, Laxmi Publications, R K Rajput

- **Reference Books:**
  1. "Electrical power system", New age international, C L Wadhwa
  2. "Electrical power generation transmission and distribution", PHI New Delhi, S M Singh
  3. "Elements of power system design", AH wheeler and Co, M V Deshpande
  4. "Power System operation & Control", Wiley India, Dr.K.Uma . Ra

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. Electrical Engineering Semester-II
ANALOG AND DIGITAL INTEGRATED CIRCUITS

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week,3 Credits	**ESE –** 70 Marks
Practical: - 2 Hrs/Week, 1 Credit	**ICA-**25Marks
	ISE- 30Marks

This course introduces the Operational Amplifier (Op-amp), its application and Logical digital IC

Course Prerequisite:
Basics of amplifier, Frequency response of amplifier, Boolean algebra, Logic gates

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Course Objectives:

- To make student analyze and understand the basic block of operational amplifier
- To Define the specification and parameters of Op-amp
- To analyze various open loop as well as closed loop circuit configurations of operational amplifier
- To design the combinational as well as sequential logic circuits

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Course Outcome:
After successful completion of this course-

- Students will be able to analyze the differential amplifier circuit
- Students will be able to define specification and parameters of Op-amp
- Students will be able to analyze open loop as well as closed loop circuit configurations of operational amplifier
- Students will be able to design the combinational as well as sequential logic circuits

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SECTION- I

Unit- 1 Introduction of Differential Amplifier **No of lectures– 05**

- **Prerequisite:**
  KVL law, AC-DC equivalent

- **Objective:**
  To make student analyze and understand the basic building block of op-amp

- **Outcomes:**
  After completing this unit-
  Students will be able to analyze basic building block of op-amp

- **Unit Content:**
  Introduction of differential amplifier and its types- DC and AC analysis of dual input balanced output, dual input unbalanced output, single input balanced output, single input unbalanced output

- **Content Delivery Methods:**
  Chalk and talk, Power point presentation, video lectures

- **Assessment Methods:**
  Derivation, Numerical and Theoretical questions

Unit- 2 Operational Amplifier **No of lectures–-06**

- **Prerequisite:** Differential Amplifiers

- **Objective:**
  To Define the specification and parameters of Op-amp

- **Outcomes:**
  After completing this unit
  Students will be able to define specification and parameters of Op-amp

- **Unit Content:**
  Block diagram of typical op-amp, Ideal characteristics of op-amp & practical characteristics of op-amp (IC741) - input offset voltage, input offset current, input bias current, differential input resistance, offset voltage adjustment range, input voltage range, common mode rejection ratio, supply voltage rejection ratio, large signal voltage gain, output voltage swing, output resistance, slew rate, gain bandwidth product, Equivalent circuit of op-amp, ideal voltage transfer curve

- **Content Delivery Methods:**
  Chalk and talk, Power point presentation

- **Assessment Methods:**
  Numerical and Theoretical questions

Unit- 3 Closed and Open loop configurations of Operational Amplifier No of lectures–05

- **Prerequisite:** Feedback Amplifiers

- **Objective:**
  To analyze open loop as well as closed loop circuit configurations of operational amplifier

- **Outcomes:**
  After completing this unit-
  Students will be able to analyze open loop and closed loop circuit configurations of an operational amplifier

- **Unit Content:**
  Open loop configurations of op-amp (differential, inverting &non-inverting), block diagram of closed loop configurations of op-amp: voltage series, voltage shunt, current series, current shunt feedback Derivation of various parameters for voltage series & voltage shunt feedback op-amp (closed loop voltage gain, input resistance with feedback, output resistance with feedback, bandwidth with feedback, total output offset voltage with feedback), concept of virtual ground condition

- **Content Delivery Methods:**
  Chalk and talk, Power point presentation, Video lectures

- **Assessment Methods:**
  Derivation, Numerical and Theoretical questions

Unit -4 Applications of Operational Amplifier **No of lectures–05**

- **Prerequisite:** Basics of op-amp

- **Objective:**
  To make student understand the op-amps applications

- **Outcomes:**
  After completing this unit –
  Students will be able to use op-amp for different electronic applications

- **Unit Content:**
  Voltage follower, Current to Voltage converter, Voltage to Current converter with floating & grounded load, Adder circuit (by using inverting, non inverting & differential configuration of op-amp), Subtractor (by using differential configuration of op-amp), instrumentation amplifier, Integrator & Differentiator

- **Content Delivery Methods:**
  Chalk and talk, Power point presentation, Video lectures

- **Assessment Methods:**
  Numerical and Theoretical questions

SECTION-II

Unit5- Combinational Logic Circuits **No of lectures–07**

- **Prerequisite:** Booleans law

- **Objective:**
  To design combinational logic circuits

- **Outcomes:**
  After completing this unit–
  Students will be able to design various combinational logic circuits

- **Unit Content:**
  Introduction, standard representation for logic functions in Sum of Product and Product of Sum (SOP and POS), Karnaugh map (K map) representation of logic functions up to 3 and 4 variables, Simplifications of logic functions using K map, Minimization of logic functions specified in Minterm and Maxterm, Don't care conditions, Principle and design of Multiplexing, de multiplexing, Half adder and full adder, Digital ICs for multiplexer and de multiplexer

- **Content Delivery Methods:**

Chalk and talk, Power point presentation, Video lectures

- **Assessment Methods:**
  Design and Theoretical questions

Unit-7 Flip Flops **No of lectures–07**

- **Prerequisite:** Logic gates

- **Objective:**
  To analyze the basics of different flip-flops circuit

  Outcomes:
  After completing this unit, students –
  Students will be able to analyze the basics of flip-flops circuits

  Unit Content:

  Introduction of Latch and Flip flop, RS Flip Flop using NOR and NAND gates, JK Flip Flop, race around condition in JK flip flop, Master Slave JK Flip Flop, D & T flip flops, operation, truth table, characteristic equation, Excitation table, Conversion of SR Flip flop to JK Flip Flop, JK to D Flip Flop

  Content Delivery Methods:
  Chalk and talk, Power point presentation, Video lectures

- **Assessment Methods:**
  Design and Theoretical questions

Unit-7 Sequential Logic Circuits **No of lectures– 07**

- **Prerequisite:**
  Basics of Flip-Flop, Characteristic and Excitation table of various Flip Flop

- **Objective:**
  To design sequential logic circuits

- **Outcomes:**
  After completing this unit –
  Students will be able to Design the sequential logic circuits

  Unit content:
  Register-
  Introduction of registers, shift register, types/modes of shift registers, bidirectional shift registers, universal shift registers, applications of shift registers (Ring counter, twisted ring counter, sequence generator)

  Counters-

Asynchronous counter- Ripple counter using flip flops, up/down Asynchronous counters, modulus of counter, limitations of asynchronous counters, Synchronous counter-Synchronous counter using T, JK flip flops, up/down synchronous counters, modulus of counter

Content Delivery Methods:
Chalk and talk, Power point presentation, Video lectures

- **Assessment Methods:**
  Design and Theoretical questions

- **Internal Continuous Assessment (ICA):**
  ICA shall consist of Minimum ten experiment from following list out of which SIX experiment on hardware and FOUR experiment on simulation.

1. To Design Application of op-amp as Inverting & non-inverting amplifier
2. To Design Application of op-amp as Adder & subtractor circuit
3. To Design Application of op-amp as Integrator circuit
4. To Design Application of op-amp as Differentiator circuit
5. To Design Application of op-amp as Voltage follower circuit
6. To Design Application of op-amp as Voltage to current and current to voltage converter circuits
7. To Implement and Reduce the given logic expression using karnaugh Map
8. To Design Multiplexer and verify the truth table
9. To Design De Multiplexer and verify the truth table
10. To Design and verify the truth table of S-R, J-K flip flops
11. To Design and verify the truth table of D flip-flops
12. To Verify the shift register operation
13. To Design Frequency divider using Counter IC

- **Text books:**

1. OP _AMP' sand Linear IC's , Gayakwad Ramakant A, Prentice Hall of India
2. Modern Digitals Electronic , Jain RP, Tata McGraw Hill, 1984
3. Digital design , Morris M Mano, Prentice Hall International – 1984
4. Digital principal and Application, Malvino& Leach, Tata McGraw Hill, 1991
5. Fundamentals of Digital Circuits, A Anand Kumar,Prentice Hall of India

- **Reference books:**

1. Electronic Devices and circuits , J B Gupta, Katson Publication
2. Digital electronic , Bignell James& Donovan Robert, Delmar, Thomas Learning, 2001
3. Analog Integrated Circuit ,Wiley India, Second edition, Tony chan carusone, Davidlohns, Kenneth Martin

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. Electrical Engineering Semester-II
NETWORK ANALYSIS

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week,3 Credits	**ESE –** 70 Marks
Practical: - 2 Hrs/Week, 1 Credit	**ICA-**25Marks
	ISE- 30Marks
	POE: 50Marks

This course introduces basic concepts of Electrical network and different network analysis techniques

Course Prerequisite:
Student shall have knowledge of terminology of electrical networks, Laplace transforms and linear differential equations

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Course Objectives:

- To develop the strong foundation for Electrical Networks
- To develop analytical qualities in Electrical circuits by application of various theorems
- To make students understand the behavior of circuits by analyzing the transient response using classical methods and Laplace Transform approach 4. To apply knowledge of Network theory for analysis of 2-port networks

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Course Outcomes:

Upon successful completion of this course, the students will be able to:

- Develop strong basics for network theory
- Develop the problem solving technique for networks by application of theorems
- Understand the behavior of the network by analyzing its transient response
- Apply knowledge of Network theory for analysis of 2-port networks

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SECTION-I

Unit 1–Basic Concepts **No of lectures – 07**

- **Prerequisite:**
  Series and parallel connection of circuit elements, Ohm's law, Solution of linear equations, Kirchhoff's law

- **Objectives:**

1. To revise of basic concepts of Electrical Network
2. To introduce to student network reduction techniques
3. To make student understand Mesh and Node analysis method

- **Outcomes:**
  After completing this unit, students -

1. Can apply network reduction techniques to solve numerical
2. Can apply loop and node analysis to solve numerical

- **Unit Content:**
  Ideal and Practical sources, Source transformations, Network reduction using Star – Delta transformation, Mesh and node analysis with linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh, coupled circuits and dot conventions

- **Content Delivery Methods:**
  Chalk and talk, Video lectures

- **Assessment Methods:**

  Numerical problems and derivation related to Star-Delta transformation, Source transformation, Loop and node analysis, Super node and super mesh, coupled circuits

Unit 2–Network Theorems **No of lectures – 07**

- **Prerequisite:**
  Concept of open circuit and short circuit, equivalent resistance

- **Objectives:**
  1. To make student understand different theorems to analyze electrical network
  2. To make student analyze electric network using network theorems

- **Outcomes:**
  After completing this unit, students –
  Can able to analyze electrical network using network theorems

- **Unit Content:**
  Superposition, Reciprocity, Compensation Theorem, Tellegan's Theorem, Millman's, Thevenin's, Norton's theorems, Maximum Power transfer theorem applied to both ac and dc circuits

- **Content Delivery Methods:**
  Chalk and talk, Video lectures

- **Assessment Methods:**
  Numerical problems and derivations related to network theorems

Unit 3–Network Topology **No of lectures – 07**

- **Prerequisite:**
  Concepts from linear algebra

- **Objectives:**
  1. To make student understand concepts network topology
  2. To make student understand dual of network

- **Outcomes:**
  After completing this unit, students –

1. Can analyze electrical network using network topology
2. Can draw dual of given network

- **Unit Content:**
  Graph of a network, Concept of tree and co-tree, incidence matrix, tie-set matrix, cut-set matrix, Formulation of equilibrium equations in matrix form, Solution of resistive networks, Principle of duality

- **Content Delivery**
  Methods: Chalk and talk,
  videos

- **Assessment Methods:**
  Numerical problems on Incidence matrix, cut set, tie set matrices and duality

SECTION-II

Unit 4-Analysis of Transient Response in Circuits-Classical Method No of lectures –07

- **Prerequisite:**
  Node and mesh analysis, Solution of linear differential equations

- **Objectives:**
  To make student analyze behavior of circuit when transient occurs

- **Outcomes:**
  After completing this unit, students –
  Can find circuit response in transient state

- **Unit Content:**
  Initial and Final Condition of network, General and Particular Solution, Transient response of R-L, R-C and R-L-C (DC Supply only) network in time domain

- **Content Delivery Methods:**
  Chalk and talk, Video lectures, animations

- **Assessment Methods:**
  Numerical problems transient response of circuit, derivations of circuit response

Unit 5-Analysis of Transient Response in Circuits: Laplace Transform Approach
No of lectures – 07

- **Prerequisite:**
  Loop and mesh analysis, Laplace transform

- **Objectives:**
  To make student analyze behavior of circuit when transient occurs

- **Outcomes:**
  After completing this unit, students –
  Can find circuit response in transient state

- **Unit Content:**

Standard test inputs: Step, Ramp, Impulse, Their Laplace transform, Representation of R,L,C in S domain, transformed network, Application of Laplace transform to solve series and parallel R-L, R-C and R-L-C circuits

- **Content Delivery Methods:**
  Chalk and talk, Video lectures, animations

- **Assessment Methods:**
  Numerical problems on transient response of circuit, derivations of circuit response

Unit 6-Two port networks **No of lectures – 07**

- **Prerequisite:**
  Loop and mesh analysis techniques, Linear Algebra

- **Objectives:**
  1) To make student understand two port network parameters
  2) To make student understand relationship between parameters
  3) To make student analyze interconnected networks

- **Outcomes:**
  After completing this unit, students –
  1. Can able to find two port network parameters
  2. Can able to convert one parameter into other
  3. Can able to analyze interconnected two port networks

- **Unit Content:**
  Determination of Z, Y, H and Transmission parameters, relationship between parameters sets, interconnection of two port network

- **Content Delivery Methods:**
  Chalk and talk, Video lectures

- **Assessment Methods:**
  Numerical problems on two port network parameters, conversion of parameters, interconnected two port networks

Internal Continuous Assessment (ICA) :
ICA shall consist of Minimum Eight tutorials/Assignments based on above curriculum

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- **Text Books:**
  1."Network Analysis", Prentice Hall of India Private Limited, Third Edition, M E Van Valkenburg
  2. "Network and Systems", New age international publishers, D Roy Choudhary
  3. "Circuit Theory", DhanpatRai and Company, 7th edition,Abhijit Chakroborty
  4. "Network Analysis and synthesis", McGraw Hill education (India) Pvt Ltd, 3rd edition 2015, Ravish R Singh
  5. "Circuits & Networks 4E", Tata McGraw-Hill Education (India) Pvt Ltd, Anant Sudhakar

- **Reference Books:**

1. “Engineering Circuit Analysis” McGraw William H Hayt, Jr Jack E Kemmerly
2. “Network analysis and Synthesis”, Wiley International Edition Franklin F Kuo
3. “Analysis of Linear Systems”, Narosa Publishing House, 11th reprint, 2002 David K Cheng
4. “Network Analysis and Synthesis”, Khanna Publication G K Mittal

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. Electrical Engineering Semester-II
Computer Aided Design and Simulation

Teaching Scheme	Examination Scheme
Practical: - 2 Hrs/Week, 1 Credit	**ICA-**25Marks
	POE: 50Marks

Course Prerequisite:
Student shall have adequate knowledge of programming using any language

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Course Objectives

- To develop conceptual & analytical understanding of Electrical engineering through computer-based simulation.
- To develop design skills so that students become able to handle design software for different applications in electrical engineering.
- To make students familiar with simulation software for electrical engineering.
- To make students familiar with Design software for electrical engineering

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Course Outcome

After successful completion of this course student will be able to

- Create Design of various devices used in electrical engineering.
- Handle design software for different applications in electrical engineering.
- Understand steady state analysis of various electrical devices through simulation.
- Handle Simulation software for different applications in electrical engineering.

Internal Continuous Assessment (ICA):

- **ICA shall consist of Minimum Eight Practical's on any simulation and Design Software**

- **Minimum Four simulation-based Experiment should be conducted but not restricted the following**

1. Simulation for verification of KCL and KVL.
2. Simulation for verification of Thevenins Theorem.
3. Simulation for verification of Superposition Theorem.
4. Steady state analysis of DC Machine using Simulation.
5. Steady state analysis of Induction Motor using Simulation.
6. Steady state analysis of Single-phase Transformer using Simulation.
7. Steady state analysis of Short Transmission Line using Simulation.
8. Steady state analysis of Medium Transmission Line using Simulation.

- **Minimum Four Design based Experiment should be conducted but not restrictedthe following**

1. Design of construction of underground cables.
2. Design of sample one-line diagram of power system.
3. Design of various bus bar arrangements in substation.
4. Design of distribution system network.
5. Design of typical layout of thermal power plant.
6. Design of typical layout of nuclear power plant.
7. Design of typical layout of solar power plant
8. Design of cross-sectional view of wind power plant.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science and Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Electronics & Telecommunication Engineering

Name of the Course: S. Y. B. Tech

(Syllabus to be implemented from w.e.f. June 2021)

PUNYASHLOK AHILYADEVI HOLKARSOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF SCIENCE& TECHNOLOGY

Electronics & Telecommunication Engineering

Programme Educational Objectives and Outcomes

A. Program Educational Objectives

1. To make students competent for professional career in Electronics & allied fields.
2. To build strong fundamental knowledge amongst student to pursue higher education and continue professional development in Electronics & other fields
3. To imbibe professional ethics, develop team spirit and effective communication skills to be successful leaders and managers with a holistic approach.
4. To nurture students to be sensitive to ethical, societal & environmental issues while conducting their professional work.

B. Program Outcomes

Electronics & Telecommunication Engineering Graduate will be able to –

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

C. Program Specific Outcomes

1. **Solid foundation** : Graduates will be able to attain a **solid foundation** in Electronics and Tele-Communication Engineering with an ability to function in multidisciplinary environment.
2. **Techniques and Skills**: Graduates will be able to use **techniques and skills** to design, analyze, synthesize, and simulate Electronics and Communication Engineering components and systems.
3. **Developing Programs:** Graduate will be capable of **developing programs** in Assembly, High level and HDL languages using contemporary tools for software development.

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FACULTY OF SCIENCE & TECHNOLOGY

Credit System structure of S.Y. B.Tech. Electronics & Telecommunication Engineering ***W.E.F. 2021-22***

Semester I

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
ET211	Engineering Mathematics – III	3	1	--	4	30	70	25	125
ET212	Electronic Circuit Analysis and Design	3	--	--	3	30	70	25	125
ET213	Network Theory and Analysis	3	--	--	3	30	70	25	125
ET214	Digital Techniques	3	--	--	3	30	70	25	125
ET215	Analog Communication	3	--	--	3	30	70	25	125
Sub Total		15	1	--	16	150	350	125	625
ENV21	Environmental Science	1	--	--	--	--	--	--	--
Course Code	***Laboratory Course Name***								
							ESE		
							POE	***OE***	
ET212	Electronic Circuit Analysis and Design	--	--	2	1	--	50*	--	--	50
ET213	Network Theory and Analysis	--	--	2	1	--	--	--	--	--
ET214	Digital Techniques	--	--	2	1	--	25	--	--	25
ET215	Analog Communication	--	--	2	1	--	25	--	--	25
E216	Electronics Software Lab-I	--	1	2	2	--	--	--	25	25
Sub Total		--	1	10	6	--	100		25	125
Grand Total		**15**	**2**	**10**	**22**	**150**	**450**		**150**	**750**

Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE- In Semester Exam, ESE - End Semester Exam, OE-Oral Examination, POE- Practical Oral Examination, ICA- Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)

 Note: *- Practical and Oral Examination of Electronics Circuit Analysis and Design include some of the practical from Network Theory and Analysis

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF SCIENCE & TECHNOLOGY

Credit System structure of S.Y. B.Tech. Electronics & Telecommunication Engineering ***W.E.F. 2021-22***

Semester II

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
ET221	Control System	3	1	_	4	30	70	25	125
ET222	Analog Integrated Circuits	3	_	_	3	30	70	25	125
ET223	Principles of Digital Communication	3	--	--	3	30	70	25	125
ET224	Signals and Systems	3	1	_	4	30	70	25	125
ET225	Data Structures	3	_	_	3	30	70	25	125
Sub Total		15	2	--	17	150	350	125	625
ENV22	Environmental Science	1	-	--	--	--	--	--	--
Course Code	***Laboratory Course Name***								
							ESE		
							POE	***OE***	
ET222	Analog Integrated Circuits	_	_	2	1	_	25	_	--	25
ET223	Principles of Digital Communication	--	--	2	1	--	25	--	--	25
ET225	Data Structures	_	_	2	1	_		_	--	
ET226	Electronic Software Lab-II	1		4	3	_	50	_	25	75
Sub Total		--		10	6		100		25	125
Grand Total		**16**	**2**	**10**	**23**	**150**	**450**		**150**	**750**

Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE- In Semester Exam, ESE - End Semester Exam, OE-Oral Examination, POE- Practical Oral Examination, ICA- Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination).

 Note:

1. Student is required to study and pass Environmental Science subject in Second Year to become eligible for award of degree.
2. Batch size for the practical /tutorial shall be of 18 students. On forming the batches, if the strength of remaining students exceeds 9, then a new batch shall be formed.
3. Vocational Training (evaluated at Final Year Part-I) of minimum 15 days shall be completed in any vacation after S.Y. Part-I but before Final Year Part-I & the report shall be submitted and evaluated in Final Year Part-I.
4. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable.

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FACULTY OF SCIENCE & TECHNOLOGY

Credit System structure of T.Y. B.Tech. Electronics & Telecommunication Engineering ***W.E.F. 2022-23***

Semester I

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
ET311	Electromagnetic Field Theory	3	1	--	4	30	70	25	125
ET312	Microcontrollers and Applications	3	--	--	3	30	70	25	125
ET313	Digital Signal Processing	3	-	--	3	30	70	25	125
ET314	Open Elective-I	3	1	--	4	30	70	25	125
SLM31	Self Learning Module–I(HSS Course)	--	--	--	2	--	50	--	50
Sub Total		12	2	--	16	120	330	100	550
Course Code	***Laboratory Course Name***								
							ESE		
							POE	***OE***	
ET312	Microcontrollers and Applications	--	--	2	1	--	50	--	--	50
ET313	Digital Signal Processing	--	--	2	1	--	50	--	--	50
ET315	Electronic Software Lab-III	1	--	4	3	--	50	--	50	100
Sub Total		--	--	8	5	--	150		50	200
Grand Total		**13**	**2**	**8**	**21**	**120**	**480**		**150**	**750**

Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE- In Semester Exam, ESE - End Semester Exam, OE-Oral Examination, POE- Practical Oral Examination, ICA- Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination).

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF SCIENCE & TECHNOLOGY

Credit System structure of T.Y. B.Tech..Electronics& Telecommunication Engineering ***W.E.F. 2022-23***

Semester II

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
ET321	Antenna & Wave Propagation	3	1	--	4	30	70	25	125
ET322	Embedded System	3	--	--	3	30	70	25	125
ET323	Electronic System Design	3	--	--	3	30	70	25	125
ET324	Professional Elective-I	3	--	--	3	30	70	25	125
ET325	Open Elective-II	3	--	--	3	30	70	25	125
Sub Total		15	1	--	16	150	350	125	625
Course Code	***Laboratory Course Name***								
							ESE		
							POE	***OE***	
ET322	Embedded System	--	--	2	1	--	25	--	--	25
ET323	Electronic System Design	--	--	2	1	--	50	--	--	50
ET324	Professional Elective-I	--	--	2	1	--	--	--	--	--
ET325	Open Elective-II	--	--	2	1	--	--	--	--	--
ET327	Mini Project	--	--	2	1	--	--	25	25	50
Sub Total		--	--	10	5	--	100		25	125
Grand Total		**15**	**1**	**10**	**21**	**150**	**450**		**150**	**750**

Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE- In Semester Exam, ESE - End Semester Exam, OE-Oral Examination, POE- Practical Oral Examination, ICA-Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination).

 Note –

1. Batch size for the practical /tutorial shall be of 16 students. On forming the batches, if the strength of remaining student exceeds 8, then a new batch shall be formed.

2. Vocational Training (evaluated at Final Year Part-I) of minimum 15 days shall be completed in any vacation after S.Y. Part-I but before Final Year Part-I & the report shall be submitted and evaluated in Final Year Part-I.

3. Self-Learning Module I at T.Y. B.Tech.– Semester I

   - Student shall select & enroll a Self Learning Module I Course from PAH Solapur University, Solapur HSS Course List (SLM31). Student must appear and pass university examination.
   - Curriculum for Humanities and Social Sciences (HSS), Self Learning Module-I is common for all undergraduate engineering programs.
   - Minimum four assignments for Self Learning Module (SLM31) shall be submitted by the students which shall be evaluated by a Module Coordinator assigned by institute/department.

   OR

   - Student shall select and enroll for university approved minimum eight weeks MOOC based HSS course (SLM31), and complete its assignments. Student must appear and pass certificate examination conducted through MOOC courses.

4. Open Elective I & II shall be common and open for the students of the branches – Electronics Engineering, Electronics & Telecommunication Engineering and Electrical Engineering. Students of these branches can take any of these Open Electives. Syllabus and university examination question paper will be same for all these branches.

5. Student shall select Professional Elective-I from given course list. Student must appear and pass university examination.

6. Project group for T.Y. B.Tech. - Semester II – Mini Project shall not be of more than three students. This mini project may include simulation and/or Software and/or Hardware. Report of this work should be submitted at the end of semester.

8. ICA assessment shall be a continuous process based on student's performance in class tests, assignments, homework, subject seminars, quizzes, and laboratory books and their interaction and attendance for theory and lab sessions as applicable.

- **List of Open Electives -**

Sr.	Branch Offering Elective	Open Elective I	Open Elective II
1.	Electronics &Telecommunication Engineering	1. Managerial Economics 2. Project Management and Operation Research	1. Sensors and Applications 2. Open Source Technologies
2.	Electronics Engineering	Information Technology & Management	Operating Systems
3.	Electrical Engineering	Business Ethics	Power System Planning

- **List of Professional Elective I–**
  1. Optical Fiber Communication
  2. Image and Video Processing
  3. Multimedia Communication Technology
- **List of Self Learning Modules (HSS Course) (SLM 31)–**

  1. MOOC/University Defined Courses

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PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF SCIENCE & TECHNOLOGY

Credit System structure of Final Year B.Tech. Electronics & TelecommunicationEngineering W.E.F. 2023-24

Semester I

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
ET411	Microwave Engineering	3	--	--	3	30	70	25	125
ET412	Data Communication	3	--	--	3	30	70	25	125
ET413	VLSI Design	3	--	--	3	30	70	25	125
ET414	Professional Elective-II	3	1	--	4	30	70	25	125
ET415	Research Methodology	3	--	--	3	30	70	25	125
Sub Total		15	1	--	16	150	350	125	625
Course Code	***Laboratory Course Name***								
							ESE		
							POE	***OE***	
ET411	Microwave Engineering	--	--	2	1	--	--	25	--	25
ET412	Data Communication	--	--	2	1	--	25	--	--	25
ET413	VLSI Design	--	--	2	1	--	25	--	--	25
ET416	Project Phase-I	_	_	4	2	_	_	--	25	25
ET417	Vocational Training	--	--	--	1	--	--	--	25	25
Sub Total		--	-	10	6	--	75		50	125
Grand Total		**15**	**1**	**10**	**22**	**150**	**425**		**175**	**750**

Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE- In Semester Exam, ESE - End Semester Exam, OE- Oral Examination, POE- Practical Oral Examination, ICA-Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF SCIENCE & TECHNOLOGY

Credit System structure of Final Year B.Tech. Electronics & Telecommunication Engineering ***W.E.F. 2023-24***

Semester II

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
ET421	Professional Elective-III	--	--	--	2	--	50	--	50
SLM41	Self Learning Module–II (Professional Course)	--	--	--	2	--	50	--	50
Sub Total		--	--	--	4	--	100	--	100
Course Code	***Laboratory Course Name***								
							ESE		
							POE	***OE***	
ET421	Project Phase-II (Capstone Project / Internship)	--	--	20	10	--	--	100	100	200
Sub Total		--	--	--	10	--	100		100	200
Grand Total			-	**20**	**14**	**--**	**200**		**150**	**300**

Note –

1. Batch size for the practical /tutorial shall be of 15 students. On forming the batches, if the strength of remaining students exceeds 8, then a new batch shall be formed.
2. Vocational Training (evaluated at Final Year Part-I) of minimum 15 days shall be completed in any vacation after S.Y. Part-I but before Final Year Part-I & the report shall be submitted and evaluated in Final Year Part-I.
3. Project group for Final Year (Electronics & Telecommunication Engineering) Part I and Part II shall not be of more than **three** students.
4. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable.
5. Self-Learning Module II at Final Year B.Tech. – Semester II

- Student shall select a Self Learning Module II (Professional Course) from Course List (SLM 41). Student must appear and pass university examination.
- Minimum four assignments for Self Learning Modules (SLM 41) shall be submitted by the students which shall be evaluated by a Module Coordinator assigned by institute / department.

OR

- Student can select & enroll for university approved minimum eight week technical course from various MOOC technical courses, and complete its assignments. Student must appear and pass certificate examination conducted by MOOC courses.

6. Student shall select Professional Elective-II and III from course list. Student must appear and pass university examination.

7. In Project phase-I students shall select Sponsored / Industry oriented / In –House projects which should cover Literature survey, Problem statement finalization, and Synopsis submission of proposed work. Student shall submit hard copy of synopsis only after delivering seminar.

8. Project phase-II can be Capstone project/Internship which shall be the implementation of the problem statement decided as in phase-I. A hard copy of the final report shall be submitted to the department after successfully completion of project

- Student can carry out project phase II as sponsored/In House project

OR

- Student can avail semester long internship/ apprentice/ industrial training and the report submitted by student will be accepted as the project work only if, project guide accepts this work and examination panel approves the same. (Student should continuously report their work to the project guide and should be periodically evaluated by the internal examiners at college level)

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- **List of Professional courses–**

Sr. No	B.Tech part I Professional Elective-II	B.Tech part II Professional Elective-III
1	PLC and Industrial Controllers	Wireless Sensor Networks
2	Mobile Communication	Satellite Communication
3	DSP Processor and application	Software Defined Radio

- **Self**

Learning Module-II

1. Electric Vehicles
2. Mechatronics
3. Biomedical Instrumentation
4. MOOC / University Defined Courses

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Credit System structure of S. Y. B. Tech. (Electronics & Telecommunication Engineering) Part-I w.e.f. 2021-2022

ET211 – Engineering Mathematics - III

Teaching Scheme:
Lecture:3 hr/week, 3 credits
Tutorial: 1 hr/week, 1 credit

Examination Scheme:
ESE : 70 Marks
ISE : 30 Marks
ICA : 25 Marks

Course Objective:

1. To introduce to student method of solving higher order linear differential equations
2. To introduce to student Fourier series.
3. To introduce to student various probability distributions
4. To introduce to student Laplace and inverse Laplace transforms and their properties.
5. To introduce numerical methods for solving linear equations and for evaluating the definite integrals.
6. To introduce to student Fourier Transform.

Course Outcomes: At the end of this course, student will be able to –

1. Solve higher order linear differential equation related to electrical circuit theory
2. Express a function in terms of sines and cosines components so as to model simple periodic functions
3. Find the relation between two variables for the given data using regression and can explain various probability distribution functions.
4. Apply Laplace and inverse Laplace transforms for analysis of simple electrical circuits.
5. Apply numerical methods for solving linear equations and for evaluating the definite integrals.
6. Solve the problems of Fourier integral and Fourier transform

Course Prerequisite:

- Fundamentals of trigonometry, method of finding roots of algebraic equations, differentiation, integration, partial fraction, sum of sequence and methods of solving definite integrations, basics of statistics and probability theory

SECTION – I

Unit 1: Higher order linear differential equations and applications [07 Hrs]

Basic definition, differential operator, complimentary functions, particular integral, Shortcut methods for standard functions like$e^{ax}, \sin(ax+b), \cos(ax+b), x^m, e^{ax}v, x, v$ particular integral bygeneral method (without method of variation of parameters) for other functions. Electrical Engineering Applications.

Unit 2: Fourier series [06 Hrs]

Introduction, Definition, Euler's formula, Fourier series of periodic functions with period 2π and $2L$, Dirichlet's theorem (only statement), even and odd functions, half range sine and cosine series.

Unit 3: Statistics and Probability: [08 Hrs]

Coefficient of correlation by Karl Pearson's method and lines of regression of bivariate data. Random variable, discrete and continuous random variable, Probability density function, Binomial, Poisson and Normal distributions.

SECTION- II

Unit 4: Laplace transform: [09Hrs]

Definition, Laplace transform of standard functions, properties- first shifting, change of scale, multiplication of power t and division by t, Laplace transform of derivative and integral, Laplace transform of periodic functions, unit step functions and unit impulse functions.

Definition, Inverse Laplace transform of standard functions, Properties of inverse Laplace transforms: Linearity property, first shifting theorem, partial fraction, inverse transform of logarithmic &inverse trigonometric functions and convolution theorem, solution of differential equations by Laplace transform.

Unit5: Solution of Algebraic and Transcendental Equations and Numerical Integration: [06Hr]

Introduction, Basic properties of equations, False position Method, Newton-Raphson Method, Numerical Integration using Newton's Cote's Formulae-Trapezoidal rule, Simpson's 1\3rd rule, Simpson's 3/8th rule, Gaussian Quadrature two point and three-point formulae.

Unit 6: Fourier Transform: [06Hr]

Fourier integral, Fourier sine and cosine integral, Complex form of Fourier integral. Fourier Transform, Fourier sine and cosine transform and Inverse transform.

Internal Continuous Assessment (ICA):

- ICA shall consist of minimum six to eight assignments based on entire curriculum

Text books:

1. A textbook of Applied Mathematics Vol. II and Vol. III, J.N. and P.N. Wartikar, Vidyarthi Grah Prakashan, Pune.
2. Higher Engineering Mathematics, Dr.B.S. Grewal, Khanna Publications, Delhi.
3. Numerical Methods, Dr.B.S. Grewal, Khanna Publications, Delhi
4. Numerical Methods, Dr. P. Kandasamy, Dr. K. Thilangavathy, Dr. K. Gunavathi, S. Chand Publication, New Delhi.
5. A Textbook of Applied Mathematics, N.P. Bali, Ashok Saxena and N.Ch. S.N. IyengarLaxmi Publications, Delhi.
6. Advanced Engineering Mathematics, Kreyzig-John Wiley & SMS, New York.

Reference Books:

1. Advanced Engineering Mathematics, Peter O'Neil, Cengage Learning.
2. Engineering Mathematics, Srimanta Pal, Subodh Chandra Bhunia, Oxford UniversityPress

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Credit System structure of S. Y. B. Tech. (Electronics & Telecommunication Engineering) Part-I w.e.f. 2021-2022

ET212 – Electronic Circuit Analysis and Design

Teaching Scheme:
Lecture: 3 hr/week, 3 credits
Practical : 2hr/week, 1 credit

Examination Scheme:
ESE : 70 Marks
ISE : 30 Marks
ICA : 25 Marks
POE : 50* Marks

Course Objectives:

1. To make student analyze transistorized amplifier.
2. To make student design and analyze feedback amplifiers.
3. To make student design and analyze oscillators.
4. To make student analyze power amplifiers.
5. To introduce to student working of FET and MOSFET and its applications.

Course Outcomes: At the end of this course, student will be able to –

1. Student can analyze and design electronic circuit using multistage amplifier for given specifications.
2. Student can analyze and design feedback amplifier.
3. Student can analyze and design oscillators.
4. Student can analyze power amplifiers.
5. Students will be able to analyze the working of JFET, MOSFET and applications of these devices.

SECTION– I

Unit 1: Bipolar Junction Transistor [8Hrs]

Introduction, Construction and working, BJT characteristics and its configuration, Load Line analysis, BJT Biasing, BJT as CE amplifier, h-model of BJT, Design of single stage CE amplifier.

Unit 2: Multistage Transistor Amplifiers: [5Hrs]

Need of cascading, different coupling schemes with frequency response, Analysis of two stage RC coupled Amplifier, square wave testing for RC coupled amplifiers.

Unit3: Feedback Amplifiers: **[08Hrs]**

Classification of amplifiers, feedback concept, General characteristics of negative feedback amplifiers, Feedback Topologies and analysis (with numerical examples), Effect of negative feedback on stability, Band width, noise, distortion, i/p resistance and o/p resistance. Darlington pair amplifier and its analysis. Design of Two stage RC coupled amplifier with voltage series feedback.

SECTION-II

Unit 4: Oscillators: **[07Hrs]**

Oscillator startup mechanism, Barkhausen's criteria, sinusoidal oscillators- RC phase shift Oscillator, Wein bridge oscillator, Colppits oscillator, Hartley oscillator Derivations for frequency of oscillations of above oscillators. Crystal oscillator- Piezo electric effect, electrical equivalent circuit of a crystal, UJT Relaxation oscillator, Designing of RC oscillator.

Unit 5: Power Amplifiers: **[07Hrs]**

Types (Class A, B, AB and C) and their comparison, crossover distortion, Second Harmonic distortion, Analysis of Class A, Class B and Class AB amplifiers, complementary symmetry push pull amplifier, Introduction to Class C amplifiers. Design of Class A& Class-B amplifier.

Unit 6: Field Effect Transistor: **[07Hrs]**

Introduction, Construction and working, JFET characteristics (Transfer and Drain), Schockley's equation, JFET biasing and DC analysis, JFET as CS amplifier, MOSFET-Construction, working & V-I characteristics(finite output resistance, body effect, break down effect, temperature effect, short channel effects),CMOS.

Note: For selection of components in design **Data Sheet** should be referred.

Internal Continuous Assessment (ICA):

List of Experiments: -

Minimum eight experiments from the following.

1. Frequency response of two stage RC coupled CE amplifier.
2. Effect of negative feedback on amplifiers.
3. RC Phase shift oscillator.
4. Wein Bridge oscillator.
5. Analysis of Class A power amplifier
6. Analysis Class B push pull Amplifier
7. V-I characteristics of JFET.
8. V-I Characteristics of MOSFET
9. Application of MOSFET as a switch.
10. Implement JFET/MOSFET CS Amplifier and calculate Av, Ri and Ro.
11. Simulate two stage RC coupled CE amplifier with feedback
12. Simulate LC oscillator
13. Simulate MOSFET amplifier

Text books:

1. Electronic Devices and Circuits Allen Mottershed PHI Publication.
2. Electronic Devices and Circuits- J.B.Gupta 3rd Edition KATSON Books.
3. A Practical approach to Electronic Circuit Design -D S Mantri& G P Jain,Nikita Publication
4. Electronics Devices and Circuits-S. Shalivahanan,N. SureshKumar, TMH Publication.

Reference Books:

1. Electronic Devices Floyd Pearson Education
2. Microelectronics : Digital and Analog Circuits and Systems- Jacob Millman
3. Electronic Devices and Circuit Theory Boylestad Pearson Education
4. "Microelectronics Circuit" by Sedra Smith, Oxford University Press, 4thEdition.

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Credit System structure of S. Y. B. Tech. (Electronics & Telecommunication Engineering) Part-I w.e.f. 2021-2022

ET213 – Network Theory & Analysis

Teaching Scheme:
Lecture: 3 hr/week, 3 credits
Practical : 2 hr/week, 1 credit

Examination Scheme:
ESE : 70 Marks
ISE : 30 Marks
ICA : 25 Marks

Course Objectives:

1. To develop skills for analysis of linear circuits with dependent and independent DC excitations.
2. To understand concept of resonance in electric circuits and its applications.
3. To analyze transient and steady state response for linear circuits.
4. To know fundamentals of two port network, passive filters, Attenuators.

Course Outcomes: At the end of this course, student will be able to –

1. Analyze linear circuit with use of different network theorems and analysis methods.
2. Compute two port network parameters and draw equivalent network.
3. Determine transient and steady state response of linear circuits.
4. Design passive filter and attenuator circuits.

Course Prerequisite:

- KVL, KCL, star-delta transformation, Mesh and Nodal Analysis

SECTION I

Unit 1: Circuit Analysis and Network Theorems: [08Hrs]

Types of Network Elements, Types of Sources and Source transformation, Superposition, Thevenin's, Norton's and Maximum Power Transfer Theorems. Numerical problems based on DC analysis.

Unit 2: Resonance: [05Hrs]

Series resonance: Series resonance, impedance and phase angle of series resonant circuit, voltage and current in series resonant circuit. Effect of resistance on frequency response curve, bandwidth, selectivity and quality factor.

Parallel resonance**:** Parallel resonant circuit (Tank circuit), resonant frequency, and variation of Impedance with frequency, reactance curves. Numerical problems based on above.

Unit 3: Two Port Networks: **[08Hrs]**

Two port Network: Open circuit impedance parameters (Z), Short circuit admittance parameters (Y), Transmission parameters (ABCD), Hybrid parameters (H), and reciprocity and symmetry conditions. Interconnection of two port networks**:** Parallel, Series and Cascade connection of two port networks, T and π representation, Terminated 2 port networks.

SECTION II

Unit 4: Transient Response: **[08Hrs]**

Review of Laplace Transform Basics: Initial conditions,

Evaluation and analysis of transient and steady state response of following:

RL circuit: DC voltage and current response.

RC circuit: DC voltage and current response

RLC circuit: DC voltage and current response.

Unit 5: Network Function: **[05Hrs]**

Complex frequency: Concept of complex frequency.

Network function**:** network function for one and two port networks, Poles and Zeros of network function. Time domain behavior from poles and zero plot.

Unit 6: Filters and attenuators: **[08Hrs]**

Filters: Characteristic of high pass, low pass and band pass and band stop filter. Constant K type Filters, m-derived filter, section m derived LPF,HPF, BPF and BSF.

Attenuators: Relationship between Neper and Decibels, Design of T, π and Lattice attenuators.

Internal Continuous Assessment (ICA):

Note:

1. Network Function unit should not include Stability concept, Routh Array as it is part of control system syllabus.
2. Practical's and Oral Examination of Electronic Circuit Analysis and Design – I is combined With Network Theory and Analysis

Experiments: -

Minimum eight experiments from the following.

1. Verification of superposition theorem.
2. Verification of Thevenin's theorem.
3. Verification of Maximum Power Transfer Theorems.
4. Frequency response of series resonance circuit.
5. Step response of RL circuit (Transient and steady state).
6. Step response of RC circuit (Transient and steady state).
7. Verification of Z and Y parameters.
8. Verification of H parameters.
9. Design LPF, plot frequency response and find cut off frequency.
10. Design HPF, plot frequency response and find cut off frequency.

11. Design and verification of T-type attenuators.
12. Design and verification of π-type attenuator.
13. Design and verification of Lattice type attenuator.

Text books:

1. Circuit and network analysis and synthesis by A Sudhakar and Sham Mohan S Palli. TMH publication. 3rd Edition
2. Electric circuit analysis by Ramesh Babu, Scientech Publication
3. Electrical ntework by Ravish Singh, TATA McGraw-Hill
4. Circuit Theory (Analysis and Synthesis) A. Chakrabarti DhanpatRai and Co. 6th Edition.
5. Network Analysis & Synthesis- Franklin Kuo, Wiley Publication.
6. Network Fundamentals & Analysis- Kaduskar, Wiley Publication.

Reference Books:

1. Network Analysis M.E. Van Valkenburg, PHI publication. 3rd Edition
2. Network and System - D. Roy Choudhary, Wiley Eastern (2nd Edition).
3. Theory and problems of Electric Circuits Joseph Aedminster, Shaum Series
4. Network Analysis F.F.Kuo - John Wiley and Sons (2nd Edition).

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Credit System structure of S. Y. B. Tech. (Electronics & Telecommunication Engineering) Part-I w.e.f. 2021-2022

ET214 – Digital Techniques

Teaching Scheme:
Lecture: 3 hr/week, 3 credits
Practical : 2 hr/week, 1 credit

Examination Scheme:
ESE : 70 Marks
ISE : 30 Marks
ICA : 25 Marks
POE : 25 Marks

Course Objectives:

1. To demonstrate the use of codes and k-map minimization, Quine-McClusky techniques in digital circuits.
2. To design combinational logic circuits using logic gates.
3. To illustrate the use and significance of logic IC families and flip-flops in digital circuits.
4. To design asynchronous and synchronous sequential logic circuits.
5. ET214.5: To apply concepts of synchronous state machines for designing digital applications.

Course Outcomes: At the end of this course, student will be able to –

1. Demonstrate the use of codes and k-map minimization, Quine-McClusky techniques in digital circuits.
2. Design combinational logic circuits using logic gates.
3. Illustrate the use and significance of logic IC families and flip-flops in digital circuits.
4. Design asynchronous and synchronous sequential logic circuits.
5. Apply concepts of synchronous state machines for designing digital applications.

SECTION– I

Unit 1: Codes and Simplification technique: [06Hrs]

Codes- BCD and Gray codes, sevensegment, Principles of combinational logic: Standard representation for Logical Function, canonical forms, don't care conditions, minimization techniques using Karnaugh map up to 4 variables only, Quine-McClusky technique, hazards and hazard free circuit.

Unit 2: Combinational Circuit Design: [07Hrs]

Binary Adder, Subtractor, Decimal digit BCD adder, Code converters (binary to gray and gray to binary, BCD to 7 segment), IC 7447,MUX, DEMUX, encoder, priority encoder, decoder, Multiplexer (Tree) and Demultiplexer (Tree), magnitude comparator.

Unit 3: Logic Families and flip flop: **[08Hrs]**

Logic Family - Introduction to logic families, Characteristics/Parameters of Digital ICs. Flip flop NAND Latch, Flip-Flop: D, SR, JK and T (Characteristic table, excitation table and characteristic equation), Race around condition, Master Slave J-K flip-flop, flip-flop conversion.

SECTION-II

Unit 4: Registers: **[07Hrs]**

Asynchronous and synchronous sequential circuits, Shift register (modes of operation), 4-bit bidirectional shift register, universal shift registers, Ring counter, Johnson counter, IC7495.

Unit 5: Counters: **[07Hrs]**

Design of ripple counter using flip-flop, 4 bit up/down counter, mod –N counter, Design of Synchronous counter using Flip-Flop, 4 bit up/down counter, mod –N counter, IC 7490,

Unit 6:State machines: **[07Hrs]**

Moore and Mealy machines, representation techniques, state diagram, state assignment, state reduction, implementation using flip flops.

Internal Continuous Assessment (ICA):

Experiments: -

Minimum Ten experiments from the following.

1. Implementation of SOP and POS logical functions using universal gates.
2. Implementation of full adder, and full subtractor using logic gates.
3. Code conversion using logic gates or logic ICs: BCD to Binary, Binary to Gray, Gray to Binary.
4. Design and implementation of 2 bit digital comparator using logic gates and functional
5. Verification of 4 bit digital comparator using IC 7485.
6. Design and implementation of 1 decimal digit BCD adder using IC 7483.
7. (i) Verification of functionality of multiplexer.
   (ii) Design and implement combinational logic function using multiplexer ICs.
8. (i) Verification of functionality of decoder.
   (ii) Design and implement combinational logic function using decoder IC.
9. Verification of the functionality of BCD to Seven segment decoder/driver.
10. Implement S-R, D, J-K, T flip flops using logic gates.
11. Functional verification of universal shift registers using IC 7495.
12. Design and implementation of Ring counter using shift register.
13. Design and implementation of Johnson counter using shift register.
14. Design and implementation of Pulse train generator using IC 7495.
15. Functional verification of ripple counter using IC 7490

Text books:

1. Digital Design - M. Morris Mano - Pearson Education (3rd Edition)
2. Digital Principles – Leach, Malvino, TMH (6th Edition).
3. Fundamental of Digital Circuits- Anand Kumar- Prentice Hall of India Pvt. Ltd.
4. Digital Electronics – Dr. R. S. Sedha – S. Chand Publications (3rd Revised Edition).
5. Digital System, Principles and Applications, Ronald J. Tocci, PHI
6. Digital Electronics- Anil K Maini, Wiley Publication.

Reference Books:

1. Digital Design Principles and Application - Wakerly – Pearson Education
2. Digital Electronics - Gothman - (PHI)
3. Digital Logic and Computer Design - Morris Mano - Pearson Education
4. The Principles of Computer hardware- Alan Clements (3rd Edition),Oxford Press.

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Credit System structure of S. Y. B. Tech. (Electronics & Telecommunication Engineering) Part-I w.e.f. 2021-2022

ET215 – Analog Communication

Teaching Scheme:
Lecture: 3 hr/week, 3 credits
Practical : 2 hr/week, 1 credit

Examination Scheme:
ESE : 70 Marks
ISE : 30 Marks
ICA : 25 Marks
POE : 25 Marks

Course Objectives:

The students are expected to demonstrate the ability to:

1. Describe and analyze the mathematical techniques of generation, transmission and reception of amplitude modulation (AM), frequency modulation (FM) and phase modulation (PM) signals.
2. Evaluate the performance levels (Signal-to-Noise Ratio) of AM, FM and PM systems in the presence of additive white noise.
3. Convert analog signals to digital format and describe Pulse and digital Modulation techniques.

Course Outcomes:

At the end of this course, student will be able to –

1. Understand and identify the fundamental concepts and various components of analog communication systems.
2. Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system.
3. Describe analog pulse modulation techniques and digital modulation technique.
4. Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.

SECTION – I

Unit 1: Introduction: **[6Hrs]**

Introduction of Communication, Element of a communication systems, Base band & Carrier communication Modulation and Demodulation, Need of Modulation, Type of modulation, Type of communication Channels (Transmission line, Parallel wires, Coaxial cables, waveguides and optical fibers), Electromagnetic spectrum, Bandwidth, Application of communication.

Unit 2: Noise **[7Hrs]**

Sources of Noise, Types of Noise, White Noise, Thermal noise, shot noise, partition noise, Low frequency or flicker noise, burst noise, avalanche noise, Signal to Noise Ratio, SNR of tandem connection, Noise Figure, Noise Temperature, Friss formula for Noise Figure, Noise Bandwidth.

Unit 3: AM Transmission: **[8Hrs]**

Block Diagram of AM Transmitter, Modulation Index, Generation of AM (DSBFC) and its spectrum. Power relations applied to sinusoidal signals, DSBSC – multiplier modulator, Nonlinear generation, switching modulator, Ring modulator & its spectrum,. SSBSC, ISB & VSB, their generation methods & Comparison, Behavior of Baseband systems and Amplitude modulated systems i.e. DSBSC and SSBSC in presence of noise and Broadcast technical standards.

SECTION-II

Unit 4: AM Reception: **[7Hrs]**

Block diagram of TRF AM Receivers, Super Heterodyne Receiver, Dual Conversion Super heterodyne Receiver. Performance Characteristics: Sensitivity, Selectivity, Fidelity, Image Frequency Rejection and IFRR. Tracking, Mixers.AM Detection: Rectifier detection, Envelope detection; Demodulation of DSBSC: Synchronous detection; Demodulation of SSBSC: Envelope detection

Unit 5: FM Transmission and Reception: **[8Hrs]**

Mathematical analysis of FM and PM, Frequency spectrum analysis of FM, Modulation Index Bandwidth requirements, Narrow Band and wide band FM, Comparison of AM,FM and PM, Direct and indirect methods of FM generation, Need for Pre-emphasis, De-emphasis. FM detection Techniques - Slope Detector, Dual Slope Detector, Foster Seeley Discriminator, Ratio Detector.

Unit 6: Pulse Analog Modulation: **[6Hrs]**

Sampling Theorem, Proof of Sampling Theorem, Nyquist Rate and Nyquist Interval, Sampling Techniques - Natural sampling, Flat Top Sampling, Comparison of Various Sampling Techniques, Concept of multiplexing (TDM and FDM).Analog Pulse Modulation/Demodulation Methods- Pulse Amplitude Modulation, Pulse Time Modulation

ICA List of Experiments for Analog Communication

Perform any 8 experiments from following List of Practical out of this two must be using software.

1. AM Generation (DSB-FC): Calculation of modulation index by graphical method, Power of AM Wave for different modulating signal.
2. AM detection using Envelope Detector - Practical diode detector, Observe effect of change in RC time constant which leads to diagonal and negative clipping
3. Generation of DSB-SC & its detection

4. Frequency modulator & demodulator, calculation of modulation index & BW ofFM into time domain & frequency domain.
5. Study of AM & FM Spectrum: Observe Spectrum of AM & FM, Compare & comment on AM & FM spectrum.
6. Verification of Sampling Theorem, PAM Techniques, (Flat top & Natural sampling), reconstruction of original signal, Observe Aliasing Effect in frequency domain.
7. PWM Technique & reconstruction of original signal.
8. PPM Technique & reconstruction of original signal.
9. Generate AM signal using suitable software.
10. Generate AM with noise using suitable software.
11. Generate FM signal using suitable software.

Note: Visit to Broadcasting Station is desirable.

Text books:

1. George Kennedy, "Electronic Communication Systems" 5th Edition, McGraw-Hill.
2. Dennis Roddy & Coolen, "Electronic Communication",4th Edition, Prentice Hall.

Reference Books:

1. B. P. Lathi, "Modern Digital and Analog. Communication Systems", 3rd Edition, Oxford University Press.
2. Simon Haykin, "Communication Systems", 4th Edition, John Wiley &Sons.
3. Taub & Schilling, "Principles of Communication Systems", Tata McGraw-Hill.
4. Frenzel, "Principles of Electronic Communication Systems"3rd Edition, Tata McGraw-Hill

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ET216 – Electronic Software Lab-I

Teaching Scheme:
Tutorial: 1 hr/week 1 credit
Practical : 2 hr/week, 1 credits

Examination Scheme:
ICA : 25 Marks

Course Objectives

1. To study and implement advanced features of C++ programming language.
2. To study and implement basics of Python programming language.

Course Outcome: At the end of this course, student will be able to –

1. Implement functions using C++.
2. Implement Inheritance and Polymorphism using C++.
3. Use functions and modules using Python.

Course Prerequisite: Basic C programming and logical computation.

SECTION-I

Unit 1: Introduction [2 Hrs]

Need of Object-Oriented Programming (OOP), Object Oriented Programming Paradigm, Basic Concepts of Object-Oriented Programming, Benefits of OOP, C++ as object oriented programming language.

Unit 2: C++ Programming [3 Hrs]

C++ programming Basics, Data Types, Structures, Enumerations, control structures, Arrays and Strings, Class, Object, class and data abstraction, class scope and accessing class members, separating interface from implementation, controlling access to members.

Unit 3: Functions [3 Hrs]

Function, function prototype, accessing function and utility function, Constructors and destructors, Objects and Memory requirements, Static Class members, data abstraction and information hiding, inline function, Operator Overloading.

SECTION II

Unit 4: Inheritance and Polymorphism **[3 Hrs]**

Inheritance - Base Class and derived Class, protected members, relationship between base Class and derived Class, Constructor and destructor in Derived Class, Overriding Member Functions, Class Hierarchies, Inheritance, Public and Private Inheritance, Levels of Inheritance, Multiple Inheritance, Ambiguity in Multiple Inheritance, Aggregation, Classes Within Classes.

Polymorphism-concept, relationship among objects in inheritance hierarchy, abstract classes, and polymorphism.

Unit 5: Introduction to Python: **[3 Hrs]**

Object and Data Structure, Comparison Operators, Statements, Loops, Methods and Functions, Control Statement, Modules and Packages, Multithreading, Built in Functions with example, Python Operators, Generators, Python Database Operations, Data Analysis, NumPy, Data Analysis- Pandas with small projects in Python.

Internal Continuous Assessment (ICA):

Students should perform minimum 10 experiments based on the Syllabus

Tentative list :

A. C++ Programs:

1. Problem statement based on Structures.
2. Problem statement based on Arrays.
3. Problem statement based on Strings.
4. Problem statement based on Class.
5. Problem statement based on Function.
6. Problem statement based on Constructors and destructors.
7. Problem statement based on operator overloading.
8. Problem statement based on Multiple Inheritance and polymorphism.

B. Python Programs:

1. Problem statement based on Object and Data Structure.
2. Problem statement based on Methods and Functions.
3. Problem statement based on Loops.
4. Problem statement based on Modules and Packages.
5. Problem statement based on Database Operations.
6. Problem statement based on Multithreading.

Text Books:

1. Object Oriented Programming with C++ -by E. Balagurusamy , Tata McGraw-Hill
2. Programming with C++ -by D. Ravichandran , Tata McGraw-Hill
3. Beginning Python: From Novice to Professional – by Magnus Lie Hetland, Apress
4. Practical Programming: An Introduction to Computer Science Using Python 3 –by Paul Gries, Jennifer Campbell, Jason Montojo, Pragmatic Bookshelf.

Reference Books

1. C++ programming language – by Bjarne Stroustrup, AT& T Labs, Pearson Education.
2. C++ The complete reference - by Herbert Schildt, Ⅱ, Eighth Edition, McGraw Hill Professional.
3. Introducing Python- Modern Computing in Simple Packages –by Bill Lubanovic, O'Reilly Media Publication

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ET221 – Control Systems

Teaching Scheme:
Lecture: 3 hr/week, 3 credits
Tutorial : 1hr/week, 1 credit

Examination Scheme:
ESE : 70 Marks
ISE : 30 Marks
ICA : 25 Marks

Course Objectives:

1. To understand concepts of various control systems.
2. To understand the mathematical modeling of control systems.
3. To represent control system using block diagram and signal flow graph and obtain transfer function of system.
4. To determine Time domain analysis of control systems.
5. To obtain stability of control systems.
6. To obtain Frequency domain analysis of control systems and understand state space analysis.

Course Outcomes: At the end of the course, the students will be able to-

1. Analyze various control systems.
2. Calculate transfer function and draw mathematical models for control systems.
3. Obtain transfer function of systems using signal flow graph and block diagram reduction.
4. Analyze control system in time domain.
5. Determine stability of systems.
6. Analyze control system in frequency domain and state space.

SECTION I

Unit 1: Introduction and Mathematical modeling: [07Hrs]

Open loop and Closed loop control systems, examples of control systems: Liquid level control system, missile launching and guidance system, Transfer function of closed loop system, Mathematical modeling of Electrical systems using R, L and C, Transfer function of RLC circuits.

Unit 2: System representation and components: [07Hrs]

Block diagram representation and reduction techniques, Signal Flow Graph- Construction, Mason's Gain formula, Stepper motor-Working principle, construction and applications.

Unit 3: Time response of systems: **[07Hrs]**

Standard test signals, time response of first order systems to step, ramp and impulse input. Step response of second order system, time domain specifications, steady state errors and error constants of type0, type1 and type2 systems.

SECTION II

Unit 4: Stability analysis & Root locus: **[08Hrs]**

Concept of stability, absolute and conditional stability, relative stability, Routh – Hurwitz criterion for stability. Concept of root locus, construction of root locus and stability analysis using root locus.

Unit 5: Frequency domain analysis: **[05Hrs]**

Frequency response specifications, co-relation between time domain and frequency domain response, Bode plot: asymptotic bode plot, stability analysis using bode plot.

Unit 6: State Space Analysis: **[08Hrs]**

State space representation and transfer function, State transition matrix, Decomposition of transfer function, Controllability and observability, Need of compensators, types (Lead, Lag & Lead Lag)

Internal Continuous Assessment (ICA): -

Minimum eight tutorials based on above syllabus (At least one tutorial from each unit).

Text books:

1. Control Systems Engineering I. J. Nagrath& M Gopal New Age Publication (Fifth Edition)
2. Feedback & Control Systems. Schaum's Outline Series McGraw Hill
3. Automatic Control Systems B. C. Kuo PHI Publication
4. Control Systems Engineering, R. Anandanatrajan,P.RameshBabu - Scitech Publication.

Reference Books:

1. Modern Control Engineering K.Ogata Pearson Education
2. Principles of Control Systems S.C. Goyal & U. A. Bakshi Technical Publication, Pune.

सोलापूर विद्यापीठ

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Credit System structure of S. Y. B. Tech. (Electronics & Telecommunication Engineering) Part-IIw.e.f. 2021-2022

ET222 – Analog Integrated Circuits

Teaching Scheme:
Lecture: 3 hr/week, 3 credits
Practical : 2 hr/week, 1 credit

Examination Scheme:
ESE : 70 Marks
ISE : 30 Marks
ICA : 25 Marks
POE : 25 Marks

Course Objectives:

1. To make student understand principles, configurations and specifications of ideal and practical op amp
2. To make student understand frequency response of op amp
3. To make student understand linear and nonlinear applications of op amp
4. To enable student design active filters using op amp and analyze waveform generators
5. To introduce to student working of special Linear ICs and its applications

Course Outcomes: At the end of the course, students will be able to-

1. Describe fundamentals of op amp and compare characteristics of ideal and practical op amp
2. Understand and analyze frequency response of op amp
3. Develop various Linear and Nonlinear applications of op amp
4. Design first order and second order filters
5. Understand and describe the concept of special ICs and its applications

SECTION– I

Unit 1: Fundamentals of Operational Amplifier: [08Hrs]

Concept of Differential amplifier- DIBO, AC & DC analysis, opamp fundamentals- block Diagram, equivalent circuit, Transfer curve, Electrical Parameters- practical & Ideal, Open loop configurations, closed loop configurations with negative feedback- Inverting, non-inverting& Differential Amplifier.

Unit 2: Practical opamp & frequency response: [06Hrs]

Input offset voltage, Input bias current, Input offset current, total output offset voltage, Thermal drift, PSRR, CMRR, SR & its importance, High frequency equivalent circuit and compensation techniques.

Unit 3: General Linear applications of Opamp: **[07Hrs]**

Summing, scaling and averaging amplifier, adder-subtractor, Instrumentation Amplifier, V to I and I to V convertors, Op-Amp as differentiator and Integrator including study of frequency response.

SECTION-II

Unit 4: Non linear applications: **[07Hrs]**

Comparator- Basic, ZCD, Schmitt trigger, window detector, sample& hold circuit, peak detector, precision rectifiers, log-antilog amplifier, clipper & clamper.

Unit 5: Active filters & Oscillators: **[07Hrs]**

Basic filter definitions, Advantages of active filters, First and second order low pass and high pass Butterworth filters, astable multivibrator, Triangular saw tooth wave generators using Op-Amp, Oscillators- principle, Phase shift, Wien Bridge, Quadrature oscillators.

Unit 6: Special ICS and its applications: **[07Hrs]**

Voltage regulators- 78xx,79xx, LM317,LM337, IC 555 Timer- basic, astable, monostable.

Internal Continuous Assessment (ICA): ICA should be based on minimum eight experiments from the following list of experiments.

Experiments: -

1. Measurement of parameters – Vio, Iio, IB etc
2. Op-Amp as Inverting and Non-inverting amplifier, Voltage follower.
3. Frequency response of Inverting and Non-inverting amplifiers.
4. Implementation of Op-Amp as adder and subtractor.
5. Op-Amp as Integrator and Differentiator.
6. Op-Amp as Schmitt trigger.
7. Op-Amp as window detector.
8. Op-Amp as peak detector.
9. Op-Amp as waveform generators (Square, triangular, Saw tooth)
10. RC oscillator.
11. Op-Amp as Precision rectifier.
12. Op-Amp as Clippers and Clampers.
13. V to I convertor with grounded load.
14. Implementation of first and second order low pass Butterworth filer.
15. Implementation of first and second order high pass Butterworth filer.

Note: Simulate results using simulation software for at least two experiments.

Text books:

1. Op-Amps and Linear Integrated Circuits, Ramakant A. Gaikwad, PHI Learning Pvt. Ltd., Third and Fourth edition
2. Linear Integrated Circuits, D. Roy Choudhary, Shail B. Jain, New age International Publishers, Third edition

Reference Books:

1. Operational Amplifiers, G.B. Clayton, English Language Book Society, Second edition
2. Operational amplifiers and Linear ICS by David Bell, oxford university press, 3rd edition
3. Linear Integrated circuits by S Salivahanan, Tata McGraw hill
4. Integrated Circuits by K R Botkar, Khanna Publication

पुण्यश्लोक अहिल्यादेवी होळकर
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Credit System structure of S. Y. B. Tech. (Electronics & Telecommunication Engineering) Part-II w.e.f. 2021-2022

ET223 – Principles of Digital Communication

Teaching Scheme:
Lecture: 3 hr/week, 3 credits
Practical : 2 hr/week, 1 credit

Examination Scheme:
ESE : 70 Marks
ISE : 30 Marks
ICA : 25 Marks
POE : 25 Marks

Course Objectives:

1. To make student understand the significance of information theory in communication system.
2. To introduce student basic components of digital communication system for different pulse, binary and M-ary digital modulation schemes with their performance analysis.
3. To explain various synchronizing techniques as well as coherent and non- coherent type of receivers used for demodulation techniques.
4. To introduce the concept and significance of Error Control Codes.

Course Outcomes: At the end of the course, students will be able to-

1. Describe & calculate information measures and apply source coding techniques for the memoryless discrete sources.
2. Apply binary block coding techniques for error detection & correction and estimate error detection & correction capabilities of block code.
3. Explicate, demonstrate and analyze different pulse code modulation techniques.
4. Explain, demonstrate and analyze binary and M-ary digital modulation techniques and compare them.
5. Describe mathematical & analytical concepts of matched filter & correlation receivers and explain synchronization techniques.

SECTION - I

Unit 1–Introduction to Information Theory [08hrs]

Introduction to information theory, average and mutual information, Entropy, Joint Entropy and conditional entropy, Rate of information, redundancy, channel capacity, Basic block diagram of digital communication system, comparison of analog & digital system.

Unit 2–Pulse Code Modulation Technique [07hrs]

Quantization – Uniform & Non uniform, Types of digital modulation system- PCM System, Eye Pattern, Intersymbol Interference, Differential PCM, Delta Modulation – Noise in DM, ADM, Line Coding Techniques.

Unit 3–Binary Digital Modulations Techniques [06hrs]

Binary ASK, FSK, PSK, DPSK Coherent and non- coherent Detection. Comparison of digital modulation schemes–Bandwidth, Power requirements, Probability of error, & Equipment complexity.

SECTION – II

Unit 4– M-ary Digital Modulations Techniques [08hrs]

M–ary Signaling scheme, Types of M-ary signaling scheme, constellation diagram and its modulators and demodulators: QPSK signaling scheme, M-ary differential PSK signaling scheme, M-ary wideband FSK signaling scheme, QAM signaling scheme.

Unit 5–Optimum receiver for digital Modulation [07hrs]

Introduction to Optimum receiver, Integrator & dump receiver, Matched filter receiver, Correlation receiver, Synchronization- Symbol Synchronization, Frame synchronization, Carrier recovery circuits.

Unit 6–Error Control Codes [06hrs]

Introduction to linear block code, linear block code examples, generator matrix, systematic linear block codes, Parity-check matrix, Syndrome testing, Error correction.

Internal Continuous Assessment:

ICA consists of Minimum 8 experiments performed on above syllabus out of which at least 2 experiments must be using MATLAB / Scilab)

Suggestive List of Practicals on

1. PCM
2. DPCM
3. Data Formats
4. DM
5. ADM
6. ASK
7. FSK
8. PSK
9. DPSK

10. QPSK

11. Coding techniques using simulation software (MATLAB/Scilab) Based Experiment.

12. Modulation techniques using simulation software (MATLAB/Scilab) Based Experiment.

Text Books:

1. Communication System Analog & Digital – Singh & Sapre.-TMH.
2. Digital Communication System Design – M.S.Roden.-PHI
3. Digital Communication -John G. Proakis- Pearson Education
4. Communication Systems (Analog and Digital) – Sanjay Sharma –Katsons

Reference Books:

1. Principles of Communication System – Taub & Schling-TMH
2. Digital & Analog Communication systems – K. Sam Shanmugan-Wiley
3. Digital communication Fundamentals and Applications–2nd edition by Bernard Sklar PearsonEducation.
4. Contemporary Communication system using MATLAB by John G. Proakis, M Asonid Salehi, Genhard Bauch

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Credit System structure of S. Y. B. Tech. (Electronics & Telecommunication Engineering) Part-IIw.e.f. 2021-2022

ET224 – Signals & Systems

Teaching Scheme:
Lecture: 3 hr/week, 3 credits
Tutorial: 1 hr/week, 1 credit

Examination Scheme:
ESE : 70 Marks
ISE : 30 Marks
ICA : 25 Marks

Course Objective:

1. To understand the fundamental characteristics of signals and systems
2. To develop mathematical skills and to solve problems involving convolution and sampling.
3. To represent and to realize LTI System by differential and difference Equations.
4. To understand the concept of Fourier Transform and its applications.
5. To understand the concept of Z transform with ROC

Course Outcome: At the end of the course, students will be able to-

1. Represent different signals and systems mathematically and characterize their behavior graphically.
2. Solve numerical on convolution integral, Convolution sum and Sampling theorem
3. Realize LTI system equations by using different forms
4. Calculate Fourier transform and plot Amplitude and Phase spectrum
5. Calculate ZT of a function and plot its ROC

SECTION– I

Unit 1: Signals and Systems: [09Hrs]
Introduction to signal and systems, Types of Signals, Elementary Continuous time and discrete time Signals, Transformations of independent Variable, Classification of Signals, Properties of System.

Unit 2: Continuous Time (CT)systems: [05Hrs]
Introduction, The Representation of Signals in Terms of Impulses, Convolution integral, Block Diagram representation of LTI Systems described by Differential Equations.

Unit 3: Discrete Time (DT) systems: [04Hrs]
The Representation of Signals in Terms of Impulses, Convolution Sum, and Block diagram Representation of LTI Systems described by Difference Equations, Interconnections of systems.

SECTION-II

Unit 4: Sampling: **[04Hrs]**

Introduction, Representation of a Continuous- Time Signal by Its Samples, The Sampling Theorem, Reconstruction of a signal from its Samples using different methods (Interpolation, Zero order hold, low pass filter), The Effect of Under-sampling (Aliasing)

Unit 5: Fourier analysis for Continuous-Time Signals and Systems: **[08Hrs]**

Introduction, The Response of LTI Systems to Complex Exponentials, Fourier series, and Representation of Continuous-Time Periodic signals, Convergence of Fourier Series, Representation of Aperiodic Signals: The Continuous -Time Fourier Transform, Properties of Fourier Transform, Application of Fourier Transform in LTI systems.

Unit 6: Z-Transform: **[06Hrs]**

Introduction, The Z-Transform, The Region of Convergence for the Z-Transform, Properties of Z Transform, The Inverse Z-Transform (IZT)(Power Series method and Partial Fraction Expansion Method), Application and Characteristics of LTI System Using Z Transform

Internal Continuous Assessment (ICA):

Tutorials: -

Minimum eight tutorials based on above syllabus (At least one tutorial from each unit).

- **Text books:**

1. Signals and Systems A.V. Oppenheim and A. S. Wilsky, 2nd edition [PearsonEducation]
2. Signals and Systems Simon Haykin and Barry Van Veen, 2nd edition [Wiley andSons]
3. Signals and Systems, I. Ravi Kumar, PHI

- **Reference Books:**

1. Signals and Systems Dr. S. Palani [Ane Books Pvt Ltd, NewDelhi]
2. Signals and Systems by V. Krishnaveni and A. Rajeswari [WileyIndia]
3. Signals and Systems by P. Ramesh Babu and R. Anand Natarajan[Scitech]

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Credit System structure of S. Y. B. Tech. (Electronics & Telecommunication Engineering) Part-II w.e.f. 2021-2022

ET225 – Data Structures

Teaching Scheme:
Lecture: 3 hr/week, 3 credits
Practical : 2 hr/week, 1 credits

Examination Scheme:
ESE : 70 Marks
ISE : 30 Marks
ICA : 25 Marks

Course Objectives:

1. To impart the basic concepts of data structures and algorithms.
2. To understand concepts about searching and sorting techniques
3. To understand basic concepts about stacks, queues, lists, trees and graphs.
4. To enable them to write algorithms for solving problems with the help of fundamental data structures

Course Outcomes: At the end of the course, students will be able to-

1. Analyze the algorithms to determine the time and computation complexity and justify the correctness.
2. Implement given Search problem (Linear Search and Binary Search).
3. Implement given problem of Stacks, Queues and linked list. Also, analyze the same to determine the time and computation complexity.
4. Write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.
5. Implement Graph search and traversal algorithms and determine the time and computation complexity.

SECTION– I

Unit 1: Introduction: **[08Hrs]**

Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, complexity analysis Time-Space trade off. Searching: Linear Search and Binary Search Techniques complexity analysis of searching techniques.

Unit 2: Stacks: **[09Hrs]**

ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation (converting infix to postfix expression using algorithm, evaluating postfix expression using algorithm, recursive flow chart, programs using recursive functions - factorial, Fibonacci sequence). and complexity analysis.

Unit 3: Queues: **[07Hrs]**

ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

SECTION-II

Unit 4: Linked Lists: **[9Hrs]**

Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, doubly linked list, Circular Singly Linked Lists: it's all operations and algorithms.

Unit 5: Trees and Graph: **[07Hrs]**

Basic Tree Terminologies, Different types of Trees: Binary Tree, Binary Search Tree its operations and complexity analysis, Threaded Binary Tree, AVL Tree, Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Unit 6: Sorting and Hashing: **[08Hrs]**

Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, basics of hashing, Different Hashing techniques, and collision resolution techniques.

Internal Continuous Assessment (ICA):

Students should perform minimum twelve practical's based on the following preferably conducted on Unix / Linux platform

Practicals: -

Minimum twelve practicals from the following.

1. Search element from list using linear search and Binary search method.
2. Implementation of stack using array.
3. Implementation of Queue using array.
4. Implementation of circular Queue using array.
5. Implementation of singly Linked list.
6. Implementation of stack using Linked list.
7. Implementation of Queue using Linked list.

8. Implementation of Doubly Linked list.
9. Implementation of Josephus problem using Circular Linked list.
10. Find Factorial of a given no, by defining recursive function.
11. Fibonacci sequence implementation using recursive function.
12. Write the program to Sort the given list using Bubble sort method.
13. Write the program to Sort the given list using Selection sort method.
14. Write a program to Sort the given list using Insertion sort method.

Text books:

1. Data Structures Using C and C++, Y.Langsam, M.J. Augenstein, A.M Tanenbaum Pearson Education Second Edition
2. Data structures using C, Rajani Jindal Umesh Publication
3. Data structures through C in Depth, S.K.Srivastava, Deepali Srivastava, BPB Publication.
4. Data Structures using C, ISRD Group, TMH
5. Data Structures- Venkatesan, Wiley Publication.

Reference Books:

a. Fundamentals of Data Structures, Ellis Horowitz, Sartaj Sahni (Galgotia Book Source).
b. Data Structures and Program design, Robert L. Kruse (PHI).
c. Data structure and algorithm, mark Allen Weiss (Pearson Publication, Second edition).
d. Data Structures using C and C++, Rajesh K. Shukla, Wiley Precise.

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Credit System structure of S. Y. B. Tech. (Electronics & Telecommunication Engineering) Part-II w.e.f. 2021-2022

ET226 – Electronic Software Lab-II

Teaching Scheme:
Lecture: 1 hr/week, 1 credit
Practical : 4 hr/week, 2 credits

Examination Scheme:
ICA : 25 Marks
POE: 50 Marks

Course Objectives:

1. Introduce procedural and object-oriented style for writing Python scripts.
2. Introduce standard library packages and modules in Python.
3. To teach testing, debugging and profiling of Python scripts.

Course Outcomes: At the end of this course, students will be able to-

1. Write Python scripts using procedure and object oriented approach of writing a computer program.
2. Exhibit ability to use Python's standard library packages to provide solution to a given problem.
3. Test and debug python script for a given problem.

Course Prerequisite:

- Basic knowledge of programming concepts like Variables, Loops, Control Statements, etc in any programming language like and basic C, C++ and python.

Section – I

Unit 1: Introduction to basics of Python [04Hrs]

Python Interpreter, Program Execution, Data types and variables, Collection data types, Control structures, loops and functions, Lambdas, Generators, Exception Handling, String handling, Scope of variables, Modules, Packages, Command line arguments. Built-in: Functions, Constants, Types, Exceptions.

Unit 2: Object Oriented Programming in Python [06Hrs]

OOPS Concepts, Classes and objects , Classes in Python, Constructors, Data hiding, Creating Classes, Instance Methods, Special Methods, Class Variables, Inheritance, Polymorphism, Type Identification, Custom Exception Classes, Iterators, generators and decorators.

Unit 3: File handling in Python [04Hrs]

I/O and Error Handling In Python :Introduction, Data Streams, Creating Your Own Data Streams, Access Modes, Writing Data to a File, Reading Data From a File, Additional File Methods, Handling

IO Exceptions, Errors, Run Time Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions, Working with Directories.

Section – II

Unit 4: Relational databases [04Hrs]

SQL statements for data manipulation, Using SQLite Manager to work with a database, Using Python to work with a database, Creating a GUI that handles an event, working with components.

Unit 5: Implement Machine Learning algorithms [06Hrs]

Usage of Numpy for numerical Data,Usage of Pandas for Data Analysis, Matplotlib for Python plotting, Seaborn for Statical plots, interactive Dynamic visualizations, SciKit for Machine learning.

Unit 6: Implementation of algorithms and application of python programming: [04Hrs]

Reading and writing CSV files, Calculation of simple and compound interest. Area and volume estimation of polygons, analysis of data from CSV files, plotting performance graphs from data set.

Internal Continuous Assessment (ICA):

1. Students should undertake minimum of 12 practical/assignments based on each of above topic.
2. The assignments should test and develop student's practical proficiency and ability to use Python standard library modules and packages efficiently in writing effective code for varied applications scenarios & requirements, use cases.
3. Use of IDEs like PyCharm, Eclipse with PyDev, Jupyter Notebook for Interactive development and debugging of Python applications is highly recommend enhancing hands on skills in Python Programming of Students.
4. Every assignment shall be performed under Python 2.x or 3.x runtime environment configured using any of the following tools 1) pyenv 2) virtualenv 3) Anaconda

- **Text Book:**

1. e-Resource : Python 2.7.16 documentationhttps://docs.python.org/2/
2. e-Resource : Python 3.7.3 documentationhttps://docs.python.org/3/
3. Programming in Python 3, Second Edition, Mark Summer field

- **Reference Books:**

1. Python Cookbook, Third Edition, David Beazley and Brian K. Jones, Shroff Publishers & Distributors Pvt. Ltd., ISBN :978-93-5110-140-6
2. Learning Python FIFTH EDITION Mark Lutz
3. Programming Python (English) 4Th Edition Mark Lutz
4. Testing Python, David Sale, Wiley India (P) Ltd., ISBN :978-81-265-5277-1

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-
2015'B'Grade
(CGPA2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM (CBCS)

Structure of

Second Year B. Tech. (Mechanical Engineering)

w.e.f. Academic Year : 2021-2022

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science & Technology
Mechanical Engineering
S. Y. B. Tech. Semester-III

Choice Based Credit System (CBCS) Structure w.e.f. Academic Year 2021-2022

Theory Courses

Course Code	*Name of Theory Course*	*Hrs./week*				*Credits*	*Examination Scheme*			
		L	*T*	*P*	*D*		*ISE*	*ESE*	*ICA*	*Total*
ME211	Applied Thermodynamics	3	-	-	-	3	30	70	-	100
ME212	Mechanics of Materials	3	-	-	-	3	30	70	-	100
ME213	Manufacturing Processes	3	-	-	-	3	30	70	-	100
ME214	Machine Drawing & CAD	3	-	-	-	3	30	70	-	100
ME215x	Professional Elective-I	3	-	-	-	3	30	70	-	100
	Sub Total	**15**	**-**	**-**	**-**	**15**	**150**	**350**		**500**
MEV21	**Environmental Sciences**	**1**	**-**	**-**	-	**-**	**-**	**-**	**-**	**-**

Laboratory / Tutorial Courses

Course Code	*Name of Laboratory/Tutorial Course*	*Hrs./week*					*Examination Scheme*				
		L	*T*	*P*	D	*Credits*	*ISE*	*ESE*		*ICA*	*Total*
								POE	*OE*		
ME211	Applied Thermodynamics	-	-	2	-	1	-	-	-	25	25
ME212	Mechanics of Materials	-	1	-	-	1	-	-	-	25	25
ME213	Manufacturing Processes	-	-	2	-	1	-	-	25	25	50
ME214	Machine Drawing & CAD	-	-	-	4	2	-	50	-	50	100
ME215x	Professional Elective-I	-	-	2	-	1	-	-	-	25	25
	Sub Total	-	1	6	-	6	-	75		150	200
	Grand Total	**15**	**1**	**6**	**4**	**21**	**150**	**425**		**150**	**725**

Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE-In Semester Examination, ESE-End Semester Examination (University Examination for Theory & / POE & / Oral), ICA Internal Continuous Assessment.

Professional Elective-I: ME2151 Microprocessors in Automation, ME2152 Internal Combustion Engines, ME2153 Composite Materials

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science & Technology
Mechanical Engineering
S. Y. B. Tech. Semester-IV

Choice Based Credit System (CBCS) Structure w.e.f. Academic Year 2021-2022

Theory Courses

Course Code	*Name of Theory Course*	*Hrs./week*				*Credits*	*Examination Scheme*			
		L	*T*	*P*	*D*		*ISE*	*ESE*	*ICA*	*Total*
ME221	Engineering Mathematics –III	3	-	-	-	3	30	70	-	100
ME222	Manufacturing Technology	3	-	-	-	3	30	70	-	100
ME223	Fluid Mechanics & Fluid Machines	3	-	-	-	3	30	70	-	100
ME224	Kinematics & Theory of Machines	3	-	-	-	3	30	70	-	100
ME225y	Professional Elective-II	3	-	-	-	3	30	70	-	100
	Sub Total	**15**	**-**	**-**	**-**	**15**	**150**	**350**		**500**
MEV22	**Environmental Sciences**	**1**	**-**	**-**	-	**-**	**-**	**-**	**-**	**-**

Laboratory / Tutorial Courses

Course Code	*Name of Laboratory / Tutorial Course*	*Hrs./week*				*Credits*	*Examination Scheme*				
		L	*T*	*P*	D		*ISE*	*ESE*		*ICA*	*Total*
								POE	*OE*		
ME221	Engineering Mathematics –III	-	1	-	-	1	-	-	-	25	25
ME222	Manufacturing Technology	-		2	-	1	-	-	-	25	25
ME223	Fluid Mechanics & Fluid Machines	-	-	2	-	1	-	-	-	25	25
ME224	Kinematics & Theory of Machines	-	-	2	-	1	-	-	25	25	50
ME225y	Professional Elective-II	-	-	2	-	1	-	-	-	25	25
ME 226	Mechanical Workshop-I	-	-	2	-	1	-	-	-	50	50
ME 227	Electrical Technology	-	-	2		1	-	-	25	25	50
	Sub Total	-	1	**12**	**-**	**7**	**-**	**50**		**200**	**250**
	Grand Total	**15**	**1**	**12**		**22**		**400**		**200**	**750**

Abbreviations: L –Lectures, P –Practical, T– Tutorial, ISE– In Semester Examination, ESE – End Semester Examination (University Examination for Theory & / POE & / Oral), ICA– Internal Continuous Assessment.

Professional Elective-II: ME2251 Mechatronic Systems, ME2252 Power Plant and Energy Engineering,ME2253 Solid Mechanics

1. Batch size for the practical /tutorial shall be of 20 students. On forming the batches, if the strength of remaining student exceeds 9, then a new batch shall be formed.

2 Student is required to study Environmental Science subject in Second Year and passing in the same to become eligible for award of degree.

3 Industrial Training/Internship (evaluated at B. Tech Semester-VII) of minimum 30 days shall be completed in any vacation after S.Y. B. Tech. Semester-III, but before B. Tech. Semester-VII & the report shall be submitted and evaluated in B. Tech. Semester-VII.

4 ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, seminars, quizzes, and laboratory books and their interaction and attendance for theory and lab sessions, as applicable.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science and Technology

CHOICE BASED CREDIT SYSTEM

Structure

Name of the Course: B.Tech (Computer Science & Engineering)

(Syllabus to be implemented from w.e.f. June 2021)

Programme Educational Objectives and Outcomes

A. Program Educational Objectives

1. To make students competent for professional career in Computers, IT & allied fields.
2. To build strong fundamental knowledge amongst student to pursue higher education and continueprofessional development in Computers, IT & other fields
3. To imbibe professional ethics, develop team spirit and effective communication skills to besuccessful leaders and managers with a holistic approach.
4. To nurture students to be sensitive to ethical, societal & environmental issues while conductingtheir professional work.

B. Program Outcomes Engineering Graduate will be able to –

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities withan understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to

assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

C. Program Specific Outcomes (PSOs)

1. Graduate has an ability to use technical skills necessary for design, maintenance, developmentand implementation of database systems and networking applications.
2. Graduate has an ability to provide IT solutions, develop mobile applications in multidisciplinaryareas using standard tools and techniques.
3. Graduate has an ability to utilize and apply software engineering tools for design and realizationof projects in various domains of Computer Science and Engineering.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF SCIENCE AND TECHNOLOGY
Structure of S.Y. B.Tech.(CSE) wef. 2021-2022
Semester – I

Course Code	Theory Course Name	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
CS211	Applied Mathematics-I	3	1		4	70	30	25	125
CS212	Discrete Mathematical Structures	3	1		4	70	30	25	125
CS213	Data structures	3			3	70	30		100
CS214	Computer Graphics	3			3	70	30		100
CS215	Microprocessors	3			3	70	30		100
CS216	Python Programming	2			2		25		25
	Sub Total	**17**	**2**		**19**	**350**	**175**	**50**	**575**
	Environmental studies	2				50			50
	Laboratory/Workshop					**ESE / POE**			
CS213	Data structures			2	1	50		25	75
CS214	Computer Graphics			2	1			25	25
CS215	Microprocessors			2	1			25	25
CS216	Python Programming			2	1	50		25	75
	Sub Total			**8**	**4**	**100**		**100**	**200**
	Grand Total	**19**	**2**	**8**	**23**	**450**	**175**	**150**	**775**

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF SCIENCE AND TECHNOLOGY
Structure of S.Y. B.Tech.(CSE) wef. 2021-2022
Semester – II

Course Code	Theory Course Name	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
CS221	Applied Mathematics-II	3	1		4	70	30	25	125
CS222	Theory of Computation	3	1		4	70	30	25	125
CS223	Computer Organization and Architecture	3			3	70	30		100
CS224	Computer Networks	3			3	70	30		100
CS225	Object Oriented Programming using Java	2			2		25		25
	Total	**14**	**2**		**16**	**280**	**145**	**50**	**475**
	Environmental studies	2				50			50
	Laboratory/Workshop					**ESE / POE**			
CS223	Computer Organization and Architecture			2	1			25	25
CS224	Computer Networks			2	1	50		25	75
CS225	Object Oriented Programming using Java			4	2	50		25	75
	Total			**8**	**4**	**100**		**75**	**175**
	Grand Total	**16**	**2**	**8**	**20**	**380**	**145**	**125**	**650**

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF SCIENCE AND TECHNOLOGY
Structure of T.Y. B.Tech.(CSE) wef. 2022-2023
Semester-I

Course Code	Theory Course Name	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
CS311	Artificial Intelligence	3			3	70	30		100
CS312	Operating Systems	3			3	70	30		100
CS313	Database Engineering	3			3	70	30		100
CS314	Design and Analysis of Algorithm	3			3	70	30		100
CS315	Mobile Application Development	2			2		25		25
SL31	Self Learning Module I (HSS)				1	50			50
	Sub Total	**14**			**15**	**330**	**145**		**475**
	Laboratory/Workshop					**ESE / POE**			
CS311	Artificial Intelligence			2	1			25	25
CS312	Operating Systems			2	1			25	25
CS313	Database Engineering			2	1	50		25	75
CS314	Design and Analysis of Algorithm			2	1	50		25	75
CS315	Mobile Application Development			2	1	50		25	75
	Sub Total			**10**	**5**	**150**		**125**	**275**
	Grand Total	**14**		**10**	**20**	**480**	**145**	**125**	**750**

Note :

1. Batch size for the practical/tutorial shall be of 15 students. On forming the batches, if the strength of remaining student exceeds 7, then a new batch shall be formed.
2. Vocational Training (evaluated at Final Year B. Tech. Semester VII) of minimum 15 days shall be completed in vacation/s after S.Y. B. Tech. Semester IV but before Final Year B.Tech. Semester VII & the report shall be submitted and evaluated in Final Year B.Tech. Semester VII
3. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable.

4. **Self-Learning Module I at T.Y. B.Tech. – I**
   Curriculum for Humanities and Social Sciences, Self Learning Module - I is common for all under graduate engineering programs.

A. Student can select & enroll a Self Learning Module I Course from PAH Solapur University, Solapur HSS Course List (SL31-A) and appear for university examination.

SL31-A: P. A. H. Solapur University, Solapur: HSS Course List

1. Economics	4. Stress and Coping
2. Intellectual Property Rights for Technology Development and Management	5. Professional Ethics & Human Value
3. Introduction to Sociology	

OR

B.Student can select and enroll for university approved minimum eight weeks NPTEL HSS course (SL31-B), complete its assignments and appear for certificate examination conducted by NPTEL. The list of courses as shown in Table SL31-B will be updated from time to time by University authorities. Latest updated list will be valid for selection of self learning Module-I (HSS) courses.

More details about NPTEL are available at http://nptel.ac.in

SL31-B: University approved NPTEL- HSS course List

1. Soft skills	15. Management of Inventory Systems
2. Introduction to Modern India Political Thought	16. Economic Growth and Development
3. Intellectual Property	17. Ethic in Engineering Practice
4. Technical English for Engineers	18. Corporate Social Responsibility
5. Developing Soft Skills and Personality	19. Marketing Management –I
6. Educational Leadership	20. Marketing Research and Analysis
7. Microeconomics: Theory & Applications	21. Selected Topics in Decision Modeling
8. Engineering Economics	22. Innovation, Business Models and Entrepreneurship
9. Human Resource Development	23. Simulation of Business Systems: An Applied Approach
10. Project Management for managers	24. Sustainability through Green Manufacturing Systems: An Applied Approach
11. Data Analysis and Decision Making - I	25. Total Quality Management - I
12. E-Business	26. Introduction to Operations Research
13. Working Capital Management	27. Knowledge Management
14. Industrial Safety Engineering	

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
FACULTY OF SCIENCE AND TECHNOLOGY
Structure of T.Y. B.Tech.(CSE) wef. 2022-2023
Semester-II

Course Code	Theory Course Name	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
CS321	System Programming	3			3	70	30		100
CS322	Internet of Things	3			3	70	30		100
CS323	Software Engineering	3	2		5	70	30	25	125
CS324	Professional Elective-I	3			3	70	30		100
CS325	Web UI and UX Technology	2			2		25		25
CSO326	Open Elective	2			2	50			50
	Sub Total	**16**	**2**		**18**	**330**	**145**	**25**	**500**
	Laboratory/Workshop					**ESE / POE**			
CS321	System Programming			2	1			25	25
CS322	Internet of Things			2	1			25	25
CS324	Professional Elective-I			2	1			25	25
CS325	Web UI and UX Technology			2	1	50		25	75
CS327	Mini Project			2	1	50		25	75
	Sub Total			**10**	**5**	**100**	**0**	**125**	**225**
	Grand Total	**16**	**2**	**10**	**23**	**430**	**145**	**150**	**725**

Professional Elective – I	**Open Elective**
Cloud Computing	Biology for Engineers
Augmented Reality/Virtual Reality	Engineering Economics and Management
Network Security	Disaster Management

Note

1. Batch size for the practical /tutorial shall be of 15 students. On forming the batches, if the strength of remaining student exceeds 7, then a new batch shall be formed.
2. Vocational Training (evaluated at Final Year B. Tech. Semester VII) of minimum 15 days shall be completed in vacation/s after S.Y. B.Tech. Semester IV but before Final Year B.Tech. Semester VII & the report shall be submitted and evaluated in Final Year B.Tech. Semester VII
3. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable.
4. Mini Project shall consist of developing software, based on various tools & technologies.
5. Project groups shall not be of more than **five** students.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
FACULTY OF SCIENCE AND TECHNOLOGY
Structure of Final Year B.Tech.(CSE) wef. 2023-2024
Semester-I

Course Code	Theory Course Name	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
CS411	Software Testing and Quality Assurance	3			3	70	30		100
CS412	Compiler Construction	3			3	70	30		100
CS413	Professional Elective-II	3			3	70	30		100
CS414	Professional Elective-III	3			3	70	30		100
CS415	DevOps	2			2		25		25
SL41	Self Learning (Technical)				1	50			50
	Sub Total	**14**	**0**	**0**	**15**	**330**	**145**		**475**
	Laboratory/Workshop					**ESE / POE**			
CS411	Software Testing and Quality Assurance			2	1			25	25
CS412	Compiler Construction			2	1			25	25
CS413	Professional Elective-II			2	1			25	25
CS414	Professional Elective-III			2	1			25	25
CS415	DevOps			2	1	50		25	75
CS416	Seminar			2	1			25	25
CS417	Vocational Training				1			25	25
	Sub Total			**12**	**7**	**50**		**175**	**225**
	Grand Total	**14**	**0**	**12**	**22**	**380**	**145**	**175**	**700**

Professional Elective-II :
Business Intelligence
Data Mining
Distributed Systems
Management Information System

Professional Elective-III :
Human Computer Interaction
Big Data Analytics
Information Retrieval

Note :

1. Batch size for the practical /tutorial shall be of 15 students. On forming the batches, if the strength of remaining students exceeds 7, then a new batch shall be formed.
2. Vocational Training (evaluated at Final Year B.Tech Semester I) of minimum 15 days shall be completed in any vacation after S.Y. B.Tech Semester II but before Final Year B.Tech Semester I & the report shall be submitted and evaluated in Final Year B.Tech. Semester I.
3. Appropriate Professional Elective II& III Subjects may be added when required.
4. Project group for Final Year B.Tech. (Computer Science and Engineering) Semester I and Semester II shall not be of more than **five** students.
5. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
FACULTY OF SCIENCE AND TECHNOLOGY
Structure of Final Year B.Tech.(CSE) wef. 2023-2024
Semester-II

Course Code	Theory Course Name	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
CS421	Professional Elective-IV	3			3	70	30		100
CS422	Cyber Laws and Ethics	2			2	50			50
	Sub Total	**5**			**5**	**120**	**30**		**150**
	Laboratory/Workshop					**ESE** / **POE**			
CS423	Project			20	10	100		100	200
	Sub Total			**20**	**10**	**100**			**200**
	Grand Total	**5**		**10**	**15**	**220**	**30**	**100**	**350**

Professional Elective-IV :
Parallel Architecture
Blockchain Technology
Image Processing

Note:

1. Batch size for the practical /tutorial shall be of 15 students. On forming the batches, if the strength of remaining students exceeds 7, then a new batch shall be formed.
2. Appropriate Professional Elective IV Subjects may be added when required.
3. Project group for Final Year B.Tech. (Computer Science & Engineering) Semester II shall not be of more than **five** students.
4. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology
Third Year B.Tech (Computer Science & Engineering)
Semester-I
CS311 : ARTIFICIAL INTELLIGENCE

Teaching Scheme	**Examination Scheme**
Lectures– 3 Hrs/week, 3 Credits	ESE - 70 Marks
Practical – 2 Hrs/week, 1 Credit	ISE - 30 Marks
	ICA - 25 Marks

Introduction:
This course presents a basic introduction to the techniques used in developing Artificial Intelligent systems. It is a walkthrough to problem spaces and search algorithms, Knowledge representation, reasoning, logic programming and applications of Artificial Intelligence.

Course Prerequisite:
Student shall have some exposure to algorithms and programming.

Course Outcomes:
At the end of the course students will be able to
1. Formulate and solve sequence of actions for an agent as a search problem.
2. Infer from represented knowledge using logical and probabilistic reasoning methods.
3. Solve agent decision problems using probability theory.
4. Comprehend forms of learning and demonstrate their working.

SECTION - I

Unit 1 – Overview **(04)**
Foundations, scope, problems, and approaches of AI. Intelligent agents : reactive, deliberative, goal-driven, utility-driven, and learning agents

Unit 2 - Problem-solving through Search **(10)**
Forward and backward, state-space, blind, heuristic, problem-reduction, A, A*, AO*,minimax, constraint propagation, neural, stochastic, and evolutionary search algorithms,sample applications.

Unit 3 - Knowledge Representation and Reasoning **(05)**
Ontologies, foundations of knowledge representation and reasoning, representing and reasoning about objects, relations, events, actions, time, and space; first order logic, situation calculus, description logics, reasoning with defaults, reasoning about knowledge, sample applications.

SECTION – II

Unit 4 - Representing and Reasoning with Uncertain Knowledge **(08)**
Probability, connection to logic, independence, Bayes rule, Bayesian networks, probabilistic inference, and sample applications.

Unit 5 - Decision-Making **(07)**
Basics of utility theory, decision theory, sequential theory, decision problems, elementary game, sample applications.

Unit 6 - Learning and Knowledge Acquisition **(08)**

Forms of Learning: Supervised, Unsupervised, Semi-supervised. Statistical learning, ReinforcementLearning: Q-learning, sample applications.

Unit 7 - Conclusions **(03)**

Philosophical Foundations, AI: The Present and Future.

Internal Continuous Assessment (ICA):

ICA should consist minimum 10 assignments using any programminglanguage with openly available tools, frameworks and resources based on thefollowing topics.

- Intelligent agents
- Problem solving through search
- First order logic
- Bayesian Networks
- Decision and Game theory
- Statistical Learning
- Q-learning.

In addition to above students shall undertake a case study on “Applications of AI: The Present and Future”

Text Books:

1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Prentice Hall
2. A First Course in Artificial Intelligence, Deepak Khemani, McGraw Hill Education (India)
3. Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.

Reference Book:

1. Artificial Intelligence, Elaine Rich and Kevin Knight, Tata McGraw Hill

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology
Third Year B. Tech. (Computer Science & Engineering)
Semester – I
CS312 – OPERATING SYSTEMS

Teaching Scheme	**Examination Scheme**
Lectures– 3 Hrs./week, 3 Credits	ESE – 70 Marks
Practical – 2 Hrs./week, 1 Credit	ISE – 30 Marks
	ICA – 25 Marks

Introduction:
This course introduces Fundamentals and basic knowledge of an operating system. It also covers the details Process Management, deadlock, Memory Management and IO subsystems.

Course Prerequisite:
Students should have knowledge of Computer Systems and basics of C programming language.

Course Outcomes:
Students will be able to:
1. Comprehend the features of the operating system to formulate its role and responsibilities.
2. Analyze the principles of process scheduling and process synchronization.
3. Simulate memory management technique for CPU performance.
4. Describe how the file system, mass storage, and I/O are handled in a modern computer system.

SECTION-I

Unit 1 - Introduction **(05)**
Operating system definition, Simple Batch System, Multiprogrammed Batch System, Time Sharing System, Personal Computer System, Parallel System, Real Time System, and System Calls.

Unit 2 - Process **(06)**
Process Concept, Process Scheduling, Operations on processes, Cooperating Processes, Threads, Inter-Process communication

Unit 3 - Process Scheduling **(06)**
Basic concept, Scheduling Criteria, Scheduling Algorithms, Multiple processor scheduling

Unit 4 - Inter-process synchronization **(05)**
Background, The critical section problem, Peterson's algorithm, Synchronization Hardware, Semaphores, Classical problems of synchronization, Monitors.

SECTION-II

Unit 5 – Deadlocks **(07)**
System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock, combined approach to deadlock.

Unit 6 - Memory Management **(06)**
Background, Logical Versus Physical Address space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with paging.

Unit 7 - Virtual Memory **(05)**

Background, Demand paging, Page replacement, Page replacement algorithms, Allocation of frames, thrashing (Only concept).

Unit 8 - IO System **(04)**

Overview, I/O hardware, Application I/O interface, Mass Storage Structure – Disk Scheduling (FCFS Scheduling, SSTF Scheduling, SCAN Scheduling, C-SCAN Scheduling, LOOK Scheduling)

International Continuous Assessment (ICA) :

It should consist of laboratory assignments as follows:

1. Study of Unix commands
2. Program using system calls: fork (), exec(), suspend() , resume()
3. Implementation of FCFS scheduling algorithm
4. Implementation of SJF (non preemptive)
5. Implementation of round robin (RR).
6. Implementation of priority scheduling algorithm (nonpreemptive)
7. Implementation of Mutual Exclusion 1st / 2nd / 3rd algorithm.
8. Implementation of Mutual Exclusion using semaphore (wait & signal)
9. Implement Bankers Algorithm for Deadlock Avoidance
10. Implementation of RAG or WFG method for deadlock detection for single instance of resources.
11. Simulation of page replacement strategies (FIFO, LRU , Optimal)
12. Simulation of Memory Allocation Strategies (First Fit, Best Fit, Worst Fit)
13. Study of I/O subsystem

Text Books:

1. Operating System concepts, Silberschatz, Galvin, 7th or 8th Edition (John Wiley).
2. Operating Systems: Internals and Design Principles by William Stallings, 5th Edition (PHI).
3. The design of Unix Operating Systems- Maurice J. Bach(PHI)

Reference Books:

1. Operating system with case studies in UNIX, Netware and Windows NT by Achyut Godbole (TMGH).
2. Operating Systems, Deitel, Deitel, Choffnes, 3rd Edition, by Pearson Education.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology
Third Year B.Tech (Computer Science & Engineering)
Semester-I
CS313 : DATABASE ENGINEERING

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hrs/week, 3 Credits	ESE: 70 Marks
Practical: 2 Hrs/week, 1 Credit	ISE: 30 Marks
	ICA: 25 Marks
	POE: 50 Marks

INTRODUCTION:
In today's data-driven economy, no computer science or business curriculum would be complete without a course in databases and data management system. This course emphasizes the understanding of the fundamentals of relational database system including data models, database architectures, normalization, data integrity, security and data manipulation. It also provides students with theoretical knowledge and practical skills in the use of databases and database management systems with the help of Structured Query language (SQL).It ends with covering database transaction and recovery concepts. Upon completion, students should be able to design and implement normalized database structures by creating simple database.

COURSE PREREQUISITE:
No prerequisite knowledge of databases is required but basic understanding of data-structures and algorithms is assumed. Any general purpose programming language knowledge is needed.

COURSE OUTCOMES:
At the end of this course, the student will be able to -

1. Apply the principles of database system and relational query language.
2. Design database using E-R modeling and apply normalization techniques on a given scenario.
3. Formulate SQL queries to perform CRUD operations.
4. Apply appropriate indexing technique to optimize the performance of the database.
5. Demonstrate transaction processing techniques.

SECTION – I

Unit 1: Introduction **(04)**
Database System Applications, Purpose of Database Systems, View of data, Database Languages, Data Storage and Querying, Database Architectures, Database users and administrators, history of databases system.

Unit 2: Database Design and E-R Model **(07)**
Overview of design process, E-R Model, Constraints, Removing redundant attributes in entity sets, E-R diagrams, Reduction to relational schema, E-R design issues, and Extended E-R features. Relational Model: Structure of relational databases, Database schema, keys, Schema diagrams, Relational Query languages, Relational algebra, Tuple Relational Calculus, Domain Relational Calculus.

Unit 3: SQL and Advanced SQL **(08)**
SQL : Overview, SQL data definition, Basic structure of SQL Queries, Additional basic operations, Set operations, NULL values, Aggregate functions, Nested sub queries, Modification of the databases , Join operations, Views, Transactions, Integrity constraints, SQL data types and schemas, Authorization, Advanced SQL : Embedded SQL, Functions and Procedures, Triggers.

Unit 4: Relational Database Design **(08)**

Features of good Relational Designs, Atomic Domains, First Normal Form, Decomposition using Functional dependencies, Second Normal Form, BCNF, Third Normal Form, Functional-dependency theory, Fourth Normal Form.

SECTION – II

Unit 5: Indexing and Hashing **(06)**

Basic Concepts, Ordered Indices, B+ Tree Index Files, B Tree Index Files, Multiple Key Access, Static Hashing, Dynamic Hashing, Comparison of Indexing and Hashing, Bitmap indices, Index definition in SQL

Unit 6: Transactions **(04)**

Transaction concepts, A simple transaction Model, Storage structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity.

Unit 7: Concurrency Control **(04)**

Lock based protocol, Deadlock handling, Multiple granularity, Time Stamp-based protocols, Validation based protocols.

Unit 8: Recovery System **(04)**

Failure Classification, Storage, Recovery and Atomicity, Recovery algorithms, Buffer management.

Course Instructions:

Assignments 2 to 4 should be implemented in MySQL/Oracle/ PostGreSQL. Assignments 6 to 11 should be implemented in C++/Java.

Internal Continuous Assessment (ICA):

It should consist of 8-10 laboratory assignments as follows:

1. E-R Diagrams: Draw E-R diagram for any specific database application and create a data dictionary for the same.
2. a) Basic SQL DDL commands: write simple queries in SQL on above database application for schema creation and updation.
   b) SQL DML commands: insert, update, select command with different clauses, queries using aggregates, grouping and ordering.
3. a) Nested sub queries, Joins and Set operations: write queries in SQL using concept of nested sub queries, join and different set operations.
4. a) Views, Integrity constraints and Authorization: queries for creating views, different integrity constraints and authorization commands.
   b) Advanced SQL: queries on embedded SQL, functions and procedures, triggers
5. Convert the created database into 1NF, 2NF, 3NF and BCNF.
6. Given a set of functional dependencies, find canonical cover and closure of functional dependency.
7. Write a Java program for database (created in expt-2) connectivity using JDBC.
8. Write a program to implement B+ tree index (n=3 or n=5) on the database previously created.
9. Write a program to implement dynamic hashing on the database previously created.
10. Write a program to simulate log based protocol using immediate or deferred database modification.
11. Write a program to simulate any one concurrency control protocol.

Text Book:

1. Database system concepts by Abraham Silberschatz, Henry F. Korth, S. Sudarshan (McGraw Hill International Edition) sixth edition.

Reference Books:

1. Fundamentals of Database systems by Ramez ElMasri, S. B. Navathe (Pearson Education) Fifth edition.
2. Database Management Systems by Ramkrishnan Gehreke (Tata McGraw Hill) third edition.
3. Principles of Database Systems by J. D. Ullman (Galgotia Publications)
4. SQL The Complete Reference, 3rd Edition by James R Groff, Paul N. Weinberg and Andy Oppel
5. Database system concepts by Peter Rob, Carlos Coronel (Cengage Learning) ninth edition.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology
Third Year B.Tech. (Computer Science and Engineering)
SEMESTER - I

CS314 - DESIGN AND ANALYSIS OF ALGORITHM

Teaching Scheme
Lectures— 3 Hrs./week, 3 Credits
Practical— 2 Hrs./week, 1 Credit

Examination Scheme
ESE - 70 Marks
ISE - 30 Marks
ICA - 25 Marks
POE – 50 Marks

Introduction :
This course introduces the algorithms, strategies of algorithms and analysis of algorithms which will help to compare and determine good algorithms.

Course Prerequisite:
Students should have knowledge of basic programming. They should also have basic knowledge of data structure and graph theory.

Course Outcomes :
At the end of the course, students will be able to -
1. Derive time and space complexity of a given algorithm
2. Select appropriate algorithm design paradigm for a problem.
3. Apply algorithm design paradigm for a problem.
4. Describe and distinguish complexity classes of problems

SECTION-I

Unit 1 – Introduction **(08)**
Algorithm Specification: Pseudo code Conventions, Recursive Algorithm, Performance Analysis: Space Complexity, Time Complexity, Calculating worst case, best case and average case complexities, complexities Asymptotic Notations, Performance Measurement

Unit 2 - Divide and Conquer **(07)**
The general method, Binary search, Finding the maximum and Minimum, Quicksort, Selection Sort, Merge Sort.

Unit 3 - The Greedy method **(08)**
The general method, Knapsack Problem, Job Sequencing with deadlines, Minimum —cost spanning trees — Prim's and Kruskal's Algorithms, Optimal storage on tapes, Optimal merge patterns, Single source shortest paths

SECTION-II

Unit 4 - Dynamic Programming **(08)**
The general method, Multistage graphs, All pair shortest paths, Optimal binary search trees, 0/1 Knap sack, Reliability design, The Traveling Sales person problem. Flow shop scheduling

Unit 5 - **Backtracking** **(07)**
The general method, 8-queen problem, sum of subsets, Knapsack Problem, Hamilton Cycle, and Graph Coloring.

Unit 6 - **NP-Hard and NP-Complete problems** **(07)**

Tractable and Intractable Problems: Computability. The Halting problem, Computability classes — P, Np- class, NP-complete and NP-hard, Standard NP-complete problems, NP-Hard Problem (Only Basics problems).

Internal Continuous Assessment (ICA) :

ICA shall consist of minimum ten practical assignment problems.

1) The nature of the problems shall be with objectives to assess student's ability to
    a. Compare and choose an appropriate algorithm design paradigm on time and space complexity
    b. Apply algorithm design paradigm to provide a solution to the problem using either C, C++, Python, Java or any other programming language the student is proficient in.
    c. Effectively assess performance of provided solutions w.r.t programming language's runtime implementation.

Text Book:

1. Fundamentals of Computer Algorithms, Horowitz, Sahni & Rajasekaran (Galgotia Publications)
2. Fundamental of Algorithm, Gilles Brassard, Paul Bratley (Pearson Publication)
3. Introduction to Algorithms, Thomas Cormen (Pearson Publication)

Reference books :

1. Introduction to Design and Analysis of Algorithm, Goodman (McGrawhill)
2. Design and analysis of algorithms, Aho, Hopfcraft and Ullman (Addison wesley)
3. Design & Analysis of Algorithms, Sharma, Khanna Publishing House, N.Delhi
4. Design & Analysis of Algorithms, S. Sridhar, Oxford

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology
Third Year B. Tech. (Computer Science & Engineering)
Semester – I
CS315 – MOBILE APPLICATION DEVELOPMENT

Teaching Scheme	**Examination Scheme**
Lectures– 2 Hrs./week, 2 Credits	ISE – 25 Marks
Practical – 2 Hrs./week, 1 Credit	ICA - 25 Marks
	POE – 50 Marks

Introduction: Mobile application development course will build your skills in creating mobile apps for Android platform as well as for Cross platform. This course includes Android application development and Xamarin Application development with basic User Interface design, basic building blocks, data handling, Testing mobile apps and how to take app to the market.

Course Prerequisite: Knowledge of programming paradigms and object-oriented programming principles.

Course Outcomes:
At the end of this course students will be able to
1. Select suitable development practices for a mobile application
2. Build cross platform mobile application for a given problem scenario.
3. Choose suitable method of testing, signing, packaging and distribution for a mobile application.

Section I : Mobile application development for Android using Java/Kotlin

Unit 1 - USER INTERFACE DESIGN (04)
Activity, Activity states, Activity Life Cycle, UI Resources, Layout Resources, String Resources, Image Resources, UI Elements and Events, Interaction between Activities, Exchanging data among activity, Fragments, Life Cycle of Fragments, Interaction between Fragments.

Unit 2 - MOBILE APPLICATION FUNCTIONALITY (04)
Beyond UI, App functionality beyond user interface - Threads, Asynchronous Tasks, Services – states and life cycle, Intent and Bound Service, Notifications, Intents and Intent Resolution, Broadcast receivers, Telephony and SMS APIs.

Unit 3 - NATIVE DATA HANDLING (04)
Native data handling On-device File I/O, data persistent and access using shared preferences, mobile databases such as SQLite and implementation for CRUD, and enterprise data access (via Internet/Intranet).

Unit 4 - TESTING & DISTRIBUTION OF MOBILE APPS (02)
Debugging mobile apps, White box testing, Black box testing, and Unit testing for Android. Versioning, signing and packaging mobile apps, distributing apps on mobile market place, Google play store.

Section II : Cross platform mobile application development using Xamarin

Unit 5 - C# PROGRAMMING GUIDE (04)
Inside a C# Program, Main() and Command-Line Arguments, Statements, Expressions, and Operators, Types, Classes and Structs, Interfaces, Inheritance and Polymorphism in C#, Delegates,

Arrays, Strings, Properties, Indexers, Events, Generics, Iterators, Namespaces, Assemblies in .NET, Attributes, Collections, Exceptions and Exception Handling, Multi-threading.

Unit 6 - GETTING STARTED WITH XAMARIN (04)

Introducing native cross-platform applications with Xamarin, Hello MVVM—creating a simple cross-platform app using MVVM, MVVM—the model-view–view model design pattern, Hello again, MVVM—understanding and enhancing our simple MVVM app, An introduction to multithreading for Xamarin apps.

Unit 7 - BUILDING APPS (06)

Designing MVVM cross-platform apps, Building cross-platform models, Building cross-platform view models, Building simple Android views, Building more advanced Android views, Building simple iOS views, Building more advanced iOS views

Unit 8 - FROM WORKING CODE TO THE STORE (02)

Running mobile apps on physical devices, Testing mobile apps using Xamarin UITest, Using App Center to build, test, and monitor apps, Deploying apps to beta testers and the stores.

ISE Evaluation: ISE Evaluation for the course will consists of three hands on tests based on the topics mentioned in the syllabus.

Internal Continuous Assessment (ICA): Minimum 10 assignments requiring students to design, develop and test cross platform mobile applications for real world problem/use-case/scenario.

Text Books :

1. Android Application Development - All in one for Dummies, Barry Burd
2. Mobile Apps Development, Anubhav Pradhan, Anil V Deshpande
3. Xamarin in Action: Creating native cross-platform mobile apps by Jim Bennett, Manning Publications; 1st edition.

Reference books :

1. Android Developer Tools Essentials by Mike Wolfson (O'Reilly Media)
2. Embedded Android-Porting, Extending, and Customizing, Karim Yaghmour, (O'Reilly Media)

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e-resources :

1. Android Developer Resources: http://developer.android.com
2. Xamarin documentation - Xamarin | Microsoft Docs: https://docs.microsoft.com/en-gb/xamarin/

Modalities for conducting End Semester Examination/Practical Oral Examination (POE):

- Practical and Oral Examination will be conducted by a panel of examiners assigned by university. A pair of examiners shall assess a batch @36 students in a day.
- The chairman shall prepare problem statements for a batch adhering to following guidelines:

1. At least Four Problem statements shall be set for a batch.
2. Problem statements shall be set in the context of course outcomes as defined in the course.
3. Problem Statements shall not be direct statements stating implement concept/topic etc.
4. Problem Statements shall be based on real world problem/use case/scenario etc.
5. Problem statement shall be at the minimum cognitive level of 'Apply' & above.
6. Problem Statements must be well described with no ambiguity and shall be of unseen nature.
7. Problem statements formulated shall be solvable by faculty in 2 hours and average students in 2.5 hrs in the examination duration.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology
Third Year B.Tech. (Computer Science & Engineering)
Semester-I
SELF LEARNING MODULE – I (H.S.S.)
SL31A-1 ECONOMICS

Teaching Scheme **Examination Scheme**
Credits :- 2 Credits **ESE:** 50 Marks

Course Outcomes:
Upon completion of this course, students will be able to
1. Identify the Basic Economic problems, Resource Constraints.
2. Apply various theories of economics for economic growth.
3. Identify causes of Inflation consequence and remedies.
4. To assess the impact of International Trade, foreign exchange on Indian economy.

Unit 1: Introduction
History of Economic thought, Basic Economic problems, Resource Constraints and Welfare maximization
Nature of Economics: Positive and Normative Economics, Micro and Macro Economics, Basic concepts in Economics, The role of State in economic activity, Market and Government failures, New economic Policy in India.

Unit 2: Theories of Economics
Theory of utility and consumer's choice, Theories of Demand, supply and market equilibrium, Theories of firm, production and costs, Market structures, Perfect and imperfect competitions, oligopoly, monopoly.

Unit 3: Macroeconomics
An overview of Macroeconomics, measurement and determination of national income, Consumption, saving and investment.

Unit 4: Banking & Inflation.
Commercial and Central Banking, Relationship between money, output and prices. Inflation causes, consequences and remedies.

Unit 5: International Influences on Economics
International Trade, foreign exchange and balance payments, stabilization policies, Monetary, Fiscal and exchange rate policies.

ASSIGNMENTS
Students shall complete five assignments, based on syllabus. (One assignment for every unit of the syllabus)
In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

Text books:
1. Economics: P.A. Samuelson & W.D Nordhaus, McGraw Hill, New York, 1995
2. Modern Microeconomics : A. Koutsoyiannis, Macmillan,1975

Reference Books:

1. Microeconomics: R. Pindyck and D.L. Rubinfield, Macmillan New York, 1989
2. Microeconomics: Gordon, 4th edition, Little Brown & Co., Boston,1987
3. The Organization of Industry: William F. Shughart II, Richard D. Irwin, Illinois, 1990

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology
Third Year B. Tech. (Computer Science & Engineering)
Semester – I
SELF LEARNING –I (HSS)
SL31A-2 : INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY DEVELOPMENT AND MANAGEMENT

Teaching Scheme
Credits: 2 Credits

Examination Scheme
ESE : 50 Marks

Course Outcomes:

Upon completion of this course, students will be able to,

1. Appreciate the intellectual property rights coming out of research and intellectual works
2. Demonstrate their knowledge about the process of acquiring the patents and copyrights for the innovative works.
3. Elaborate the role of Indian IPR system and role of WTO in protecting IntellectualProperty Rights
4. Avoid the plagiarism in their thesis, research papers etc. which can be questioned legally.

Unit 1:

Dynamics of Knowledge evolution, creation of ownership domains in the knowledge space using various instruments of IPR

Unit 2:

Outlines concepts of confidentiality and information security, explores their role in technology development and transfer integrating Intellectual Property in project planning, execution & commercialization

Unit 3:

Discussion on the shifting paradigms of R&D and their linkage to IPR, Introduction to concepts of Valuation of IP & Value Realization,

Unit 4:

Comparison the Indian IPR system with international IPR frameworks especially in the context of WTO, followed by a few sessions on IPR litigations both for the enforcement of rights and business strategy.

Unit 5:

Discussion on contentious issues of current interest such as Biotechnology and Intellectual Property, Protection of Traditional Knowledge, IPR and Electronic Commerce, TRIPS and Access to Medicines, Copyright issues in creative works, etc.

ASSIGNMENTS

Students shall complete five assignments, based on syllabus. (One assignment for every unit of the syllabus)

In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

Text books:

1. Prabuddha Ganguli: Intellectual Property Rights Unleashing the Knowledge Economy. TataMcGraw Hill, New Delhi, 2001
2. Prabuddha Ganguli: Gearing Up for Patents The Indian Scenario. Universities Press India Ltd., Hyderabad, 1998
3. P. Narayan: Patent Law. Eastern Law Co., Calcutta

Reference Books:

1. Global Dimensions of Intellectual Property Rights in Science and Technology, Author: National Research Council , National Academies Press, 1993.
2. Technology Transfer: Intellectual Property Rights, C Sri Krishna, ICFAI University press(2008)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology
Third Year B. Tech. (Computer Science & Engineering)
Semester – I
SELF LEARNING –I (HSS)
SL31A-3 : INTRODUCTION TO SOCIOLOGY

Teaching Scheme
Credits: 2 Credits

Examination Scheme
ESE : 50 Marks

Course Outcomes:
Upon completion of this course, students will be able to -

1. Interpret the effect of various social phenomena on sociology
2. Elaborate the role of urbanization on the society
3. Appreciate the need of social institutions for better society.
4. Assess the role of modernization, industrialization, environmental/ecological changes in the development of society.

Unit 1:
What is sociology, some sociological concepts: social structure, status, role, norms, values etc., Socialization, and culture and change.
Social stratification - various approaches and concept of social mobility.

Unit 2:
Population and society - Trends of demographic change in India and the world, Human Ecology, Trends of Urbanization in the developing countries and the world.

Unit 3:
Major social institutions - Family and marriage, caste and tribe and organizations:
i. Formal organization (bureaucracy)
ii. Informal Organization

Unit 4:
Processes of social change- Modernization (including Sanskritization), industrialization, environmental/ecological changes and development.

Unit 5:
Social movements - protest movements, reformist movement and radical movements in India.

ASSIGNMENTS
Students shall complete five assignments, based on syllabus. (One assignment for every unit of the syllabus)
In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

TEXT BOOKS

1. Sociology, L. Broom, P. Selznick and D. Dorrock, 11th Edn. 1990 (Harper International).
2. Sociology: Themes and Perspectives, M. Haralambos, Oxford University Press, 1980.
3. General Introduction to Sociology, Guy Rocher, A. , MacMillan, 1982.

REFERENCE BOOKS

1. Social movements in India, vols. 1-2, 1984, M.S.A. Rao, Manohar Publications.
2. Society in India, David Mandelbaum, 1990, Popular Publications.
3. Social change in modern India, M.N. Srinivas, 1991, Orient Longman Publications.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology
Third Year B. Tech. (Computer Science & Engineering)
Semester – I
SELF LEARNING –I (HSS)
SL31A-4 : STRESS AND COPING

Teaching Scheme
Credits: 2 Credits

Examination Scheme
ESE : 50 Marks

Course Outcomes:
Upon completion of this course, students will be able to,
1. Identify various sources and nature of a stress.
2. Elaborate the effects of medical, psychological and behavioral stress.
3. Appreciate the social support to mitigate the stress.
4. Adopt various stress management techniques.

Unit 1:
Concept of stress-current and historical status. The nature of the stress response.

Unit 2:
Common sources of stress biological, personality and environmental.

Unit 3:
Coping styles defensive behaviors and problem-solving. Consequences of stress - medical, psychological and behavioral.

Unit 4:
The role of social support in mitigating stress.

Unit 5:
Stress management techniques-relaxation, meditation, cognitive restructuring, self-control, bio-feedback and time management, Preparing stress profile of a student.

ASSIGNMENTS
Students shall complete five assignments, based on syllabus. (One assignment for every unit of the syllabus)
In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

TEXT BOOKS

1. Walt, S. "Stress Management for Wellness". Harcourt Brace & Jovanovich, N.York, 1994.
2. D. Girdano and G. Everly., "Controlling Stress and Tension", Prentice-Hall, 1986.
3. Monat and R. Lazarus, "Stress and Coping: An Anthology", Columbia Univ. Press, 1985.

REFERENCE BOOKS

1. Weisman, "The Coping Capacity", Human Services Press, 1984.
2. Stress and Coping: The Indian Experience, D.M. Pestonjee, SAGE India; Second edition (1998)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology
Third Year B. Tech. (Computer Science & Engineering)
Semester – I
SELF LEARNING –I (HSS)
SL31A-5 : PROFESSIONAL ETHICS & HUMAN VALUES

Teaching Scheme | **Examination Scheme**
Credits: 2 Credits | ESE : 50 Marks

Course Outcomes:

Upon completion of this course, students will be able to,

1. Inculcate the human values in their behavior.
2. Demonstrate the Engineering ethics in their professional practice.
3. Practice the safety and responsibility and professional rights in their professional practice.
4. Incorporate the code of ethics of Global organizations such as ASME, ASCE, and IEEE

Unit 1: Human Values

Morals, Values and Ethics, Integrity, Work Ethics, Service Learning, Civic Virtue, Respect for others, Living Peacefully, Caring, sharing, Honesty, Courage, Valuing Time, Cooperation, Commitment, Empathy, Self-Confidence, Character, spirituality

Unit 2: Engineering Ethics

Senses of engineering ethics, Variety of Moral Issues, Types of inquiry, Moral Dilemmas Moral Autonomy, Kohlberg's Theory, Gilligan's Theory, Consensus and Controversy, Models of Professional Roles, Theories about Right Action, Self Interest , Customs and Religion.

Unit 3: Safety, Responsibilities and Rights

Safety and Risk, Assessment of safety and Risk, Risk Benefit Analysis and Reducing Risk, The Three Mile Island and Chernobyl Case Studies.

Collegiality and Loyalty, Respect for Authority, Collective Bargaining, Confidentiality, Conflicts of Interest, Occupational Crime, Whistle Blowing, Professional Rights – Employee Rights, Intellectual Property Rights (IPR) – Discrimination

Unit 4: Global Issues

Multinational Corporations, Environmental Ethics, Computer Ethics, Weapons Development, Engineers as Managers, Consulting Engineers, Engineers as Expert Witnesses and Advisors, Sample Code of Ethics of ASME, ASCE, IEEE, Institution of Engineers (India), etc.

ASSIGNMENTS

Students shall complete five assignments, based on syllabus. (One assignment for every unit of the syllabus)

In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

Text books:

1. Bayles, M.D.: Professional Ethics, California: Wadsworth Publishing Company, 1981.
2. Koehn, D.: The Ground of Professional Ethics, Routledge, 1995.
3. R.S. Naagarazan, A Text Book of Professional Ethics & Human Values, New Age International, 2006

Reference Books:

1. Camenisch, P.F.: Grounding Professional Ethics in a Pluralistic Society, N.Y.: Haven Publications, 1983.
2. Wuest, D.E.: Professional Ethics and Social Responsibility, Rowman & Littlefield, 1994

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology
Third Year B.Tech. (Computer Science & Engineering)
Semester – II
CS321 – SYSTEM PROGRAMMING

Teaching Scheme	**Examination Scheme**
Lectures – 3 Hrs./week, 3 Credits	ESE – 70 Marks
Practical – 2 Hrs./week, 1 Credit	ISE – 30 Marks
	ICA - 25 Marks

Introduction: This course introduces Language Processing activities, which helps to understand the basics of design and development of various professional languages, along with understanding of all the system software involved in executing a particular code written in a particular language.

Course Prerequisite: Students should have knowledge of Data Structures, Computer Organization, Microprocessors, Advanced C Concepts.

Course Outcomes:
Student will be able to
1. Describe the basic principles of system software and tools.
2. Implement Assembler and Macros to provide program generation facilities.
3. Use LPDT tools for a relevant problem to generate a scanner and parser.
4. Apply linkers and loaders for execution of a program.

SECTION - I

Unit 1 - Language Processors **(08)**
Introduction, language processing activities, Fundamentals of language processing, Fundamentals of language, Specification, language Processor development tools, UNIX programming Tools-lex & yacc, Recognizing words with Lex, Parser lexer communication, the parts of Speech lexer, A Yacc parser, The rules section of yacc, running lex and yacc on Unix.

Unit 2 - Assemblers **(07)**
Elements of assembly language programming, A simple assembly scheme, Pass structure of assemblers, design of a two pass assembler, A single pass assembler for IBM PC.

Unit 3 - Macros and Macro Processors **(06)**
Macro definition and call, Macro Expansion, Nested macro calls, Design of Macro preprocessor-Design overview.

SECTION – II

Unit 4 - Compilers and Interpreters **(07)**
Aspects of compilation, compilation of expressions, code optimization, Static and dynamic memory allocation, Memory allocation in block structured languages (Scope Rules, Memory allocation and access, Dynamic pointer), Interpreters

Unit 5 – Linkers **(06)**
Relocation and linking concepts, design of a linker, Self-relocating programs, linking for overlays.

Unit 6 - Loaders **(07)**
Function of loader, General loader scheme, Absolute loader, Relocating loader, Direct linking loader, Dynamic loading, Design of direct linking loader.

Internal Continuous Assessment (ICA) :

ICA consists of minimum 8 to 10 experiments based on the following guidelines.

1. Design Lex specifications for the tokens – keywords, identifiers, numbers, operators, white spaces.
2. Implementation of simple Lexical Analyzer in C which will generate the different tokens.
3. Implementation of syntax recognizer using grammar rules.
4. Simulation of text editor.
5. Introduction of TASM.
6. Symbol Table generation for *.c or *.asm file.
7. Design and Implementation of two pass assembler.
8. Design and Implementation of Single pass assembler.
9. Implementation of Macros.
10. Implementation of Nested macros.
11. Implementation of Toy-code generator.
12. Simulation of linkers.
13. Simulation of loaders.

Text Books:

1. System Programming and operating systems, D.M. Dhamdhere, 2nd Edition (TMGH) (Unit-1,2,3,4,5)
2. System Programming, J. J. Donovan, Mc-Graw Hill, (Unit 6)
3. Unix Programming Tools – lex & yacc , John R. Levine, Tony Mason & Doug Brown, (O"REILLY) (Unit 1)

Reference Books:

1. System Software - An Introduction to Systems Programming, Leland L. Beck, 3rd Edition (Pearson Education)
2. System Programming with C and Unix, Adam Hoover, Pearson,2010
3. Language Implementation Patterns, Terence Parr, SPD,2009

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology
Third Year B.Tech. (Computer Science & Engineering)
Semester – II
CS322 – INTERNET OF THINGS

Teaching Scheme	**Examination Scheme**
Lectures – 3 Hrs./week, 3 Credits	ESE – 70 Marks
Practical – 2 Hrs./week, 1 Credit	ISE – 30 Marks
	ICA - 25 Marks

PREREQUISITES :
1. Fundamentals of Communication and computer network.
2. Micro controller, Network Security and Web programming.

COURSE OUTCOMES:
At the end of this course, students will be able to
1) Explain what Internet of Things is.
2) Describe components of IoT Architecture and platforms of IoT ecosystem.
3) Choose Sensors and actuators for a given IoT system.

SECTION – I

Unit 1: Introduction to IoT **(06)**
Definition, Applications and characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels

Unit 2: IoT Architecture and Communication Technologies **(07)**
IoT Architecture by Oracle, Sources of IoT, M2M Communication, IoT/M2M systems, layers and design standards, Communication Technologies

Unit 3: Elements of IoT **(08)**
Sensor Technology, Participatory Sensing – Industrial IoT and Automotive IoT, Actuator, Sensor Data Communication Protocols, RFID, WSN Technology

SECTION – II

Unit 4: IoT Standards and Connectivity **(08)**
Constrained Application Protocols (CoAP), Representational State Transfer (REST), Zigbee / IEEE 802.15.4, Bluetooth and its low energy profile, IEEE 802.15 WPAN, 6LoWPAN

Unit 5: IoT Security and Business model **(07)**
Introduction to IoT Privacy, Security and Vulnerabilities, Use case and Misuse cases, IoT Security Tomography and Layered attacker model, Business model and business model innovation for IoT, Value Creation in the IoT, Business model scenarios for IoT

Unit 6: Case Studies **(06)**
Domain Specific IoTs: Home Automation, Smart Cities, Environments, Energy, Agriculture, Industry, Health and Lifestyle

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Internal Continuous Assessment (ICA) :
Minimum 8-10 assignments on the above topics.

Text Book :

1. Internet of Things: A Hands-on approach, ArshdeepBahga, Vijay Madisetti, Universities Press (Unit 1 and 6)
2. IoT Architecture and Design Principles, Raj Kamal, McGraw Hill Education (Unit 2, 3 & 5)
3. Building the IoT with IPv6 and MIPv6, Daniel Minoli, Wiley Publication (Unit 4)

Reference Books:

1. The Internet of Things: Applications and Protocols, Wiley publications. Author(s): Oliver Hersent, David Boswarthick, Omar Elloumi

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Third Year B.Tech (Computer Science & Engineering)
Semester-II
CS323 - SOFTWARE ENGINEERING

Teaching Scheme
Lecture: 3 Hrs/week, 3 Credits

Examination Scheme
ESE: 70 Marks
ISE: 30 Marks

Introduction : Current Software engineering methods and techniques have made us much better at building large and complex systems than we were. However, there are still too many projects that are late, over budget, and do not deliver the software that meets customer's needs. The main aim of introducing this course is to understand the methods, processes, techniques, and approaches which are required to develop high-quality software products within schedule and budget. On top of that this course ensures understanding of the complete Software Development Life Cycle (SDLC) for the development of software products as per the customer's needs. Further, it ensures the knowledge of various quality standards used in the software system and the Agile Project Management Process.

Course Prerequisite:
Student shall have undergone a course on Object Oriented Programming through C++. An understanding of Object Oriented Analysis and Design and Programming skills.

Course Outcomes:
At the end of the course Student will be able to
1. Apply the appropriate lifecycle model for software development.
2. Prepare SRS and SDS accordingly for a given problem.
3. Apply appropriate software testing method.
4. Ensure the quality of a product by applying the quality management process.

SECTION-I

Unit 1 - Introduction to Software Engineering (11)

Introduction, The Problem Domain, Software Engineering Challenges and Approach, Software Process, Characteristics of Software Process, Software Development Process Models: Waterfall model, Prototype model, Iterative development model: Incremental Model, Spiral model, Rational unified Process model, Time Boxing model, Agile process model.

Unit 2 - Software Requirement Analysis & Specification (06)

Need of SRS, Characteristics of Good SRS, Requirement Process, Requirements specification, Functional Specification with Use Cases, Other Approaches for Analysis: Data Flow Diagram, EntityRelationship Diagram,

Unit 3 - Software Architecture and Design (08)

Introduction to Software Design, Software Architecture: Role of Software Architecture, Architecture Views, Component & Connector View, Architecture Style for Component & Connector view, Documenting Architecture Design, Design Concepts: Design Principles, Conceptual Design and Technical Design, Coupling, Cohesion, Open Closed Principle, Function-Oriented Design, Object Oriented Design, High Level Design, Detailed Design, Verification, Metrics.

SECTION-II

Unit 4 - Testing **(04)**

Testing Fundamentals, Testing Process, Black-Box Testing, White-Box Testing, Object-Oriented Software testing methods, Functional testing, Unit testing, System testing, User satisfaction testing.

Unit 5 - Project Planning and Management **(08)**

Project management process, The Inspection and Audit Process, Software Configuration Management process, Effort estimation, Project Schedule and Staffing, Quality planning: Quality Concepts, Qualitative quality management planning. CMM project management process, Risk Management Planning, Project Monitoring Plan, Detailed Scheduling.

Unit 6 - Agile Project Management **(08)**

Introduction to APM, Implementation, Iterative Project Management Life Cycle, Adaptive Project Management Life Cycle, Adaptive & Integrating the APM toolkit, The Science of Scrum, New Management Responsibilities.

Text Books:

1. An Integrated Approach to Software Engineering, Pankaj Jalote, 3rd Edition (Narosa Publishers)
2. Effective Project Management Traditional, Agile, Extreme, Robert K. Wysocki, 6th Edition,WILEY INDIA
3. Software project management in practice, Pankaj Jalote Pearson India Ltd.

Reference Books :

1. Software Engineering, Ian Sommerville, 6th edition, Pearson education Asia.
2. Software Engineering Fundamentals, Ali Behforooz and Frederick j. Hudson (Oxford UniversityPress).
3. Project Management with Scrum, Ken Schwaber.
4. Software Engineering-A precise approach, Pankaj Jalote Wiley Precise Precise Textbook.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Third Year B.Tech (Computer Science & Engineering)

Semester-II

CS324A - Professional Elective – I : Cloud Computing

Teaching Scheme	**Examination Scheme**
Lectures : 3 Hours/Week, 3 credits	ESE - 70 Marks
Practical : 2 Hour/Week,1 credit	ISE - 30 Marks
	ICA-25 marks

Introduction:

Cloud computing has recently emerged as one of the buzz words in the ICT industry. Numerous IT vendors are promising to offer computation, storage, and application hosting services and to provide coverage in several continents, offering service-level agreements (SLA)-backed performance and uptime promises for their services.

The course introduces to introduction to Cloud Computing, Virtual Machines Provisioning and Migration Services, understanding Services and Applications by Type, Integration of Private and Public Clouds, Understanding of Cloud Security, Legal Issues in Cloud Computing.

Prerequisites:

Programming Skills, Database fundamentals & SQL, Operating Systems and Networking.

COURSE OUTCOMES:

At the end of this course, students will be able to

1. Analyze various hardware & software to choose appropriate one for implementation of cloud environment.
2. Identify different cloud based solutions to meet a set of given requirements.
3. Determine financial and technological implications for selecting cloud computing platforms.
4. Identify Security and Privacy concerns in cloud computing for data management.

SECTION I

Unit1 : Introduction to Cloud Computing BU (8)

Cloud Computing in a Nutshell, Roots of Cloud Computing, Layers and Types of Clouds, Desired Features of a Cloud, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers, Challenges and Risks, Migrating into a Cloud, Introduction, Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud.

Unit 2 : Virtual Machines Provisioning and Migration Services (7)

Virtual Machines Provisioning and Manageability, Virtual Machine Migration Services, VM Provisioning and Migration in Action, Provisioning in the Cloud Context.

Unit 3 : Understanding Services and Applications by Type (8)

Defining Infrastructure as a Service (IaaS), IaaS workloads, Pods, aggregation, and silos, Defining Platform as a Service(PaaS), Defining Software as a Service (SaaS), SaaS characteristics, Open SaaS and SOA, Salesforce. Command CRM SaaS, Defining Identity as a Service,What is an identity? Networked identity service classes, Identity system codes of conduct, IDaaS interoperability, User authentication Authorization markup languages, Defining Compliance as a Service(CaaS)

SECTION II

Unit 4: Integration of Private and Public Clouds (8)

Aneka: Introduction, Technologies and Tools for Cloud Computing, Aneka Cloud Platform, Aneka Resource Provisioning Service, Hybrid Cloud Implementation. Comet: Comet Cloud Architecture, Autonomic Behavior of Comet Cloud, Overview of Comet Cloud-based Applications.

Unit 5: Understanding of Cloud Security (8)

Securing the Cloud, The security boundary, Security service boundary, Security mapping, Securing Data, Brokered cloud storage access, Storage location and tenancy, Encryption Auditing and compliance, Establishing Identity and Presence, Identity protocol standards, Windows Azure identity standards

Unit 6:Legal Issues in Cloud Computing (6)

Introduction, Data Privacy and Security Issues, Cloud Contracting models, Jurisdictional Issues Raised by Virtualization and Data Location, Commercial and Business Considerations-A Cloud User's Viewpoint.

Internal Continuous Assessment (ICA):

Minimum 10 assignments must be of nature, which require students to identify and implement the use case scenarios for Cloud and Cloud enabled technologies mentioned above.

Text Book :

1. Cloud Computing : Principles and paradigms By Raj Kumar Buyya, ames Broberg, Andrezei M.Goscinski, 2011 Cloud Computing, By Michael Miller, 2008. [1,2,4,6]
2. Cloud Computing Bible by Barrie Sosinsky by WileyPublications [3,5]
3. https://arpitapatel.files.wordpress.com/2014/10/cloud-computing-bible1.pdf
4. Cloud Computing for dummies, By Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper,2009. Download E-book
5. Cloud Computing: Black Book, by Kalish Jayaswal, J. Kallakurchi, Donald J. Houde, Dr. Deven Shah Kogent learning Solutions Inc. Dream techpress

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Reference Book:

1. Cloud Security, A comprehensive Guide to Secure Cloud Computing by Krutz, Ronald L.; Vines, Russell Dean
2. Cloud computing : Implementation, management and security By Ritting house,John,W.
3. Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill, 2013

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Third Year B.Tech (Computer Science & Engineering)

Semester-II

CS324B - Professional Elective – I : Augmented Reality and Virual Reality

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours /Week, 3 credits	ESE - 70 Marks
Practical: 2 Hour/Week, 1 credit	ISE - 30 Marks
	ICA - 25 Marks

Introduction:

This course will introduce Virtual Reality and Augmented Realty, with an emphasis on designing interactive virtual and augmented reality experiences. This will course will cover the history of the area, fundamental theory, interaction techniques, and specific application areas.

Prerequisite:

Basic Programming knowledge

COURSE OUTCOMES:

After completion of course, students would be able:

1. To demonstrate the basic concept and framework of virtual reality
2. To analyse the hardware and software requirements for VR and AR
3. To use the different 3D interaction techniques.
4. To design 3D interfaces
5. To explore VR & AR applications

Unit 1 **(10)**

Virtual reality and virtual environments: the historical development of VR, scientific landmarks computer graphics, real-time computer graphics, virtual environments, requirements for VR, benefits of virtual reality.

Hardware technologies for 3D user interfaces: visual displays, auditory displays, haptic displays, choosing output devices for 3D user interfaces.

Unit 2 **(14)**

3D user interface input hardware: input device characteristics, desktop input devices, tracking devices, 3d mice, special purpose input devices, direct human input, home -brewed input devices, choosing input devices for 3D interfaces.

Software technologies: database - world space, world coordinate, world environment, objects - geometry, position / orientation, hierarchy, bounding volume, scripts and other attributes, VR environment - VR database, tessellated data, LODs, Cullers and Occluders, lights and cameras, scripts, interaction - simple, feedback, graphical user interface, control panel, 2D controls, hardware controls, room / stage / area descriptions, world authoring and playback, VR toolkits, available software in the market.

Unit 3 **(08)**

3D interaction techniques: 3D manipulation tasks, manipulation techniques and input devices, interaction techniques for 3D manipulation, design guidelines – 3D travel tasks, travel techniques, design guidelines - theoretical foundations of way finding, user centered way finding support, environment centered way finding support, evaluating way finding aids, design guidelines - system control, classification, graphical menus, voice commands, Gestrual commands, tools, mutimodal system control techniques, design guidelines, case study: mixing system control methods, symbolic input tasks, symbolic input techniques, design guidelines, beyond text and number entry.

Unit 4 **(07)**

Designing and developing 3D user interfaces: strategies for designing and developing guidelines and evaluation.

Advances in 3D user interfaces: 3D user interfaces for the real world, AR interfaces as3D data browsers, 3D augmented reality interfaces, augmented surfaces and tangible interfaces, agents in AR, transitional AR-VR interfaces - the future of 3D user interfaces, questions of 3D UI technology, 3d interaction techniques, 3d UI design and development, 3D UI evaluation and other issues.

Unit 5 **(04)**

Virtual reality applications: engineering, architecture, education, medicine, entertainment, science, training.

Text Books/References:

1. Paul Mealy, Virtual & Augmented Reality for Dummies, John Wiley & Sons.
2. Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual Reality
3. Applications: Foundations of Effective Design", Morgan Kaufmann.
4. Jan Erik Solem, Programming Computer Vision with Python, Shroff Publisher/O'Reilly Publisher
5. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach".
6. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, "3D User
7. Interfaces, Theory and Practice", Addison Wesley, USA

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Third Year B.Tech (Computer Science & Engineering)
Semester-II
CS324C - Professional Elective – I : Network Security

Teaching Scheme:
Lectures-3 Hours/week, 3 Credits
Practical - 2 Hours/ week,1 Credit

Examination Scheme
ESE-70 Marks
ISE - 30 Marks
ICA – 25 Marks

COURSE OUTCOMES :

At the end of course the student will be able to:

1. Describe the issues addressed by Network Security and understand the concepts of cryptography and Network security.
2. Apply cryptographic techniques and algorithms to provide security to the transmitted information.
3. Analyze the concepts of Authentication and Hash functions.
4. Analyze System level security issues.

SECTION-I

Unit – I **(08)**

Introduction: OSI Security Architecture, Classical Encryption techniques: Symmetric Cipher Model, Substitution Techniques, Transportation Techniques. Block Ciphers and Data Encryption Standards: Traditional Block Cipher Structure, The Data Encryption Standard, A DES Example, The Strength of DES. Advanced Encryption Standard: AES Transformation Functions, AES Key Expansion, An AES Example, AES Implementation.

Unit – II **(07)**

Public Key Cryptography and RSA: Principles of Public-Key Cryptosystems, The RSA Algorithm. Other Public-Key Cryptosystems: Diffie-Hellman Key Exchange, Elgamal Cryptographic System, Elliptic Curve Arithmetic, Elliptic Curve Cryptography, Pseudorandom Number Generation Based on an Asymmetric Cipher.

Unit – III **(07)**

Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithm (SHA), SHA-3.

SECTION-II

Unit – IV **(06)**

Message Authentication Codes: Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, Security of MACs, MACs Based on Hash Functions: HMAC, MACs Based on Block Ciphers: DAA and CMAC, Authenticated Encryption: CCM and GCM, Pseudorandom Number Generation Using Hash Functions and MACs. Digital Signatures: Digital Signatures, Elgamal Digital Signature Scheme, Schnorr Digital Signature Scheme, NIST Digital Signature Algorithm, Elliptic Curve Digital Signature Algorithm, RSA-PSS Digital Signature Algorithm.

Unit – V **(08)**

Network Access Control and Cloud Security: Network Access Control, Extensible Authentication Protocol, IEEE 802.1X Port-Based Network Access Control. Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN Overview, IEEE 802.11i Wireless LAN Security.

Unit – VI **(08)**

Electronic Mail Security: Internet Mail Architecture, Email Formats, Email Threats and Comprehensive Email Security, S/MIME, Pretty Good Privacy, DNSSEC, DNS-Based Authentication of Named Entities, Sender Policy Framework, Domain Keys Identified Mail. IP Security: Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange.

Internal Continuous Assessment (ICA) :

It should consist of the 08 practical based on following guidelines.

1. Implementation of Substitution Cipher
2. Implementation of Poly alphabetic Cipher (Vigenere Cipher and Vernam Cipher)
3. Implementation of Transposition Cipher
4. Implementation of Play fair Cipher
5. Implementation of Secure file transfer in Client/Server environment (use any one of above method for encryption and decryption)
6. Write a program to simulate RSA algorithm
7. Install and understand docker container

Text Books :

1. Cryptography And Network Security - Principles and Practices, William Stallings Pearson Education Limited, 7th Edition, 2017. ISBN-13: 978-0134444284 ISBN-10: 0134444280.
2. Cryptography and Network Security, Behrouz A. Forouzan, Tata McGraw-Hill, 2008, ISBN-13: 978-0-13-187319-3. RV College of Engineering® Digital Communication Engineering 10
3. Computer Security: Principles and Practice, William Stallings, Lawrie Brown, Pearson Education Limited, 4th Edition. ISBN-10: 9780134794105.
4. Cryptography and Network Security, Atul Kahate, Tata McGraw-Hill, 2003, ISBN-81:203-2186-3.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology
Third Year B.Tech (Computer Science & Engineering)
Semester – II
CS325 - Web UI and UX Technology

Teaching Scheme	**Examination Scheme**
Lecture : 2 Hours/week,2credits	ISE – 25 Marks
Practical : 2 Hours/week,1credits	ICA- 25 marks
	POE – 50 marks

Introduction :
Web Technology alludes to the different tools and techniques that are used during the process of communication between various sorts of gadgets over the web or internet. This course includes different technologies which help to build the front end and back end for websites and web applications.

COURSE OUTCOMES:
At the end of course, students will be able to
1. Design web pages using HTML, CSS and JavaScript
2. Analyse client / server-side scripting technologies to meet requirements of web application and choose an appropriate one.
3. Develop a web application using client / server-side scripting technologies for a given problem.

SECTION - I

Unit1 : UI Design **(05)**
HTML5: Features of HTML5, designing frontend using HTML5, Designing Graphics using Canvas API, Web storage(Session and local storage).
CSS3: Features of CSS3, Styling front end using CSS3
JavaScript: Syntax and Semantics of JavaScript, Document Object Model, Event Handling, Browser Object Model, Form handling, and validations. Object-Oriented Techniques in JavaScript. XML.
JSON : Introduction to AJAX. Introduction to JQuery and D3JS, Java Script in Browser.

Unit 2 : REACT JS **(05)**
Introduction, Fundamentals of React JS, Working with Lists and Conditionals, Styling React Components and Elements, Debugging React apps, Understanding HTTP Requests in React in the context of AJAX

Unit3 : Electron JS **(05)**
Introduction, Fundamentals of Electron JS, Creating cross-platform applications, Deployment of Electron JS application

SECTION - II

Unit4: RESTful Web Services **(05)**

REST and the Rebirth of HTTP, RESTful Architectural Principles, The Object Model, Model the URIs, Defining the Data Format, Assigning HTTP Methods, JAX-RS

Unit 5 : Introduction to Server-side JS Framework–Node.js **(05)**

Introduction - What is Node JS, Architecture, Feature of Node JS, Installation and setup, creating web servers with HTTP (Request & Response), Event Handling, GET & POST implementation - Connect to NoSQL Database using Node JS, Implementation of CRUD operations.

Unit 6 : PHP and MySQL **(05)**

Introduction to PHP5 and PHP6, variables and constants, program flow, functions, arrays and files and directories, Forms and Databases, integration with MySQL applications on PHP

Internal Continuous Assessment(ICA) :

1. Minimum 12 assignments based on the above topics.
2. Objective of assignments should be to test students' understanding and assess their ability to put into practice the concepts and terminologies learned.
3. Assignments must be of nature, which requires students to identify the use case scenarios for using technologies mentioned in the syllabus.

Text Books / Reference Books:

1. BenFrain,"ResponsiveWebDesignwithHTML5andCSS3",PacktPublication
2. Jon Duckett,"Java Script and jQuery : Interactive Front-End Web Development"
3. Official documentation of Open API standardhttp://spec.openapis.org/oas/v3.0.3
4. Official documentation of Node.js:https://nodejs.org/en/
5. Official documentation of Electron JS https://www.electronjs.org/docs
6. Official documentation of ReactJS https://reactjs.org/docs/getting-started.html
7. Official documentation of PHP https://www.php.net/docs.php
8. Web link for MongoDB : https://www.mongodb.com/

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology
Third Year B.Tech (Computer Science & Engineering)
Semester - II
OPEN ELECTIVE

CSO326A: PRINCIPLES OF MANAGEMENT: PRACTICING ETHICS, RESPONSIBILITY, SUSTAINABILITY

Teaching Scheme
Lectures : 2 lectures/week, 2 Credits

Examination Scheme
ESE – 50 Marks

Introduction:
This course introduces to the concepts of Ethics, Responsibility, Sustainability. Having a clear management structure in place is vital for any successful organization. Efficient andwell intentioned management sets the tone for the rest of the staff. It is common for the attitude approach of managers to filter through the entire organization, so having managers working in an exemplary way is an excellent.

Course Prerequisite: Basics of ethics

Course Outcomes:
Students will be able to
1. Develop cognizance of engineering ethics and professionalism.
2. Comprehend the knowledge of professional responsibilities.
3. Identify technological solution for global sustainability and sustainable development.

SECTION I

Unit 1 - Engineering Ethics **(07)**
Introduction, Definition of Engineering Ethics, Sense of Engineering Ethics, Varity of Moral issues, Type of Inquery,Moral Dilemmas, Moral Autonomy, Theories of Moral Autonomy. Computer Ethics: Power Relationships, Property and Privacy.

Unit 2 - Profession, Professional and Professionalism **(08)**
Models of Professional Roles, Profession, Professional and Professionalism Professional Responsibility: Self direction virtues, Public spirited virtues, Team work virtues and Proficiency virtues. Engineers as responsible experimenters.

SECTION II

Unit 3 - Technology Solution for Global Sustainability **(07)**
Resource Innovation, Resource Conservation, Resource Recycling, Switch over to Renewable Resources, Resource Technology Symbiosis, Indian mission mode initiatives, Indian water mission, Indian energy mission and Indian Environment mission.

Unit 4: Economic & Governance of Sustainable Development **(08)**
Basis of economic sustainability, Munasinghe hypotheses of sustainability, Economics of exhaustible resources, Some further economic critique, Consumers Cost and benefit from environment change, Some reflection on environment accounting, Governance for sustainable development, Corporate governance for sustainable development, Visionaryagenda for sustainable world.

Text Books:

1. Professional Ethics and Human Values –M.P.Raghavan
2. Sustainable Development :Environment ,Energy &Water Resources:M.K.Ghosh Roy
3. Demand-side management from a sustainable development perspective-Pierre Baillargen & Annie Caron.

Reference book:

1. Principles of Management: P.C.Tripathi and P.N.Reddy
2. Ethics, Indian Ethos and Management –S.Balachandran, K.C.R.Raja and B.K.Nair

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology
Third Year B.Tech (Computer Science & Engineering)
SEMESTER - II
OPEN ELECTIVE
CSO326B: ENGINEERING ECONOMICS AND MANAGEMENT

Teaching Scheme | **Examination Scheme**
Lectures : 2 lectures/week, 2 Credits | ESE – 50 Marks

COURSE OUTCOME:

At the end of the course, students will be able to

1. Demonstrate To basics of Economics and Management applied to engineering.
2. Apply concepts & principles of Economics with respect to a firm/organization Under different market conditions.
3. Apply concepts and principles of management to real world applications.

SECTION-I

Unit 1: **Introduction to Economics** **(04)**

Definitions, Nature, Scope, Difference between Microeconomics & Macroeconomics Theory of Demand & Supply; meaning, determinants, law of demand, law of supply, equilibrium between demand & supply Elasticity; elasticity of demand, price elasticity, income elasticity,cross elasticity

Unit 2: Theory of production **(04)**

Production function, meaning, factors of production (meaning & characteristics of Land, Labour, capital & entrepreneur), Law of variable proportions & law of returns to scale Cost; meaning, short run & long run cost, fixed cost, variable cost, total cost, average cost, marginal cost, opportunity cost. Break even analysis; meaning, explanation, numerical

Unit 3 : Markets and Money **(05)**

Types of markets & their characteristics (Perfect Competition, Monopoly, Monopolistic Completion, Oligopoly) National Income; stock and flow concept, NI at current price & constant price, GNP, GDP, NNP,NDP, Personal income, disposal income. Basic economic problems;
Monetary policy- meaning, objectives, tools, fiscal policy-meaning, objectives, tools Banking; meaning, types, functions, Central Bank- RBI; its functions, concepts; CRR, bank rate, repo rate, reverse repo rate, SLR

SECTION-II

Unit 4 : Introduction to Management **(06)**

Definitions, Nature, scope Management & administration, skill, types and roles of managers Management Principles; Scientific principles, Administrative principles, Maslow's Hierarchy of needs theory, Functions of Management; Planning, Organizing, Staffing, Directing, Controlling (meaning, nature and importance) Organizational Structures; meaning, principles of organization, types-formal and informal, line, line & staff, matrix, hybrid (explanation with merits and demerits), span of control, departmentalization

Unit 5: Introduction to Marketing Management **(05)**

Marketing Mix, concepts of marketing, demand forecasting and methods, market segmentation Introduction to Finance Management; meaning, scope, sources, functions

Unit 6: Introduction to Production Management **(06)**

Definitions, objectives, functions, plant layout-types & factors affecting it, plant location- factors affecting it. Introduction to Human Resource Management; definitions, objectives of manpower planning, process, sources of recruitment, process of selection, Corporate Social Responsibility; meaning, importance Business Ethics; meaning, importance.

Text Books :

1. Engineering Economics, R.Paneerselvam, PHI publication
2. Fundamentals of Management: Essential Concepts and Applications, Pearson Education, Robbins S.P. and Decenzo David A.
3. Economics: Principles of Economics, N Gregory Mankiw, Cengage Learning

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Reference Books:

1. Principles and Practices of Management by L.M.Prasad
2. Principles of Management by Tripathy and Reddy
3. Modern Economic Theory, By Dr. K. K. Dewett & M. H. Navalur, S. Chand Publications

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology
Third Year B.Tech (Computer Science & Engineering)
Semester - II
OPEN ELECTIVE
CSO326C : DISASTER MANAGEMENT

Teaching Scheme	**Examination Scheme**
Lectures : 2 lectures/week, 2 Credits	ESE – 50 Marks

COURSE OUTCOMES :

The students will be able to

1. Classify the types of disasters, its causes and impact on environment and society.
2. Acquaint a awareness regarding prevention or reduction of losses that occur due to hazards, disaster and emergencies.
3. Apply various disaster mitigation, preparedness and management techniques

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SECTION-I

Unit- 1 : Introduction to Disaster Management (5)

Concept of Disaster, Causes and Types of Disasters, Summary of Types of Disasters, Dimensions of Natural and Anthropogenic Disasters, Aims of Disaster Management, Principles and Components of Disaster Management.

Unit-2 : Disaster Management and Planning (5)

Nature, Scope and Management Process, Policy of Disaster Management, Types of Plans: Management by Objectives, SWOT Analysis, Hazard and Vulnerability Analysis, Identifying Crisis Situations: A Framework, Organisational Structure and Design, Authority, Delegation and Decentralisation.

Unit-3 : Disaster Mitigation (4)

Disaster Mitigation: Meaning and Concept, Structural Mitigation, Non-Structural Mitigation, Disaster Mitigation Strategies, Importance of Information and Communication in Disaster Mitigation, Emerging Trends in Disaster Mitigation.

SECTION-II

Unit-4 : Disaster Preparedness (4)

Introduction to Disaster Preparedness, The Three A's of Disaster Preparedness, Principles of Disaster Preparedness, Steps of Disaster Preparedness, Organisational Structure for Disaster Preparedness, Essential Services Preparedness and Logistical Readiness, Contingency Planning.

Unit-5 : Disaster Response (5)

Aims of Response, Control Process and Measurement, Security Issues, Profile of an Effective Crisis Leader, Leading at the Time of Crisis: Competencies and Challenges, Evacuation and Migration, Administering First-Aid, Handling of Injured at Hospitals: Challenges and Issues, Mobilization and Restoration of Essential Services, Search and Rescue Work.

Unit-6 : Disaster Recovery (5)

Introduction to Medium- and Long-Term Recovery Aspects, Community Participation in Defining Objectives and Their Priorities, Identifying and Ascertaining Impact of Disaster, Participative Rehabilitation: Physical and Social Infrastructure, Social and Economic Rehabilitation: Capacity Building for Reconstruction and Rehabilitation, Recovery and Rebuilding Works.

Text Books:

1. Disaster Management Dr. Mrinalini Pandey, WILEY, Publishers, ISBN: 9788126549245
2. Disaster Management S.C.Sharma Khanna Book Publishers, ISBN: 9789386173386
3. Disaster Management, R.B. Singh, Rawat Publication, New Delhi, 2000.

Reference Books :

1. Disaster Management in India – A Status Report, National Disaster Management Division, Ministry of Home Affairs, Govt. of India, 2004.
2. Disaster Management and Preparedness, Collins Larry R. and Scheind Thomas D. (2000)., Taylor and Francis, 2000
3. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology
Third Year B. Tech (Computer Science & Engineering)
Semester – II
CS327 : MINI PROJECT

Teaching Scheme
Practical: 2 Hrs/week, 1 Credit

Examination Scheme
ICA : 25 Marks
POE – 50 marks

Course Outcomes :

At the end of this course, student will be able to

1. Select mini project problem of societal relevance in selected domain
2. Design system architecture with due consideration of environment, sustainability and ethics.
3. Develop the solution to the problem using tools, resources and frameworks.
4. Engage in teamwork and communicate effectively, while observing professional ethics.
5. Inculcate habit of self study and lifelong learning.

Note :

1. There should be a group of preferably 4/5 students.
2. Students should be given projects in Hardware, Software, Embedded or any contemporary topic.
3. One guide should be allocated per group.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015 'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: ELECTRICAL ENGINEERING

Name of the Course: T.Y. B. Tech (Sem I & II)

(Syllabus to be implemented from w.e.f. June 2022)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Engineering & Technology
T.Y. B.Tech. (Electrical Engineering)

Choice Based Credit System Syllabus Structure of T. Y. B.Tech. Electrical Engineering W.E.F. 2022-2023

Semester I

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
EL 311	Power System III	3	-	-	3	30	70	-	100
EL 312	Linear Control System	3	-	-	3	30	70	-	100
EL 313	Advanced Microcontroller System	3	-	-	3	30	70	-	100
EL 314	Electromagnetic Engineering	3	1	-	4	30	70	25	125
EL 315	Open Elective-I	2	1	-	3	30	70	25	125
EL 316	Self-Learning Module-I			-	2		50		50
Sub Total		**14**	**2**	**-**	**18**	**150**	**400**	**50**	**600**
Laboratory Course Name							***ESE***		
							POE	***OE***	
EL 311	Power System III	-	-	2	1	-	-	25	25	50
EL 312	Linear Control System	-	-	2	1	-	-	25	25	50
EL 313	Advanced Microcontroller System	-	-	2	1	-	50	-	25	75
EL 317	Electrical Workshop	-	-	2	1	-	-	-	25	25
Sub Total		**-**	**-**	**8**	**4**	**-**	**100**		**100**	**200**
Grand Total		**14**	**2**	**8**	**22**	**150**	**500**		**150**	**800**

- *Abbreviations: L - Lectures, P –Practical, T - Tutorial, ISE - In semester Exam, ESE - End Semester Exam, ICA - Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)*

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Engineering & Technology
T.Y. B.Tech. (Electrical Engineering)

Choice Based Credit System Syllabus Structure of T.Y.B. Tech. Electrical Engineering W.E.F. 2022-2023

Semester II

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
EL 321	Electrical Machine Design	3	-	-	3	30	70	-	100
EL 322	Electrical Utilization	3	1	-	4	30	70	25	125
EL 323	Power Electronics & Industrial Drives	3	-	-	3	30	70	-	100
EL 324	Advanced Control Systems	3	-	-	3	30	70	-	100
EL 325	Open Elective-II	2	1	-	3	30	70	25	125
EL 326	Self-Learning Module-II	-	-	-	2	--	50	-	50
Sub Total		**14**	**2**	**-**	**18**	**150**	**400**	**50**	**600**
Laboratory Course Name							***ESE***		
							POE	***OE***	
EL 321	Electrical Machine Design	-	-	2	1	-	-	25	25	50
EL 323	Power Electronics & Industrial Drives	-	-	2	1	-	50	-	25	75
EL 324	Advanced Control Systems	-	-	2	1	-	-	-	25	25
EL 327	Mini Hardware Project	-	-	2	1	-	-	25	25	50
Sub Total		**-**	**-**	**8**	**4**	**-**	**100**		**100**	**200**
Grand Total		**14**	**2**	**8**	**22**	**150**	**500**		**150**	**800**

Abbreviations: L - Lectures, P –Practical, T - Tutorial, ISE - In Semester Exam, ESE - End Semester Exam, ICA - Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)

Self-Learning Module-II:

1. Hybrid Electric Vehicle Design
2. Electrical Safety
3. Solar Photovoltaic System Design & Installation
4. NPTEL Course/MOOC/University Defined Courses

Note –

- Batch size for the TE practical /tutorial shall be of 15 students. On forming the batches, if the strength of remaining student exceeds 7, then a new batch shall be formed.
- Vocational Training (evaluated at B.E. Part-I) of minimum 15 days shall be completed in any vacation after S.E. Part-II but before B.E. Part-I & and evaluated based on presentation as well as training report.
- Student shall select one as Self Learning Module at T.E. Part I and T.E. Part II each from Technical and Humanities and Social
- Sciences Group with at least one as Self Learning Module from the Humanities and Social Sciences Group
- Curriculum for Humanities and Social Sciences Self Learning Modules is common for all undergraduate programmes of faculty of Engineering and Technology
- Minimum four assignments for Self-Learning Modules at T.E. Part I and T.E. Part II shall be submitted by the students which shall be evaluated by a Module Coordinator assigned by institute / department
- Project group for T.E.(Electrical) Part II Mini Project shall not be of more than three students
- Project group for B.E.(Electrical) Part I and Part II shall not be of more than FOUR students.
- ICA shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable
- Open Elective I & II shall be common and open for the students of the branches – Electronics Engineering, Electronics & Telecommunication Engineering and Electrical Engineering. Students of these branches can take any of these Open Electives. Syllabus and university examination question will be same for all these branches.

List of Open Electives

Sr. No.	Open Elective I	Open Elective II
1	Information Technology & Management	Operating Systems
2	Advanced Electrical Machines	Renewable Energy Sources
3	Business Ethics	Fiber Optic Communication
4	Managerial Economics	Sensors and Applications

DETAILED SYLLABUS

FOR

T.Y. B.Tech. (ELECTRICAL ENGINEERING)

PART – I

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B.Tech. (Electrical) Semester-I
POWER SYSTEM-III

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week,3 Credits	**ESE –** 70 Marks
Practical: - 2 Hrs/Week, 1 Credit	**ICA -** 25Marks
	ISE - 30Marks
	OE - 25Marks

Course Objectives

1. To draw a single line diagram of complex 3-phase power system network and represent various power system equipment in their equivalent circuit models.
2. To provide the solution against the different faults occurred on the power system.
3. To enhance their ability to analyze complete load flow problem of a given sample power network.
4. To get familiar with the complete behavior of the power system network & power system equipment by stability analysis under various conditions.

Course Outcomes: On completion of the course, learner will be able to-

1. Draw a single line diagram of a given power system network.
2. Evaluate the required circuit breaker rating under different fault conditions.
3. Analyze power flow equation for the solution of different load flow problem.
4. Analyze the steady state and transient stability of a power system using analytical methods.

SECTION-I

Unit 1– Representation of Power System Components **No. of Lectures – 08**

- **Prerequisite:** Vectors, AC Circuit Fundamentals, Working principles of AC and DC Machines.
- **Objectives:**
  1. To get familiar with the fundamental concepts of AC Circuits as well as apply the knowledge of AC machines in the study of power system analysis.
  2. To draw a single line diagram of complex 3-phase power system network.
  3. To develop a Per Unit (PU) representation of a given sample power system network.
  4. To analyze impact of admittance in an interconnected network and develop step by step algorithm of bus impedance matrix.
- **Course Outcomes: On completion of the course, learner will be able to-**
  1. Apply fundamentals of AC Circuits to power system and draw Impedance diagram of a given power system by applying the knowledge of AC machines.
  2. Draw a single line diagram of a given power system network.
  3. Develop per unit impedance diagram of a given power system network.
  4. Write an impact of admittance in an interconnected network and develop step by step algorithm of bus impedance matrix
- **Unit Content:**

  Power in single phase & three phase circuit, Complex Power, Complex Power Balance, Equivalent circuits - synchronous machines, Transmission line, Transformers and Loads, Single line diagram of power system, reactance/impedance diagram, per unit system, per unit impedance diagram of power system, Per unit representation of transformer.

  Introduction of Network Matrices, Formation of Y-BUS by method of inspection and method of singular transformation, Formation of Bus Impedance matrix by step-by-step building algorithm, formation of modified bus impedance matrix.
- **Content Delivery Methods:**

  Chalk and talk, power point presentations
- **Assessment Methods:**

  Numerical problems and derivations related to per unit system and its representations.

Unit 2 - Symmetrical Faults Analysis **No. of lectures – 05**

- **Prerequisite:** Equivalent circuit of power system, single line diagram, per unit impedance diagram.
- **Objectives:**
  1. To introduce students' concept of faults and its impacts on power system.
  2. To evaluate required rating of circuit breaker at different locations in power system.
  3. To analyze transients on a transmission line.
  4. To synthesize behavior of synchronous machine during short circuits with and without load.
- **Course Outcomes: On completion of the course, learner will be able to-**
  1. Differentiate system behavior under steady state and transient condition.
  2. Obtain the required circuit breaker rating by calculating the fault level at different locations in power system.
  3. Analyze transients on a transmission line.
  4. Develop a solution against short circuit on a synchronous machine connected with and without load.
- **Unit Content:**

  Introduction of symmetrical faults, percentage reactance, short circuit KVA, Reactor control of short circuit currents, selection of circuit breaker rating, transients on a transmission line, Short-Circuit currents and the reactance of synchronous machines with and without load.
- **Content Delivery Methods:**

Chalk and talk, power point presentation.

- **Assessment Methods:**

Numerical problems and derivation related to above Content.

Unit 3- Symmetrical Components **No. of lectures – 08**

- **Prerequisite:** Equivalent circuit of power system, single line diagram, per unit impedance diagram.
- **Objectives:**
  1. To enable students need of symmetrical components with its significance.
  2. To evaluate symmetrical components of unbalanced vector quantities.
  3. To impart knowledge of sequence impedance and sequence networks of various components used in power system.
  4. To prepare sequence networks of a given sample power system network.
- **Course Outcomes: On completion of the course, learner will be able to-**
  1. Demonstrate need of symmetrical components with its significance.
  2. Calculate symmetrical components of unbalanced vector quantities.
  3. Draw sequence networks of various components used in power system.
  4. Draw and analyze sequence networks of a given sample power system network.
- **Unit Content:**

  Introduction, Resolution of unbalanced phasors into their symmetrical components, Power in terms of symmetrical components**,** Analysis of balanced and unbalanced loads against unbalanced 3 phase supply, Sequence impedances and networks of power system elements like alternator, transformer, and transmission line.
- **Content Delivery Methods:**

  Chalk and talk, power point presentations, animation on wave propagation.
- **Assessment Methods:**

Numerical problems and derivation related to symmetrical components, Sequence impedances and networks.

SECTION-II

Unit 4 - Unsymmetrical Faults **No. of lectures – 07**

- **Prerequisite:** per unit impedance diagram, symmetrical components, Sequence impedances and networks.
- **Objectives:**
  1. To get familiar with different unsymmetrical faults on power system.
  2. To make student understand behavior of power system under unsymmetrical faults
  3. To analyze short circuit calculations of different electrical quantities in power system
  4. To select rating of circuit breaker at different locations in power system.
- **Course Outcomes: On completion of the course, learner will be able to-**
  1. Derive fault current equations under various unsymmetrical faults.
  2. Calculate unsymmetrical fault currents and voltages.
  3. Select required rating of circuit breaker for protection against fault.
  4. Differentiate various unsymmetrical faults with their significance.
- **Unit Content:**

  L-G, L-L, L-L-G faults on an unbalanced alternator with and without fault impedance, Unsymmetrical faults on a power system with and without fault impedance, Open conductor faults in power system.
- **Content Delivery Methods:**

  Chalk and talk, power point presentation.
- **Assessment Methods:**

  Numerical and derivation related to above Content.

Unit 5– Load Flow Studies **No. of lectures – 08**

- **Prerequisite:**

  Concepts of AC Circuit, Numerical methods, concept of algorithm and flow chart
- **Objectives:**
  1. To develop and analyze power flow equation
  2. To enhance ability to analyze complete load flow problem of a given sample power network.
  3. To apply the concepts of numerical methods to power system.
  4. To evaluate power flows through transmission lines in the interconnected power system.
- **Course Outcomes: On completion of the course, learner will be able to-**.
  1. Apply power flow equation for the solution of load flow problem.
  2. Develop a solution for a complete load flow problem of a given sample power network.
  3. Apply a numerical method for the solution of power system network.
  4. Evaluate power flows through transmission lines in the interconnected power system.
- **Unit Content:**

  Introduction, complex power flow, Power flow equations, Classification of buses, Operating constraints, Data for load flow, Gauss-Seidel Method – Algorithm and flow chart for PQ and PV bus, Acceleration of convergence; Newton Raphson's Method –Algorithm and flow chart for NR Method in polar coordinates, Algorithm and flow chart for Fast Decoupled load flow method, Comparison of Load Flow Methods.
- **Content Delivery Methods:**

  Chalk and talk, power point presentation, videos
- **Assessment Methods:**

  Numerical problems up to 1st iteration and derivation related to above Content.

Unit 6 - Stability Studies **No. of lectures – 06**

- **Prerequisite:** concepts of stability, Mechanical dynamics.
- **Objectives:**
  1. To introduce stability issues in power system.
  2. To understand impact of stability on power system performance with its significance.
  3. To analyze stability parameters under various conditions.

- **Course Outcomes: On completion of the course, learner will be able to-**
  1. Write stability issues in power system.
  2. Derive and analyze swing equation, critical clearing angle and time
  3. Analyze the steady state and transient stability of a power system using analytical methods.
- **Unit Content:**
  Introduction**,** rotor dynamics and the swing equation, Steady state and transient stability, Equal area criterion for transient stability evaluation and its applications, critical clearing angle and time
- **Content Delivery Methods:**

Chalk and talk, power point presentations, animation on different types of antennas

- **Assessment Methods:**

Derivation related to swing equation, Steady state and transient stability, Equal area criterion for transient stability, critical clearing angle and time and Numerical related to swing equation.

Textbooks:

1. Elements of Power System Analysis, W. D. Stevenson, TMH,4th Edition
2. Modern Power System Analysis, I. J. Nagrath and D. P. Kothari- TMH, 3rd Edition,2003.
3. Symmetrical Components and Short Circuit Studies, Dr. P. N. Reddy, Khanna Publishers
4. Computer Methods in Power System Analysis, Stag, G. W., and EI-Abiad, A. H.-McGraw Hill International Student Edition. 1968.

Reference Books:

1. Power System Analysis, Hadi Sadat, TMH, 2nd Edition.
2. Power system Analysis, R. Bergen, and Vijay Vittal, Pearson publications, 2nd edition, 2006.
3. Computer Aided Power system analysis, G.L., Kusic, PHI. Indian Edition, 2010.
4. Power System Analysis, W. D. Stevenson & Grainger, TMH, First Edition, 2003.
5. Advanced Power System Analysis and Dynamics, Singh, L. P, New Age International (P) Ltd, New Delhi, 2001.
6. Computer Aided Power System Operations and Analysis"- Dhar, R. N, TMH, 1984.

Internal Continuous Assessment (ICA):

ICA shall consist of at least 8 simulations/programs of the following:

1. Y Bus formation for power systems with mutual coupling by singular transformation
2. Y Bus formation for power systems without mutual coupling by singular transformation
3. Y Bus formation for power systems with mutual coupling by inspection Method.
4. Y Bus formation for power systems without mutual coupling by inspection Method.
5. Determination of bus currents, bus power and line flow for a specified system voltage (Bus) Profile
6. Formation of Z-bus (without mutual coupling) using Z-bus building Algorithm.
7. To obtain swing curve and to determine critical clearing time and regulation for a single machine connected to infinite bus
8. Write a program to perform load flow using Gauss- Seidel method
9. Write a program to perform load flow using NR method
10. Write a program to perform load flow using decoupled method
11. To determine fault currents and voltages in a single transmission line system with star delta transformers at a specified location for LG fault.
12. To determine fault currents and voltages in a single transmission line system with star delta transformers at a specified location for LL fault.
13. To determine fault currents and voltages in a single transmission line system with star delta transformers at a specified location for LLG fault.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T. Y. B. Tech. (Electrical) Semester-I
Linear Control System

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week, 3 Credits	**ESE –** 70 Marks
Practical: - 2 Hrs/Week, 1 Credit	**ICA -** 25Marks
	ISE - 30Marks
	OE - 25Marks

This course covers the fundamentals of Control Systems, types and block diagram representations, Signal flow graph. It includes the modelling of electrical and mechanical systems and their transfer functions. It also introduces analysis of linear time-invariant systems in time domain and frequency domain. It includes concepts of stability in time domain and frequency domain.

- **Course Prerequisite:**

Student should have mathematical background of differential equations, able to apply Kirchhoff's laws. Also, students should have the knowledge of Laplace transform.

- **Course Objectives**
  1. To understand the facing challenges posed by growing trends in control systems
  2. To represent the system by block diagram and signal flow graph.
  3. To enhance the describing ability of the students to represent the control system mathematically.
  4. To enhance the describing ability of the students to analyze the system in time and frequency domain.
  5. To enable student to use transforms techniques for the analysis of LTI systems.
- **Course Outcomes: On completion of the course, student will be able to-**
  1. Explain basic terminologies and applications of control systems.
  2. Derive mathematical model and determine the transfer function of a given control system through various techniques.
  3. Compute the time response and stability the given system.
  4. Analyze the given control system in time and frequency domain.

SECTION I

Unit 1: Introduction to Control System **No. of Lectures -06**

- **Prerequisite:** Laplace transform, Network Systems.
- **Objectives:**
  1. To introduce student different types of control systems.
  2. To develop the transfer function of the electrical systems as well as positive and negative feedback.
- **Course Outcomes: On completion of the course, student will be able to-**
  1. Identify the type / classification of control system.
  2. Compute the transfer function.
  3. Differentiate basic components of control system
- **Unit Content**

Definition, basic components & classification of general control system, Open loop & Closed Loop control systems, advantages & disadvantages, examples, Positive & negative feedback, Transfer Function of open loop and closed loop control system.

- **Content Delivery Methods:**

Chalk and talk

- **Assessment Methods:**

Numerical and derivations related to Transfer functions

Unit 2: Mathematical Models of Physical Systems **No. of Lectures -07**

- **Prerequisite:** Differential equations, Laplace transforms
- **Objectives:**
  1. To represent the system by differential equation
  2. To get familiar with analogous systems.
  3. To evaluate the Transfer functions of AC/DC Servo motors.
- **Course Outcomes: On completion of the course, student will be able to-**
  1. Represent the system by differential equation.
  2. Compare analogous systems.
  3. Obtain the Transfer functions of AC/DC Servo motors**.**
- **Unit Content**

Introduction, Differential equations of physical systems &Laplace transform for these differential equations, Transfer Function of electrical and mechanical (Translational and Rotational) systems, electrical analogy of mechanical systems (F-V & F-I), Transfer Function of AC &DC Servomotor.

- **Content Delivery Methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Numerical related to Transfer functions of electrical and mechanical systems.

Unit 3: Reduction of Multiple Systems **No. of Lectures -08**

- **Prerequisite:** Differential equations formation, Laplace transforms
- **Objectives:**
  1. To represent the system by block diagram and SFG.
  2. To evaluate Transfer function of various systems by block diagram reduction techniques
  3. To convert the block diagram to SFG and vice versa.
  4. To analyze the sensitivity of the system.
  5. To synthesize the effect of feedback on system parameters
- **Course Outcomes: On completion of the course, student will be able to-**
  1. Represent the system by block diagram and SFG.
  2. Evaluate Transfer function of various systems by block diagram reduction techniques.
  3. Convert the block diagram to SFG and vice versa and find the transfer function.
  4. Obtain the sensitivity of the system.
- **Unit Content**

Reduction of multiple systems & feedback characteristic, Block diagram representation, Signal flow Graph (SFG), Mason's Gain formula and its application for SFG, Conversion of Block diagram to SFG. Definition of sensitivity, effect of feedback on - system parameter variation, system dynamics & disturbance signal.

- **Content Delivery Methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Numerical related to Transfer functions of systems by block diagram and Mason's Gain Formula

SECTION-II

Unit 4: Time-Response Analysis **No. of Lectures -07**

- **Prerequisite:** Transfer function, poles and zeros, Transients in electric circuits.
- **Objectives:**
  1. To educate students about Standard test signals and their representation.
  2. To analyze response of first order and second order systems
  3. To evaluate Steady state errors & error constants Kp, Kv and Ka,
  4. To get familiar with P, PI, PD and PID Controller
- **Course Outcomes: On completion of the course, student will be able to-**
  1. Recognize Standard test signals.
  2. Find the response of first order and second order systems

3. Calculate transient &Steady state errors
4. Apply concepts of P, PI, PD and PID Controller

• **Unit Content:**

Standard test signals, poles, zeros & system response, response of first order and second order systems to standard input, Transient response specifications, Steady state errors & definitions of error constants Kp, Kv and Ka, P, PI, PD and PID Controller.

• **Content Delivery Methods:**

Chalk and talk, Power point presentation

• **Assessment Methods:**

Derivations &Numerical on above unit contents

Unit 5: Stability & Root Locus Techniques **No. of Lectures -07**

• **Prerequisite:** Transfer function, S-plane representation of poles and zeros

• **Objectives:**

1. To Understand the concept of stability
2. To get familiar with different analytical techniques for stability analysis
3. To make the students able to understand the procedure for root locus
4. To analyze stability using root locus

• **Course Outcomes: On completion of the course, student will be able to-**

1. Develop the stability related to pole location
2. Apply different analytical techniques for stability analysis.
3. Sketch & apply root locus
4. Apply the concept of root locus for stability analysis

• **Unit Content**

Concept of stability & necessary condition, Routh-Hurwitz criterion with special cases, location of roots in s-plane, concept of root locus diagram, properties, and rules for construction of root locus, Determination of stability from root locus.

• **Content Delivery Methods:**

Chalk and talk, power point presentation

• **Assessment Methods:**

Theoretical and Numerical on above contents

Unit 6: Frequency Response Analysis **No. of Lectures -07**

•**Prerequisite:** Transfer function, S-plane representation of poles and zeros

•**Objectives:**

1. To Correlation between Time domain and Frequency domain
2. To Understand the concept of Bode Plot
3. To Understand the concept of Polar Plot
4. To draw and analyze Bode Plot/ Polar Plot.
5. To analyze stability using Bode Plot.

• **Course Outcomes: On completion of the course, student will be able to-**

1. Correlate between Time domain and Frequency domain
2. Apply the concept of Polar Plot
3. Sketch Bode Plot/ Polar Plot
4. Obtain the control system for stability

• **Unit Content:**

Introduction to frequency response of system, Frequency domain specifications, Correlation between Time domain and Frequency domain, polar plot & bode plot for frequency function. Minimum phase function, gain margin & phase margin, determination of stability using Bode Plot.

• **Content Delivery Methods:**

Chalk and talk, power point presentation

Assessment Methods:

Theoretical and Numerical on above contents

Text Books:

1. Control System Engineering, I. J. Nagrath, M. Gopal,. New Age International Publishers, 5th Edition.
2. Control System Engineering by R. Anandanatrajan, P Ramesh Babu, Scitech publications, 2nd Edition.
3. Automatic Control Engineering, Benjamin C. Kuo, Prentice Hall of India Pvt. Ltd.
4. Modern Control Engineering, K. Ogata, Prentice Hall of India Pvt. Ltd.
5. Control system principles and design, M. Gopal, TMH publication, 3rd edition, 2008.

Reference Books:

1. Feedback Control Systems, C. L. Phillips, R. D. Harbor, PHI publication, 1988
2. Modern Control Systems, Richard C. Dorf, Robert H. Bishop, Pearson Education Eleventh edition.
3. Control systems, Smarajit Ghosh, Pearson Education 2nd Edition

Internal Continuous Assessment (ICA):

ICA consists of minimum 8 experiments of following:

1) To verify potentiometer as transducer and error detector.
2) To verify Synchro as transducer.
3) To verify Synchro as error detector.
4) AC position control system.
5) DC position control system.
6) Time response of first order system.
7) Step response of second order system using R, L and C.
8) To study the effect of P, PI & PID Controller on a 2ndorder system.
9) Transient response specifications of second order system using software program.
10) Root locus plot using software program.
11) Bode plot using software program.

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B.Tech. (Electrical) Semester-I
Advanced Microcontroller System

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week, 3 Credits	**ESE –** 70 Marks
Practical: - 2 Hrs/Week, 1 Credit	**ICA -** 25Marks
	ISE - 30Marks
	POE - 50Marks

Prerequisite:

Students shall have the knowledge of Basic Number System, Binary Arithmetic & Logical Operations and logic gates. He/She should also have the knowledge of electrical machines.

Objectives:

The objectives of this course are

1. To provide understanding of Microcomputer systems.
2. To impart knowledge on the architecture of 8051.
3. To impart knowledge on instruction set and programming of 8051.
4. To impart knowledge on the interfacing of different peripherals with 8051
5. To impart knowledge on the advanced microcontrollers.
6. To use of microcontroller 8051 for various applications.

Course outcomes:

On successful completion of the course the student will be able to

1. Understand the basics of Microcomputer systems.
2. Understand the architecture and addressing modes of 8051.
3. Develop program in assembly language and C language for 8051.
4. Interface a microcontroller 8051 to various devices.
5. Understand the architecture of advanced microcontrollers.
6. Develop various applications of 8051in Electrical Engineering.

SECTION I

Topic 1: Introduction to Microcomputer systems **No of Lectures -07**

Unit Content:

Introduction to digital computer, block diagram of a digital computer, definitions of terms: Hardware, software, firmware, memory, CPU, address bus, data bus, control bus, ports. Memory classification: RAM, ROM, PROM, EPROM, EEPROM, and FLASH. Microprocessor, features of a microprocessor. Microcontroller, features of Microcontroller, Schematic block diagram of a microcontroller. Comparison between a microcontroller and microprocessor. Von-Neumann and Harward architecture. RISC and CISC machines.

Topics 2: 8051 Microcontroller Architecture **No of Lectures -07**

Unit Content:

Features, architecture of 8051 Microcontroller, Pin diagram, pin function, alternate function of pins, reset circuit. De-multiplexing of Address-Data Bus, Memory Organization internal and external program and data memory, Register banks, Special function registers (SFR), Stack and stack pointer, I/O ports structure, serial port registers, SCON, SBUF, and SMOD. Timers/counters, TMOD and TCON SFR map. Interrupts, IE and IP SFR map.

Unit 3: Instructions set and programming of 8051. **No of Lectures -07**

Unit Content:

Addressing modes, Instruction set, introduction to IDE, Development Tools: Simulators, debuggers, cross compilers, in-circuit Emulators for the microcontrollers. C data types. Programming in assembly and C language.

SECTION II

UNIT 4: 8051 Interfacing **No of Lectures -07**

Unit Content:

Memory addresses decoding, interfacing external program (ROM) and data (RAM) memory with 8051. Relay and opto-isolator interface, seven segment LED interface, 16x2 LCD interface, Matrix keyboard interface, ADC 0809, DAC 0808 interface.

UNIT –5 Introductions to advanced microcontroller **No of Lectures -07**

Unit Content:

PIC 16F877A- Features, block diagram, Pin Diagrams, pin description, memory organization, special function registers Status Register,

ARM Processor- fundamentals, features, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set.

UNIT –6 APPLICATIONS OF MICROCONTROLLERS. **No of Lectures -07**

Unit Content:

Temperature measurement using LM35 temperature sensor, DC motor speed control, Stepper motor control, Servo motor control.

- **Content Delivery Methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Programs and Interfacing diagram related to above Content.

Guidelines for Instructor's Manual

- Any simulation software like Keil, MPLAB, Multisim, Simulink etc.
- Instruction set of 8051.
- An IDE for simulating the functionalities of 8051microcontroller and its use for software and hardware development.
- Develop and debug program in assembly language or C language for specific applications

Guidelines for Student's Lab Journal

- Title of the program.
- The program has to be written in the following format. Address- Instruction- Comment
- Input data has to be specified.
- Result of the program.

Flow Chart for each program has to be drawn on separate page

Internal Continuous Assessment (ICA):

ICA shall consist of at least 8 simulations/programs of the following:

List of Experiments:

1. Write an ALP to perform arithmetic operations Using 8051.
2. Write an ALP to perform Logical Operations Using 8051.
3. Write an ALP to perform blocks Transfer/block exchange operation Using 8051.
4. Write an ALP to generate square wave on the port and port pin using timer.
5. Write a simple C programs for continuously toggle all bits of a port and particular port pin with some delay.
6. Write a simple C program for bit wise shift operation. Left/right port data continuously.
7. Write a simple C programs for Read input port and send hex data to output port.
8. Interfacing seven segments LED display to 8051 Microcontroller.
9. Interfacing 16x2 LCD display to 8051 Microcontroller.
10. Interfacing Matrix/Keyboard to 8051 Microcontroller.
11. Interfacing DC motor with 8051 Microcontroller.
12. Interfacing Stepper motor with 8051 Microcontroller.
13. Interfacing LM35 with 8051 Microcontroller and display temperature on it.

TEXT BOOKS:

1. Ramesh S. Gaonkar, "Microprocessor – Architecture, Programming and Applications with the 8085", Penram International Publisher , Fifth Edition,2006.
2. Muhammad Ali Mazidi, "The 8051 Microcontroller and embedded systems", Pearson Education.
3. Advanced Microprocessors and Peripherals – A. K. Ray and K. M. Bhurchandani, TMH, 2nd Edition 2006.
4. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012
5. Fundamentals of Microcontrollers and Applications in Embedded Systems with PIC by Ramesh Gaonkar, Thomson and Delmar learning, First Edition.

REFERENCE BOOKS:

1. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed, 2004.
2. Microprocessors and Interfacing, D. V. Hall, TMGH, 2nd Edition 2006.
3. The 8051 Microcontrollers, Architecture and Programming and Applications -K. Uma Rao, Andhe Pallavi, Pearson, 2009.
4. Device datasheet- ATMEL, DALLAS.
5. 8051 Manual (Intel).
6. PIC16F877A Datasheet (Microchip).

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B.Tech. (Electrical) Semester-I
Electromagnetic Engineering

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week, 3 Credits	**ESE –** 70 Marks
Tutorial: - 1 Hr/Week , 1 Credit	**ICA -** 25 Marks
	ISE - 30 Marks

This course introduces electromagnetic field theory which deals with electric and magnetic field vectors.

Course Prerequisite:

Student shall have knowledge of circuit theory and shall also have basic knowledge of vectors and Del operator.

Course Objectives:

1. To make student understand use of different coordinate systems, significance of divergence, gradient, and curl.
2. To introduce to student basic laws of electrostatics and magneto statics.
3. To introduce students to boundary conditions for electric and magnetic fields.
4. To make student derive Maxwell's equations under different conditions.

Course Outcomes:

1. Student can solve numerical problems on different coordinate systems, divergence, curl and gradient.
2. Student can derive basic laws of electrostatics and magneto statics and can apply them for different fields.
3. Students can analyse boundary conditions for conductors and dielectric.
4. Student can derive Maxwell's equations under different conditions

Section I

Unit 1–Vector Analysis & Coulomb's law **No of lectures – 08**

- **Prerequisite:** Scalar and vector quantities**,** trigonometry, differentiation, integration, basics of electricity.
- **Objectives:**
  1. To revise concepts of vector algebra.
  2. To introduce to student different coordinate systems.
  3. To make student understand vector transformation techniques.
  4. To make student understand applications of Del operator.
  5. To make student understand concepts of static electric field and charge distribution.
  6. To make student analyze electric field intensity and density due to various charge distributions.
- **Outcomes: After completing this unit, student -**
  1. Can apply Del operator to solve numerical.
  2. Can calculate length, surface and volume in different coordinate systems.
  3. Can convert vectors in different coordinate system.
  4. Can evaluate force using Coulomb's law
  5. Can calculate electric filed intensity and density over different charge distributions.
- **Unit Content:**
  Scalars & vectors, vector algebra, vector components & vectors, vector field, Dot & cross products, Introduction to Co-ordinate System – Rectangular – Cylindrical and Spherical Co-ordinate System, Introduction to line, Surface and Volume Integrals, Definition of Curl,

Divergence and Gradient, Coulomb's Law in Vector Form, Definition of Electric Field Intensity, Electric field due to continuous charge distribution, Electric Field due to line charge & sheet charge

- **Content Delivery Methods:**

Chalk and talk, power point presentations, animation on coordinate system, 3D models

- **Assessment Methods:**

Numerical problems and derivation related to above Content.

Unit 2–Static Electric Fields **No of lectures – 08**

- **Prerequisite:** Vector calculus, basics of electricity, Coulomb's Law.
- **Objectives:**
  1. To make student derive Gauss's law and understand its applications.
  2. To make student apply Del operator to calculate divergence.
  3. To make student derive & apply Divergence Theorem.
  4. To make student evaluate potential due to various charges in electric field.
- **Outcomes: After completing this unit, student –**
  1. Can derive point form of Gauss's law
  2. Can derive & apply Divergence Theorem.
  3. Can evaluate energy and potential associated with charge distributions.
- **Unit Content:**

Gauss Law – Applications, point form; Divergence theorem, Electric Scalar Potential, Relationship between potential and electric field, Electric Flux Density , Energy & potential energy expended in moving a point charge in an electric field, Line integral, potential difference & potential, potential gradient, potential field of a point charge & system of a charges, dipole, energy density in electrostatic field

Content Delivery Methods:

Chalk and talk, power point presentations

- **Assessment Methods:**

Numerical problems and derivation related to above Content.

Unit 3–Conductors & Dielectrics **No of lectures – 05**

- **Prerequisite:** Concept of Electric fields, Nature of materials.
- **Objectives:**
  1. To make students derive point form of ohm's law.
  2. To make students derive continuity equation for current
  3. To introduce students to Capacitance.
  4. To make student evaluate Capacitance of various types of capacitors.
  5. To make student understand boundary conditions.
- **Outcomes: After completing this unit, student –**
  1. Can derive point form of ohm's law.
  2. Can derive apply Poisson's and Laplace's equation.
  3. Can solve numerical problems to Capacitance of parallel plate and spherical capacitors
  4. Can derive and evaluate boundary conditions for electric fields.
- **Unit Content:**

Electric current, Current density, point form of ohm's law, continuity equation for current, Poisson's and Laplace's equation, Uniqueness, Electric Polarization, Nature of dielectric materials- Definition of Capacitance, calculation of Capacitance of parallel plate and spherical capacitors, Electrostatic energy and energy density, Boundary conditions for electric fields

- **Content Delivery Methods:**

Chalk and talk, power point presentation, videos

- **Assessment Methods:**

Numerical problems and derivation related to above Content.

Section II

Unit 4–Static magnetic field **No of lectures – 09**

- **Prerequisite:**

Concepts of magnetic field, magnetic flux lines, applications of magnetic field

- **Objectives:**
  1. To make student derive Biot Savart law, Ampere's law
  2. To make student apply Curl, Stroke's Theorem for getting magnetic flux and magnetic flux density, scalar, and vector magnetic potentials.
  3. To make student evaluate force on current element using Lorentz force equation.
- **Outcomes:**
  After completing this unit, student –
  1. Can apply Biot Savart law to finite, infinite, and circular current elements.
  2. Can solve numerical problems to find magnetic field intensity and magnetic flux density with various types of current distributions.
  3. Can apply Ampere's circuit law for symmetrical surface and asymmetrical surface.
  4. Can compute forces on current elements using Lorentz force equation.

- **Unit Content:**

The Biot-Savart Law in vector form, Magnetic Field intensity due to a finite and infinite wire carrying a current, Magnetic field intensity on the axis of a circular and rectangular loop carrying a current, Ampere's circuital law and applications, Magnetic flux density, Curl Stokes theorem, Lorentz force equation for a moving charge, Scalar and Vector Magnetic Potential

- **Content Delivery Methods:**

Chalk and talk, power point presentation, videos

- **Assessment Methods:**

Numerical problems and derivation related to above Content.

Unit 5-Fields in Magnetic materials **No of lectures – 08**

- **Prerequisite:** Field theory and circuit theory.
- **Objectives:**
  1. To introduce to student concept of energy stored in magnetic field and inductors.
  2. To understand different magnetic materials and their properties.
  3. To make student understand magnetic boundary conditions.
- **Outcomes: After completing this unit, student** –
  1. Can understand inductance and compute energy density in magnetic fields.
  2. Can understand different magnetic materials with their properties.
  3. Can analyze magnetic boundary conditions.
- **Unit Content:**
  Definition of Inductance, Inductance of loops and solenoids, mutual inductance, Energy density in magnetic fields, Nature of magnetic materials, magnetization and permeability, magnetic boundary conditions, Energy in a inductor & energy density
- **Content Delivery Methods:**
  Chalk and talk, power point presentations
- **Assessment Methods:**

Numerical problems and derivation related to above Content.

Unit 6 -Maxwell's equations **No of lectures –04**

- **Prerequisite:**

Faraday's law, Gauss's law, Ampere's law in point form and integral form.

- **Objectives:**
  1. To introduce to student concept of displacement current and conduction current density
  2. To make student derive mathematical proof of Maxwell's equation.
  3. To introduce to student Maxwell's equations for different field conditions.
- **Outcomes:**

  After completing this unit, student –

  1. Can analyze difference between displacement current and conduction current density
  2. Can derive Maxwell's equation in differential and integral forms.
  3. Can evaluate Maxwell's equations under static and harmonically varying field conditions.
- **Unit Content:**

  Continuity equation for static conditions, displacement current and current density, Maxwell's equations in integral form and point form, Maxwell's equations for static, time varying field and harmonically varying field.
- **Content Delivery Methods:**

Chalk and talk, power point presentation
- **Assessment Methods:**

Derivations related to above Content.

Internal Continuous Assessment (ICA)

ICA shall consist of minimum six tutorials based upon above curriculum. Tutorial shall include numerical problems and derivations.

Text Books:

1. Electromagnetic Engineering, William Hyte, 7th Edition, Tata Mc Graw Hill
2. Electromagnetic field theory & Transmission Lines, GSN Raju, Pearson Education
3. Schaum's series in electromagnetic, Edminister McGraw Hill publications, 3rd edition.

Reference Books:

1. Problems and solutions in electromagnetic, William Hyte, Tata Mc Graw Hill
2. Elements of Engineering Electromagnetics, M. N. O. Sadiku, Oxford University Press, 3rd edition.
3. Electromagnetic Corson and lerrain CBS publications, 2nd edition.

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B.Tech. (Electrical) Semester-I
Open Elective-I
INFORMATION TECHNOLOGY AND MANAGEMENT

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week, 3 Credits	**ESE –** 70 Marks
Practical: - 1 Hrs/Week, 1 Credit	**ICA -** 25Marks
	ISE - 30Marks

This course provides the basic tactical and strategic principles of information technology uses for management information systems and its various applications to the organizations. It also addresses changing face of business with proliferation of electronic commerce and ethical & social issues arising with it. It also introduces about the software projects, software development models and overview of project management.

Course Prerequisite:

Student shall have basic knowledge of computer hardware, software, programming, and communication.

Course Objectives:

1. To introduce concepts of information systems and its impact on business and organization
2. To show how e-commerce helps organization to increase productivity and competitive advantage.
3. To give overview of ethical and social issues concerning information systems
4. To make student aware of software project and its attributes
5. To introduce to student software development life cycle and software models

Course Outcomes: After completion of this course

1. Student can present case studies about changing face of business and importance of management information system for today's business
2. Along with the examples student can explain different e-commerce mechanisms
3. Student can describe necessity and benefits of data management for business and organizations
4. Student can present examples of primary and higher organizational applications of information system
5. Student can illustrate software development life cycle and can describe popular software models
6. Student can describe various social and ethical issues related to IT.

Section-I

Unit 1-Information Systems **No of lectures – 04**

- **Prerequisite:** Basic knowledge of computer hardware, software, programming, and internet.
- **Objectives:**
  1. To introduce concepts of information system and describe various types of information system.
  2. To make student relate and contrast transaction processing and functional information system.
  3. To make student analyse support that IT provides to people in different roles in an organization.
  4. To make student understand how IT provides support to business processes
  5. To give student overview of IT infrastructure, architecture, and emerging computer environments.
  6. To make student realize dimensions of information systems and contemporary approach to information system.
- **Outcomes:** After completing this unit, student -
  1. Can define information system and describe various types of information system.
  2. can relate and contrast transaction processing and functional information system.
  3. Can analyse the support that IT provides to people in different roles in an organization.
  4. can highlight IT infrastructure, architecture, and emerging computer environments through case study.
  5. Able to portray dimensions of information systems and contemporary approach to information system.

- **Unit Content:**

Business in digital economy & information age, information concepts – data, information & knowledge, information systems: concepts and definitions, classification, and types of information systems, how IT support people, information technology, architecture, and emerging computing environments.

- **Content Delivery Methods:**

Chalk and talk, power point presentations, case studies

- **Assessment Methods:**

Questions based upon information system concepts, classification and types of information systems, information system infrastructure, architecture and emerging computing environments, dimensions of information systems, contemporary approach to information system.

Unit 2– E-business and E-commerce **No of lectures – 05**

- **Prerequisite:** Information system concepts, information system infrastructure, architecture, and emerging computing environments
- **Objectives:**
    1. To introduce to student importance and significance of e-business and e-commerce**.**
    2. To make student distinguish business to consumer applications and business to business applications.
    3. To make student understand e-commerce supports services.
    4. To create awareness about ethical and legal issues in e-business.
    5. To make student to gain knowledge about mobile e-commerce.
- **Outcomes:** After completing this unit, student –
    1. Can compare e-business and e-commerce.
    2. Can describe major e-commerce mechanisms.
    3. Able to identify e-commerce support services.
    4. Can explain e-payment systems with Indian context
    5. Can describe mobile e-commerce.
- **Unit Content:**

Overview of e-business and e-commerce, major e-commerce mechanisms, business to consumer applications, business to business applications, major models of e-business, e-commerce supports services, infrastructure support required, e-payment systems, ethical and legal issues in e-business, mobile e-commerce

- **Content Delivery Methods:**

Chalk and talk, power point presentation, case studies

- **Assessment Methods:**

Descriptive questions based upon e-business and e-commerce, major e-commerce mechanisms, business to consumer applications, business to business applications, major models of e-business, e-commerce supports services, ethical and legal issues in e-business, mobile ecommerce

Unit 3–Data Management **No of lectures – 05**

- **Prerequisite:** Operating system, information system, e-commerce.
- **Objectives:**
    1. To introduce to student importance of data management.
    2. To introduce to student database management system.
    3. To make student aware about data management issues
    4. To acquaint student with benefits of data warehouse, data marts and data centers.
- **Outcomes:** After completing this unit, student –
    1. can compare traditional file system with database management system
    2. can describe functions of data base and data base management system.
    3. Can describe the tactical and strategic benefits of data warehouse, data marts and data centers.

- **Unit Content:**

Data hierarchy, problems with traditional file environment, database approach, database management system, creating database, relational DBMS, logical vs physical view, DBMS components, data warehouse, data mart, data mining

- **Content Delivery Methods:**

Chalk and talk, power point presentation, case studies

- **Assessment Methods:**

Descriptive questions based upon managing data, database approach, database and management system, data warehouse, data marts and data centres, enterprise content management, data visualization technology, managerial issues.

Section II

Unit 4– Modern Organizational Applications **No of lectures – 05**

- **Prerequisite:** Information system, information system infrastructure.
- **Objectives:**
    1. To make student aware about organization, features of organization & organizational structure.
    2. To make student understand how information system impact organizations and business firms
    3. To introduce to student primary organizational applications like OLAP, TPS
    4. To introduce to student higher organizational applications like ECM, ERP, supply chain management, decision support system
    5. To make student realize importance of data visualization and its applications
- **Outcomes:** After completing this unit, student –
    1. Can describe features of modern organizational structure
    2. Can explain with case studies how organization and information system are influencing each other in contemporary business practices
    3. Can explain with case studies primary applications of information system in a typical modern business
    4. Can explain with case studies higher applications of information system in a typical modern business
    5. Can list various commercial tools/ software available for data visualization
- **Unit Content:**

What is an organization, features of organizations, organizational structure, doing business in digital economy, organizations, and information systems, how information systems impact organizational practices, OLAP, TPS, enterprise content management, introduction to ERP and supply chain management, introduction to decision support systems, data visualization?

- **Content Delivery Methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Questions based upon block diagram and descriptive questions to ensure understanding organization, features of organizations, organizational structure, responses and IT support, impact on organizations and business firms, primary and higher organizational applications of information system

Unit 5–Project & software development life cycle **No of lectures – 05**

- **Prerequisite:** Information system, data management, organizational structure, basics of programming
- **Objectives:**
    1. To introduce to student about project and its attributes.
    2. To make student realize difference between software project and other projects
    3. To make student understand project planning framework.
    4. To introduce to student need and concept of SDLC
    5. To provide to student a short induction to popular SDLC models used by industry
    6. To make student apprehend role and responsibilities of the software project manager
- **Outcomes:** After completing this unit, student –
    1. Can differentiate software projects and other engineering projects

2. Can explain major phases in SDLC
3. Can explain popular SDLC models used by industry
4. Can list project management knowledge areas
5. Can describe IT project methodology

- **Unit Content:**

What is a project? project attributes, project planning framework, software project comparison with other projects, context of project management, role of project manager, project life cycle, software development life cycle, software development process models, project management process and knowledge areas, IT project methodology

- **Content Delivery Methods:**

Chalk and talk, power point presentation, case studies.

- **Assessment Methods:**

Questions based upon block diagram and descriptive questions to ensure understanding project, project attributes, project planning framework, context of project management, the role of project manager, project life cycle, software development life cycle, software development process models, IT project methodology

Unit 6–Ethical and social issues **No of lectures – 04**

- **Prerequisite:** Information system, data management, E-business.
- **Objectives:**
  1. To make student aware about ethical and social issues evolved because of IT and IS
  2. To make student recognize the respect for intelligent property rights
  3. To make student aware about workplace behaviour and health while working in IT industry
  4. To fetch the attention of the student to need and practice of green IT
- **Outcomes:** After completing this unit, student –
  1. Can describe ethical and social issues arose because of IT and IS
  2. Can describe trade secrets, copyrights, patents with examples
  3. Can explain issues related to workplace behavior and health and how to overcome them
  4. Can explain green IT practices
- **Unit Content:**

Ethical and social issues related to systems, moral dimensions of information age, ethical principles, intellectual property rights- trade secrets, copyrights, patents, privacy, workplace behavior and health, de-skilling and alienation, telecommuting, e waste, green IT

- **Content Delivery Methods:**

Chalk and talk, power point presentation, case studies.

- **Assessment Methods:**

Descriptive questions on privacy, workplace monitoring, power over users, candidate ethical principles, workplace behaviour and health, de-skilling and alienation, telecommuting, e-waste, and green IT

- **Internal Continuous Assessment (ICA)**

ICA consists of minimum one assignment based on each unit - may be comprising of case studies, group discussion and information survey.

- **Text Books:**

1. Information Technology for Management – Transforming Organizations into Digital Economy, Efraim Turban, Linda Volonino, Wiley Student Edition, Wiley India Pvt. Ltd.
2. Management Information System, Kel Laudon, Jane Laudan, Rajanish Dass, 11th Edition, Pearson.
3. Software Project Management, Bob Houghes, Mike Cotterall, Tata McGraw-Hill, 4th Edition

- **Reference Books:**

1. Introduction to Information Technology, Turban, Rainer, Potter, Wiley Student Edition, 2nd Edition
2. Information Systems, Ralph Stair, George Reynolds, Cengage Learning, 10th Edition
3. Management Information System (MIS), Rahul De, Wiley India Pvt. Ltd.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B.Tech. (Electrical) Semester-I
Open Elective-I
Advanced Electric Machines

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week, 3 Credits	**ESE –** 70 Marks
Tutorial: - 1 Hrs/Week, 1 Credit	**ICA -** 25Marks
	ISE - 30Marks

This course introduces different Advanced Electrical Machines in electrical engineering with their construction, working principle, operation, analysis and control techniques and applications.

- **Course Prerequisite:**
  Student shall have knowledge of all conventional AC and DC machines.
- **Course Objectives:**

1. To get detailed knowledge of construction, operating principles of different Advanced Electrical Machines.
2. To find equivalent circuit parameters and performance parameters of all Advanced Electrical Machines.
3. To understand different control methods and applications of different Advanced Electrical Machines.

- **Course Outcomes:** Upon successful completion of this course student:

1. Can analyze, examine, and identify applications of Synchronous Reluctance Motors and different stepping motors.
2. Can analyze, examine, and identify applications of Switched Reluctance Motors.
3. Can analyze, examine, and identify applications of Permanent Magnet Brushless dc motors and Permanent magnet Synchronous Motors.

Section-I

Unit 1–Synchronous Reluctance Motors: **No of lectures – 04**

Introduction, Construction of Synchronous Reluctance Motor, Rotor design and construction, working of synchronous reluctance motor, primary design considerations, Torque – speed characteristics, Phasor diagram, Advantages and disadvantages, Applications.

Unit 2–Stepping Motor: **No of lectures – 06**

Introduction, Classification of stepper motors, Single stack variable reluctance stepper motor (Construction, Connection and Principle of Operation),Micro stepping control of stepping motor, Multistack variable reluctance stepper motor, Hybrid stepper motor, Single phase stepping motor (Construction, Connection and Principle of Operation) ,Static and Dynamic characteristics of stepper motor, Torque-speed characteristics, Drive system and control circuitry for stepper motor, Application of Stepper Motor.

Unit 3–Switched reluctance Motor: **No of lectures – 04**

Introduction, Construction and operation, Power semiconductor switching circuits, Voltage and torque equations, Control circuits, Torque-speed characteristics, Advantages and disadvantages, Applications.

Section-II

Unit 4–Permanent Magnet Brushless D.C. Motors **No of lectures – 07**

Introduction, Constructional feature, Principle of operation, Classification, Emf equation, Torque equation, Torque- speed characteristics, Power and control circuit, Advantages and disadvantages, Applications.

Unit 5–Permanent Magnet Synchronous Motors **No of lectures – 07**

Introduction, Construction and principle of operation, Emf equation, Torque equation, Phasor diagram, torque-speed characteristics, Self-control, Vector control, Microprocessor based control

- **Internal Continuous Assessment (ICA):**

ICA consists of minimum eight tutorials based upon above curriculum.

Text Books:

1. Electric Machines, Third Edition, I J Nagrath, D P Kothari Tata McGraw Hill Publication,
2. Electrical Machines, Third Edition, S K Bhattacharya, Tata McGraw Hill Publication,
3. Theory and Performance of Electrical Machines, J B Gupta, S K Kataria& Sons ,
4. A Textbook of Electrical Technology Volume II, B L Theraja, S Chand Publications
5. Brushless Permanent Magnet and Reluctance Motor Drives, T. J. E. Miller Clarendon Press, Oxford.
6. Stepping Motors and Their Microprocessor Controls, T. Kenjo, Clarendon Press London.

Reference Books:

1. Electrical Machinery, A E Fitzgerald, C Kingsley, S D Umans, 6th Edition 2002, Tata McGraw Hill,
2. Electrical Machinery, P S Bhimbhra, Khanna Publishers.
3. Electrical Machines, Ashfaq Hussain, Dhanpat Rai & Sons.
4. Theory and Performance of Electrical Machines, J B Gupta, S K Kataria, and sons
5. Principles of electronic machines & Power electronics, P C Sen, Wiley India,
6. Switched Reluctance Motor Drives–Modeling, Simulation, Analysis, Design and Application, R. Krishnan, CRC Press, New York.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B.Tech. (Electrical) Semester-I
Open Elective-I
Business Ethics

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week, 3 Credits	**ESE –** 70 Marks
Tutorial: - 1 Hrs/Week, 1 Credit	**ICA-**25Marks
	ISE- 30Marks

This course introduces basics of business ethics and its related. The course also introduces theoretical aspects of ethical issues related to stakeholders

- **Course Prerequisite:**

Student shall have knowledge basic management principles.

- **Course Objectives:**
  1. To make students aware of basics of business ethics and related theories
  2. To understand different tools for decision making and management in business ethics
  3. To get acquainted with corporate and ethical issues related with it
  4. To understand different ethical issues related to various stakeholders
- **Course Outcomes:** At the end course student will be able to
  1. Elaborate concepts of ethics and related theories
  2. Describe and apply tools for decision making and management in business ethics
  3. Understand and form the ethical issues in corporation
  4. Understand and identify the ethical issues from various stakeholders' point of context

SECTION-I

Unit 1: Introduction **No of lectures – 04**

Business Ethics: An overview, importance of Business Ethics, Key context- Globalization, sustainability, Normative ethical theories and descriptive ethical theories and contemporary ethical theories

Unit 2: Decisions and management of business ethics **No of lectures – 05**

Models of ethical decision making, Individual and situational influences on decision making business ethics management, Setting standards of ethical behavior, Managing stakeholder relations, Assessing ethical performance, Organizing for Business Ethics management

Unit 3: Framing business Ethics **No of lectures – 05**

Framing Business Ethics- CSR, stakeholders and Citizenship, Corporation- key features, CSR, Stakeholder theory of firm, corporate accountability, corporate citizenship, understanding corporate governance and ethical issues

SECTION-II

Unit 4: Employees, consumers and business ethics **No of lectures – 05**

Models of organization, Employees as stakeholders, Ethical issues in the firm-employee relation, Ethical challenges of globalization, corporate citizen and employee relations towards sustainable employment. Consumers as stakeholders, Ethical issues, marketing and the consumer, Globalization and consumers, Consumers and corporate citizenship, Sustainable consumption

Unit 5: Civil Society and Environment **No of lectures – 05**

Civil society organizations as stakeholders, Ethical issues and CSOs, Globalization and CSOs, Corporate Citizenship and civil society, Civil society, business and sustainability, Business Ethics and Environmental values, The dimensions of pollution and resource depletion, Ethics of pollution control, Ethics of conserving depletable resources

Unit 6: IT and Government **No of lectures – 04**

Information technology and its moral significance to business, IT code of conduct, Data identity and security, Crime and punishment, Government as stakeholder, Ethical issues in the relation between business and government, Globalization and business- government relations, Corporate Citizenship and regulation, Governments, business and sustainability

- **Internal Continuous Assessment (ICA):**

ICA consists of minimum eight tutorials based upon above curriculum. Tutorial shall include case studies related to context like employee, civil citizens, environment, consumer etc. It will be motivated to have seminars and role plays for various case studies related to ethical issues. Visits to various organizations and reports based on that can be considered.

- **Text Books:**

1. Business Ethics by Andrew Crane, Dirk Matten, Oxford University press

- **Reference Books:**

1. Business Ethics: Ethical Decision Making and Cases, O. C. Ferrell, John Fraedrich, Linda Ferrell, Cengage Publication
2. Business Ethics Methods and Application, Christian U. Becker, Taylor and Francis
3. Business & Society: Ethics and Stakeholder Management, Archie B. Carroll, Ann K. Buchholtz , Cengage Publication 7th Edition

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B.Tech. (Electrical) Semester-I
Open Elective-I
Managerial Economics

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week, 3 Credits	**ESE –** 70 Marks
Tutorial: - 1 Hrs/Week, 1 Credit	**ICA-**25Marks
	ISE- 30Marks

This course introduces basics of economics and concepts related to economics. The course also introduces theoretical and practical aspects of decision making for managers.

- **Course Prerequisite:**

Student shall have knowledge basic management principles.

- **Course Objectives:**
  1. To make students aware to concepts of managerial economics
  2. To introduce students to concepts of demand, supply and market
  3. To introduce different tools for demand analysis and forecasting
  4. To make students aware about production and cost functions
  5. To make students aware about correlation of pricing with market, demand and supply
- **Course Outcomes:** At the end course student will be able to
  1. Elaborate the concepts of managerial economics
  2. Analyse the issues related to demand, supply and market
  3. Use different tools for demand analysis and forecasting
  4. Analyse the production and cost functions
  5. Decide price based on market, demand and supply

SECTION-I

Unit 1: Introduction: **No of lectures – 05**

Introduction to Economics, Introduction to Managerial Economics, Economics contribution to managerial decision, Scope of Managerial Economics – Microeconomics and Macroeconomics, Basics of Mathematical Tools – Statistics and Operational Research

Unit 2: Demands, Supply and Market Equilibrium **No of lectures – 05**

Demand, Supply, Market Equilibrium, measuring value of market exchange, changes in market equilibrium, Price ceilings and Price floors, Meaning of demand, Demand utility, Approaches to consumer demand analysis, Analysis of consumer behavior – Cardinal behavior and ordinal approach

Unit 3: Demand and Market Analysis **No of lectures – 04**

Price Elasticity of Demand, Price Elasticity, Total Revenue and Marginal Revenue, Factors Affecting Price Elasticity, Cross Price Elasticity, Income Elasticity of Demand, Other Elasticities, Elasticities for Nonlinear Demand Functions, Elasticity of Supply

SECTION -II

Unit 4: Tools for Demand Forecasting **No of lectures – 06**

Survey Methods – Consumer survey and Opinion Poll, Statistical Method – Trend Projection Barometric Method, Econometric Method, Simultaneous equation, Linear Regression Model, Multiple Regression, Non-linear Regression, Basic concepts used in Linear Programming, Application of Linear Programming Techniques

Unit 5: Production and Cost Analysis **No of lectures – 04**

Introduction to Production, Production Function, Theory of cost concepts, Cost of Production, Breakeven analysis- Linear, Non-linear, Profit Margin of Safety

Unit 6: Market Structure and Pricing Decision **No of lectures – 04**

Concept of Market, Demand side of market, Supply side of Market, Market Structure and Degree of Competition, Pricing Decision and Monopoly Power

- **Internal Continuous Assessment (ICA):**

ICA consists of minimum eight tutorials based upon above curriculum. Tutorial shall include case studies related to above curriculum.

- **Text Books:**

1. Managerial Economics by D. N. Dwivedi – 8th Edition- Vikas Publications
2. Managerial Economics Foundations of Business Analysis and Strategy- C. R. Thomas & Maurice – 8th Edition- McGraw Hill

- **Reference Books:**

1. Managerial Economics Concepts and Applications - C. R. Thomas & Maurice – 8th Edition- MCGraw

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B.Tech. (Electrical) Semester-I
Electrical Workshop

Teaching Scheme	Examination Scheme
Practical: - 2 Hrs/Week, 1 Credit	**ICA-**25Marks

Course Objectives:

1. To develop practical workshop skills in the students.
2. To provide students a widespread knowledge and understanding of the workshop tools and other facilities.

Course Outcomes:

At the end of the course student –

1. can apply workshop equipment, wiring accessories and print circuit boards
2. can prepare the PCB in the practical field.
3. can install the earthing for different equipment
4. can find the faults in the circuits by troubleshooting

Electrical workshop

To perform and record any six of following experiments

1. Understanding of different types of switches such as SPST, SPDT, DPST, DPDT, TPST, TPDT
2. Understanding of different types of switchgears such as MCCB, MCB, ELCB, Isolators, HRC fuses
3. Understanding Different types of meters such as analog multimeter, clamp meter, trivector meter, power quality analyser, RLC meters etc.
4. Measurement of insulation resistance and earth resistance.
5. Understanding Different types of power supply, function generator, DSO, CRO.
6. Study and performing of motor winding.
7. Installation of plate, pipe, and grid earthing.
8. Types of wiring, Industrial, domestic wiring and panel wiring etc.
9. PCB design and fabrication
10. Soldering and desoldering of components on PCB.
11. Troubleshooting in electronic circuits.

Carry out at least one activity of the following to give the students an insight to their practical approach in diverse electrical field.

1. Site visit to nearby apartments/industries to understand the electrical wiring.
2. Workshop on PCB design using any suitable and available software like ORCAD, eagle, Proteus etc.
3. Workshop on Solar panel installation.
4. Workshop on motor rewinding.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B.Tech. (Electrical) Semester-II
Electrical Machines Design

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week,3 Credits	**ESE –** 70 Marks
Practical: - 2 Hrs/Week, 1 Credit	**ICA-**25Marks
	ISE- 30Marks
	OE - 25 Marks

Course Prerequisite:

Knowledge on types, construction and working of transformers, DC Machines, three phase induction motor and Synchronous machines.

Course Objectives:

1. To clear the basic concept of design of transformer.
2. To get detailed information for designing a DC Machine.
3. To get detailed information for designing a Three phase Induction machine.
4. To get detailed information for designing a Synchronous machine.

Course Outcomes:

Upon successful completion of this course:

1. Student will get a basic knowledge to design a transformer.
2. Student will get a basic knowledge to design a DC Machine.
3. Student will get a basic knowledge to design a three phase Induction motor.
4. Student will get a basic knowledge to design a Synchronous machine.

SECTION-I

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Unit 1: Introduction: **No of Lectures- 04**

- **Prerequisite:** Working principle of DC and AC Machines
- **Objectives:**

  1. To make students to Understand design principles of design and design factors.
  2. To make students to Understand modern trends in design of electrical machines.

- **Outcomes: After completion of this unit the learner will be able to-**
  1. Understand principles of design and design factors.
  2. Modern trends in design of electrical machines.

- **Unit Content:**
  Principles of design, design factors, specifications, limitations, modern trends in design of electrical machines.
- **Delivery Methods:**
  Chalk and Talk
- **Assessment Methods:**
  Theoretical questions related to above contents

Unit 2: Design of transformers: **No of Lectures -10**

- **Prerequisite**: Transformer basics like Types, construction and working principle
- **Objectives:**
  1. To make students to Understand basic concepts of design of Transformer.
  2. To make students to understand how to design various parts of Transformer.

- **Outcomes: After completion of this unit the learner will be able to**
    1. Design core and yoke.
    2. Design winding and Tank.
- **Unit Content:**
  Types, classification & specifications, output equation, design of core, selection of design constants, design of yoke, design of window, and design of windings, tank design with and without cooling tubes
- **Delivery Methods:**
  Chalk and Talk, Video lectures
- **Assessment Methods:**
  Theoretical questions related to above contents, Numericals on output equation, design of core, design of yoke, design of window, and design of windings, tank design with and without cooling tubes

Unit 3: Design of DC Machines **No of Lectures -07**

- **Prerequisite:**
  Basic knowledge of Rotating machines and Constriction, working of DC Machines
- **Objectives:**
    1. To make students to Understand design of DC Machine.
    2. To make students to Understand how to design various parts of transformer.

Outcomes: After completion of this unit the learner will be able to

1. Design and Analyze parameters of rotating machines
2. Design of Poles, core length and design of field system

- **Unit Content:**
  Output equations of DC machine, factors affecting size of rotating machines, Choice of specific loadings, separation of main dimensions, Selection of no of poles, core length, air gap, design of armature of field system
- **Delivery Methods:**
  Chalk and Talk, Video lectures
- **Assessment Methods:**
  Theoretical questions related to above contents, Numerical on output equation, specific loadings, Selection of no of poles, core length, air gap, design of armature of field system

SECTION-II

Unit 4: Design of three phase induction motors: **No of Lectures 10**

- **Prerequisite:**
  Basic knowledge of Constriction, Types and working of Three Phase Induction Motors
- **Objectives :**
    1. To make students to Understand design of three phase induction motors
    2. To make students to Understand design of various parts of three phase induction motors
- **Outcomes: After completion of this unit the learner will be able to**
    1. Design of Stator.
    2. Design of rotor.
- **Unit Content:**
  Output equation, Choice of specific loadings, main dimensions, stator design, stator winding, stator core, stator slot design, selection of stator slots, air gap length, rotor design, selection of rotor slots, rotor bars/windings calculation, design of end ring, design of wound rotor, no of rotor turns, area of rotor conductors, rotor tooth density, design of rotor core.
- **Delivery Methods:**
  Chalk and Talk, Video lecture
- **Assessment Methods:**
  Theoretical questions related to above contents, Numerical on above contents

Unit 5: Design of synchronous machines: **No of Lectures 11**

- **Prerequisite:**
  Basic knowledge of Construction, Types and working of Synchronous machines
- **Objectives:**
  1. To make students to understand the basic concepts of design of Synchronous machines
  2. To make students to understand how to design various parts of Synchronous machines
- **Outcomes: After completion of this unit the learner will be able to**
  1. Design of Main dimensions.
  2. Design length of air gap.
- **Unit Content:**
  Output equation, specific loadings, design of salient pole machines-main dimensions, length of air gap, armature design, design of turbo alternator main dimensions, length of air gap,stator design, rotor design.
- **Delivery Methods:**
  Chalk and Talk, Video lecture
- **Assessment Methods:**
  Theoretical questions related to above contents, Numericals on above contents

- **Internal Continuous Assessment (ICA):**

Term work shall consist of at least 6 drawing sheets based on the above syllabus.

Text Books:

1. A.K Sawhney, “A course in Electrical machine design”, Dhanpat Rai & Sons
2. R.K Agarwal, “Principles of Electrical machine design” , S K Kataria & Sons

Reference Books:

1. Mittle V.N and Mittle A, “Design of Electrical machines”, Standard publications and Distributors
2. M.G.Say, “Performance & design of A.C machines”, CBS Publishers & Distributors
3. A.E.Clayton, “Performance & design of D.C machines”, CBS Publishers & Distributors

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B.Tech. (Electrical) Semester-II
Electrical Utilization

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week, 3 Credits	**ESE –** 70 Marks
Tutorial: - 1 Hr/Week , 1 Credit	**ICA -** 25 Marks
	ISE - 30 Marks

Course Prerequisite:
Basics of Electrical Engineering, Effects of electric current, Control circuit design basics, awareness about artificial lighting, Characteristics and application of different electric motors, awareness about traction, awareness about energy conservation.

Course Objectives

1. To provide the students the fundamental concepts of traction system, train movement, tractive effort used in electric traction and controlling of traction motors.
2. To analyze the accessing techniques for braking system implementation in traction.
3. To comprehend the different issues related to heating, welding and illumination.
4. To make the students aware about the importance of maximizing the energy efficiency by optimum utilization of electrical energy.
5. To develop self and lifelong learning skills, introduce professionalism for successful career.

Course Outcomes

1. Students will be able to design a suitable scheme of speed control for the traction systems.
2. Students will be able to understand different controlling methods, transition methods in traction.
3. Students will be able to identify a heating/ welding scheme for a given application.
4. Students will be able to identify/ Trouble shoot various lamps and fittings in use.
5. Students will be able to understand the importance of maximizing the energy efficiency by its optimum utilization and mould their practical work in professional world accordingly

SECTION-I

Unit-1 Traction Systems **No of Lectures- 08**

- **Prerequisite:**
  Awareness about traction
- **Objectives:**
  1. To introduce to student basic terms used in traction system.
  2. To introduce different types of traction systems.
  3. To introduce student to types of speed time curve.
- **Outcomes: After completing this unit student-**
  1. Can define different terms in traction system.
  2. Can understand different types of traction systems.
  3. Can analyze selection of speed time curves for different services.
- **Unit Content:**
  Introduction, different system of traction, systems of electric traction, speed time curve for different services, calculation by trapezoidal and quadrilateral speed time curve, mechanics of train movement, tractive effort for propulsion of train, determination and factors effecting specific energy consumption using speed time curve, dead weight, accelerating weight and adhesive weight, introduction to metro system, monorail system.
- **Content Delivery Methods:**
  Chalk and talk, Power point presentation, Video lectures
- **Assessment Methods:**
  Derivation, Numerical, Theoretical questions on above unit content.

Unit-2 Control of Traction Motors and Train Lighting **No of Lectures- 08**

- **Objectives:**
  1. To introduce to student about different types of motors used for traction, different braking systems and lighting systems.
  2. To introduce student to speed control, control and auxiliary equipment.
- **Outcomes: After completing this unit student-**
  1. Can define different types of motors, braking systems and lighting systems.
  2. Can analyze selection of control and auxiliary equipment.
- **Unit Contents:**
  Desirable characteristic of traction motors, suitability of dc series motor, 3 phase induction motor for traction, control of traction motors -series-parallel control, shunt and bridge transition, electrical breaking, regenerative breaking in traction, control equipment and auxiliary equipment, drum controller, master controller, train lighting system.
- **Content Delivery Methods:**
  Chalk and talk, Power point presentation, Video lectures
- **Assessment Methods:**
  Derivation, Numerical, Theoretical questions on above unit content.

Unit-3 Selection of Motors for Industrial Applications **No of Lectures- 05**

- **Objectives:**
  1. To make students to understand concepts and operation of different types of motors.
  2. To make students to understand application of different motors.
- **Outcomes:**
  After completing this unit student-
  1. Can understand operation of different motors.
  2. Can analyze for application of motors.
- **Unit Contents:**
  Motor selection in textile industries, machine tools, rolling mills, sugar mills, cranes and Lifts
- **Content Delivery Methods:**
  Chalk and talk, Power point presentation, Video lectures
- **Assessment Methods:**
  Theoretical questions

SECTION-II

Unit-4 Electric Heating and Welding **No of Lectures- 08**

- **Objectives:**
  1. To ensure that the knowledge acquired can be applied in various fields of electric Heating.
  2. To ensure that the knowledge acquired can be applied in various fields of electric Welding.
- **Outcomes: After completing this unit student-**
  1. Students will get technical knowledge of modern heating techniques in practical world.
  2. Students will get technical knowledge of modern welding techniques in practical world.
- **Unit Contents:**
  Electric heating- types, advantages, disadvantages & applications, electric welding- types, advantages, disadvantages & applications
- **Content Delivery Methods:**
  Chalk and talk, Power point presentation, Video lectures
- **Assessment Methods:**
  Theoretical questions, Numerical on resistance heating

Unit-5 Illumination **No of Lectures- 08**

- **Objectives:**
  1. To develop ability amongst the students to analyze the performance of different sources of light.

2. To develop ability amongst the students to analyze the performance of different illumination schemes.

- **Outcomes: After completing this unit student-**
  1. will be able to design simple illumination schemes
  2. Can analyze selection of sources of light
- **Unit Contents:**
  Introduction, terms used in illumination, laws of illumination, factors to be considered for design of illumination scheme, source of light, discharge lamps, MV and SV lamps, comparison between tungsten filament lamps and fluorescent tubes, basic principles of light control, street lighting and flood lighting, CFL & LED Lamps.
- **Content Delivery Methods:**
  Chalk and talk, Power point presentation
- **Assessment Methods:**
  Numerical, Theoretical questions

Unit-6 Energy Conservation **No of Lectures- 05**

- **Objectives:**
  1. To make the students aware about the importance of Energy Conservation.
  2. To make the students aware about the importance of maximizing the energy efficiency by optimum utilization of electrical energy.
- **Outcomes: After completing this unit-**
  1. Students will be able to define the importance of Energy Conservation.
  2. Students will be able to define the importance of maximizing the energy efficiency by its optimum utilization
- **Unit Contents:**
  Introduction, Motivation for Energy Conservation, Principles of Energy Conservation, Energy Conservation Planning, Energy Conservation in Industries, Energy Conservation in Household and Commercial Sectors, Energy Conservation in Transport and Agriculture
- **Content Delivery Methods:**
  Chalk and talk, Power point presentation
- **Assessment Methods:**
  Theoretical questions

Text Books: -

1. J.B. Gupta, “A course in Electrical Power” by, S K Kataria And Sons
2. Dr. S.L. Uppal, “Electrical power”, Khanna Publishers

References Books: -

1. B.R. Gupta, “Generation of Electrical Energy”, S Chand
2. E. O. Taylor, “Utilizations of electrical energy”, Orient Longman Pvt Ltd.
3. H Partab, “Art & Science of Utilization of Electrical Energy” Dhanpat Rai & Co

Internal Continuous Assessment (ICA):-

There should be minimum 6 assignments on the above syllabus and one industrial visit. Visit to any one location from the following-

1. Railway station (Control room)
2. Loco shed
3. Traction substation
4. Forging Industry

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B.Tech. (Electrical) Semester-II
Power Electronics & Industrials Drives

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week, 3 Credits	**ESE –** 70 Marks
Practical: - 2 Hrs/Week, 1 Credit	**ICA-** 25 Marks
	ISE- 30 Marks
	POE - 50 Marks

Course prerequisite: Basics of low power Semiconductor devices, uncontrolled rectifiers, AC, DC waveforms and its equations, Electrical Machines.

Course Objectives To enable students to gain knowledge and understanding in the following aspects:

1. Fundamentals of power electronic devices and characteristics.
2. The concepts and operating principles of power electronics circuits.
3. Provide the basics of DC and AC variable speed drives.

Course Outcome: Upon successful completion of this course, a student should be able to:

1. Understand the fundamental principles and applications of power electronics circuits
2. Solve problems and design switching regulators according to specifications.
3. Use Computer-aided techniques for the design of power converter circuits.
4. Appreciate the latest developments in power electronics.
5. Assimilate new technological and development in related field
6. Analyze and solve numerical problems on electrical drives.
7. Apply the knowledge to practical industrial systems.

SECTION-I

Unit 1 Silicon Controlled Rectifier and Semiconductor Devices **No of Lectures - 07**

- **Prerequisite:**

Low power Semiconductor diode, transistor and MOSFET

- **Objective:**

1. To introduce to student Silicon controlled Rectifier (SCR).
2. To make student understand SCR & Power Semiconductor Devices characteristics.
3. To make student understand Turn ON & Turn OFF methods of SCR.

- **Outcome:**

After completion of topic students will be able to

1. Understand operation and Characteristics of various power electronic devices.
2. Draw Static & Dynamic Characteristics of SCR
3. Draw circuits & waveforms of commutation methods
4. Draw circuits of turn on methods

- **Unit Content:**

Introduction to PN junction, Principle of operation of Silicon Controlled Rectifier (SCR), Static & Dynamic characteristics, Turn on Methods, Firing circuits (using R, R-C only), Commutation Circuits (class C & D only), Protection circuits of SCR (over voltage, over current, dv/dt & di/dt). Principle of operation, V-I characteristics, rating and applications of Triac, Diac, Gate turn Off Thyristor (GTO),

- **Content Delivery Method:**

Chalk and Talk, Power Point Presentation, Animation Video

- **Assessment Methods:**

Theoretical questions on above contents.

Unit 2 Phase Controlled Rectifiers **No of Lectures - 07**

- **Prerequisite:**

Low Power diode based rectifiers.

- **Objective:**

1. To enable students to gain knowledge and understanding of the concepts and operating principles of phase-controlled rectifiers.
2. To enable students to analyze phase-controlled rectifiers
3. To enable students to gain knowledge and understanding of the concepts and operating principles of DC-to-DC converters.
4. To enable students to analyze DC to DC converters

- **Outcome:**

After completion of topic students will be able to

1. Understand the concepts & operating principles of phase-controlled rectifiers
2. Analyze phase-controlled rectifiers
3. Understand the concepts & operating principles of DC to DC converters
4. Analyze DC to DC converters

- **Unit Content**

Rectifiers: Introduction, Half wave controlled rectifiers with R, R-L load with and without freewheeling diode. Full Wave controlled rectifiers (Half controlled & Fully controlled) with R, R-L load with and without freewheeling diode, Three phase half controlled & Fully controlled rectifiers with R load only.

Chopper's: Principle of operation, Classification of choppers, Control Techniques, Step down and Step up choppers, DC-DC switched mode regulators– Buck, Boost, Buck-Boost and Cuk.

- **Content Delivery Method:**

Chalk and Talk, Power Point Presentation, Animation Video

- **Assessment Methods:**

Theoretical and numerical on the above contents.

Unit 3 Inverters & AC Voltage Controllers. **No of Lectures - 07**

- **Prerequisite:**

Operation of Switching devices, pure and quasi-AC waveforms.

- **Objective:**

1. To enable students to gain knowledge and understanding of the concepts and operating principles of Inverters
2. To enable students to analyze Inverter circuits
3. To enable students to analyze AC voltage controllers

- **Outcome:**

After completion of topic students will be able to

1. Understand the concepts & operating principles of inverters
2. Analyze inverter circuits
3. Understand the concepts & operating principles of AC to AC converters

- **Unit Content**

Inverters: Introduction and Classification of Inverters, Principle of operation, Single phase half and full bridge Inverters with R & R-L load, 3 phase bridge Inverters (120^0 and 180^0 conduction mode) with R load. Voltage control methods of 1- phase inverters.

AC Voltage Controllers - Introduction of AC Voltage Controllers, Principle of On-Off Control, Principle of Phase Control, Single Phase bidirectional control with R load only.

- **Content Delivery Method:**
  Chalk and Talk, Power Point Presentation, Animation Video
- **Assessment Methods:**
  Theorical and derivations questions on above contents.

SECTION: II

Unit-4 Introduction and Dynamics of Electrical Drives **No of Lectures - 07**

- **Prerequisite:**

Basic concepts from Electrical Machines, Speed control of Electric Machines.

- **Objectives:**

1. To make students to understand Electrical Drive concept.
2. To make students to understand selection of motor rating for drive.
3. To make students to understand selection of converter rating for drive.
4. To make students to understand dynamics of Electrical Drives.

- **Outcomes:**

After completing this unit, student –

1. Able to apply the concepts of Electrical Drive.
2. Able to select proper motor rating for drive.
3. Able to select converter rating for drive.
4. Understand the dynamics of Electrical Drives.

- **Unit Content:**

Block diagram, Types of the electrical drives, parts of electrical drives, criteria for Selections & choice of electrical drives. Dynamics of electrical drives: Fundamental torque equation, speed, torque, connection and Multi-quadrant operation of Drives, Close loop control of drives.

- **Content Delivery Method:**

Chalk and Talk, Power Point Presentation, Animation Video

- **Assessment Methods:**

Theoretical questions on above contents.

Unit-5 DC Drives **No of Lectures - 07**

- **Prerequisite:**

Basic relations & characteristics of DC motor, conventional speed control methods of DC motors, basic knowledge of rectifier and chopper operation etc.

- **Objectives:**

1. To make students to understand the speed control of DC motors using power electronic converters such rectifiers, Choppers etc.
2. To make students to perform the various speed control methods of DC motors using different converters.
3. To make student to understand the real time application of these methods.

- **Outcomes:**

After completing this unit, student –

1. Would understand the converter fed DC motor speed control techniques.
2. Would perform the practical using different speed control methods.
3. Would be able to get the real time application of converter fed DC motor.

- **Unit Content:**

Single phase, three phase half and fully controlled converter fed DC motor drives. Chopper controlled dc shunt motor drives in single quadrant and multi-quadrant operation chopper controlled drives, Braking and types of Electrical Braking. Brush less DC Motor drives operation & converter circuit, numerical on rectifier fed dc motors only.

- **Content Delivery Method:**

  Chalk and Talk, Power Point Presentation, Animation Video

- **Assessment Methods:**

Theorical and derivations questions on above contents.

Unit-6 AC Drives **No of Lectures – 07**

- **Prerequisite:**

Basic relations & characteristics of Induction motor, conventional speed control methods of induction motors, basic knowledge of inverter operation etc.

- **Objectives:**

1. To make students to understand the speed control of induction motor using power electronic converters such as inverters.
2. To make students to perform the various speed control methods of induction motors using different converters.
3. To make student to understand the real time application of these methods.

- **Outcomes:**

After completing this unit, student –

1. Would understand the inverter fed induction motor speed control techniques.
2. Would perform the practical using different speed control methods.
3. Would be able to get the real time application of inverter fed induction motor.

- **Unit Content:**

Basic relations, of 3 phase induction motor, Stator voltage control of 3 phase induction motor by AC regulators fed 3 phase induction motor speed control, variable frequency control by CSI & VSI, comparison between VSI and CSI. VSI fed synchronous motor drives, Variable frequency control of multiple Synchronous motor drives, Stepper motor drives operation & converter circuit, switched reluctance motor drives operation & converter circuit.

- **Content Delivery Method:**

Chalk and Talk, Power Point Presentation, Animation Video

- **Assessment Methods:**

Theoretical questions on above contents.

Text Books:

1. M H Rashid, “Power Electronics” Prentice-Hall of India
2. P S Bimbhra, “Power Electronics” Khanna Publishers
3. K Hari Babu, “Power Electronics” Scitech Publication
4. Alok Jain, “Power Electronics & its Applications” Penram International Publishing (India) Pvt. Ltd.
5. Vedam Subramanyam, “Power Electronics” New Age International.
6. Gopal. K. Dubey, “Fundamentals of Electrical Drives”, Narosa Publication

Reference Book:

1. Landers “Power Electronics”, McGraw Hill
2. M.D. Singh, K.B. Khanchandani, “Power Electronics” Tata McGraw Hill
3. P.C.Sen, “Modern Power Electronics” Wheeler Publication
4. M H Rashid, “Power Electronics Handbook” Academic Press Series in Engineering.
5. N. Mohan T.M. Udeland and W.P. Robbins John, “Power Electronics convertor application” Willey & Sons
6. Vedam SuryaVanshi, “Electrical Drives-concept and application” IEEE, 1997
7. B.K. Bose “Modern power electronics & AC drives” Prentice Hall PTR, 2002

Internal Continuous Assessment (ICA):

Minimum Six experiments on hardware and Three simulations should be performed:

List of experiment is as follows:

1. V-I Characteristic of SCR
2. Characteristic of any one high switching frequency devices
3. Commutation circuit of SCR
4. Experiment based on controlled rectifiers
5. Experiment based on inverters
6. Experiment based on DC to DC converter
7. Experiment based on AC voltage controller
8. Speed control of DC motor based on controlled rectifiers.
9. Speed control of AC motor using VSI.
10. Speed control of AC motor based on Regulators.

List of simulations is as follows:

1. Simulations based on AC to DC converter
2. Simulations based on DC to DC converter
3. Simulations based on DC to AC converter
4. Simulations based on AC to AC converter

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B. Tech. (Electrical) Semester-II
Advanced Control System

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week,3 Credits	**ESE –** 70 Marks
Practical: - 2 Hrs/Week, 1 Credit	**ICA -** 25Marks
	ISE - 30Marks

- **Course Prerequisite:**

Student shall have knowledge of Ordinary differential equation, mathematical modelling of different systems, transient and steady state response of systems, stability of systems in time domain and frequency domain. Student shall also have basic knowledge of linear algebra and Laplace and Z-Transform.

- **Course Objectives**
  1) To enhance the analytical ability of the students in facing the challenges posed by growing trends in designing the control systems in time and frequency domain.
  2) To enhance the ability of the students to analyze and design the control system in modern control approach.
  3) To enhance the ability of the students to understand nonlinear control systems.
  4) To enhance the ability of the students to analyze the Discrete Time Control Systems.
- **Course Outcome**
  1) Students will be able to design the controller in time and frequency domain.
  2) Students will be able to examine and design the control system in modern approach.
  3) Students will be able to analyze the nonlinear control systems.
  4) Students will be able to analyze the Discrete Time Control Systems.

SECTION I

Unit 1: Design of compensator using Root Locus **No of Lectures- 08**

- **Prerequisite:** Time domain specifications, stability, root locus plot
- **Objectives:**
  1) To revise root locus plot and stability analysis
  2) To make student understand different compensation techniques
  3) To make student design the compensators in time domain
  4) To make student realize the compensators
- **Outcomes: After completing this chapter, the student will be able to:**
  1) Use the root locus to design cascade compensators to improve the steady-state error
  2) Use the root locus to design cascade compensators to improve the transient response
  3) Use the root locus to design cascade compensators to improve both the steady-state error and the transient response
  4) Realize the designed compensators physically
- **Unit contents:**
  Introduction of design problem, Approach & preliminary considerations, Realization of basic compensators with passive and active networks, Design of lead, lag & lag-lead compensators
- **Content Delivery Methods:**
  Chalk and talk, Video lectures and power point presentations
- **Assessment Methods:**
  Design problems and theoretical aspects

Unit 2: Design of compensator using Frequency response **No of Lectures- 06**

- **Prerequisite:** Frequency domain specifications, correlation between time and frequency domain, stability, Bode plot
- **Objectives:**
  1) To revise Bode plot and stability analysis
  2) To make student design the compensators in frequency domain
  3) To make student realize the compensators
- **Outcomes:**
  After completing this chapter, the student will be able to:
  1) Use the Bode plot to design cascade compensators to improve the steady-state error
  2) Use the Bode plot to design cascade compensators to improve the transient response
  3) Use the Bode plot to design cascade compensators to improve both the steady-state error and the transient response
- **Unit Content:**
  Transient response through gain adjustment, lag compensation, lead compensation, lag-lead compensation using Bode Plot
- **Content Delivery Methods:**
  Chalk and talk, Video lectures and power point presentations
- **Assessment Methods:**
  Design problems and theoretical aspects

Unit 3: State-Space Analysis **No of Lectures- 07**

- **Prerequisite:** Introductory linear algebra, introductory differential equations and Laplace transform, introductory vector-matrix analysis
- **Objectives:**
  1) To introduce the basic methods of state variables and state equations
  2) To make student obtain the state space representation for electrical and mechanical systems
  3) Students can use state-space techniques to model linear systems
  4) Students understand the concepts of controllability and observability
- **Outcomes:**
  After completing this chapter, the student will be able to:
  1) Find a mathematical model, of state-space representation, for a linear, time invariant system.
  2) Model electrical and mechanical systems in state space.
  3) convert a transfer function to state space and vice versa.
  4) Controllability and observability
- **Unit Content:**
  Concept of state, state variable & state model, state-space representation of transfer function of electrical and mechanical systems, state transition matrix, its properties, Solution of homogeneous and non-homogeneous state equation, Controllability & Observability
- **Content Delivery Methods:**
  Chalk and talk, Video lectures and power point presentations
- **Assessment Methods:**
  Design problems and theoretical aspects

SECTION-II

UNIT 4: State Space Design **No of Lectures- 07**

- **Prerequisite:** Qualitative theory of ordinary differential equations, Linear algebra, State space representation and analysis
- **Objectives:**
  1) Understanding the basis results in state-space analysis of LTI systems
  2) Learn fundamental control design architectures
- **Outcomes: After completing this chapter, the student will be able to:**

1) Apply state space and state feedback in modern control systems, and pole placement.
2) Design pole placement controller and/or observer for the given system to achieve desired response
3) Design of state observers and output feedback controllers

- **Unit Content:**
  Introduction, Design of Pole placement, Necessary and sufficient condition for arbitrary pole placement, Determination of K using transformation Matrix, Direct Substitution and Ackermann's Formula, State Observer, Full state observers, Effects of addition of the observer on a closed loop system. TF of the observer-based controller Design of Control System with observers
- **Content Delivery Methods:**
  Chalk and talk, Video lectures and power point presentations
- **Assessment Methods:**
  Design problems and theoretical and numerical aspects

Unit 5: Non-linear Control Systems **No of Lectures- 07**

- **Prerequisite:** The students are expected to be familiar with ordinary differential equations, linear control systems and linear algebra
- **Objectives:**
  1) Learn properties of nonlinear behavior and nonlinear controlled systems
  2) Understand phase-plane analysis, equilibrium Points, describing function method
  3) Students will learn a variety of methods for analyzing the structure and behavior of nonlinear feedback systems.
- **Outcomes: After the successful completion of the course the students will be able to:**
  1) Construct the phase plane trajectory of a given nonlinear system
  2) Demonstrate non-linear system behavior by phase plane and describing function methods
  3) Identify the existence of limit cycle(s) for the given nonlinear system
  4) Perform the stability analysis nonlinear systems
- **Unit Content:**
  Introduction, common non-linearity in control system, Phase plane method. Singular points, Stability of Nonlinear Systems, construction of phase trajectories by analytical and graphical methods, Definition & derivation of Describing Functions for different nonlinearity.
- **Content Delivery Methods:**
  Chalk and talk, Video lectures and power point presentations
- **Assessment Methods:**
  Design problems and theoretical aspects

UNIT 6: Discrete-time Control System **No of Lectures- 07**

- **Prerequisite:** Difference Equations, Z Transforms, Laplace Transforms, Linear Control System Analysis
- **Objectives:**
  1) To equip the students with the basic knowledge of discretization.
  2) To explain basic and digital control system for the real time analysis of control systems
  3) To explain the process of sampling and the effect of sampling period in the performance of digital control system
  4) To calculate the performance of a given pulse transfer function in time domain
- **Outcomes: After completing this chapter, the student will be able to:**
  1) Derive discrete-time mathematical models in both time domain (difference equations, state equations) and z-domain (transfer function using z-transform)
  2) Predict and analyze transient and steady-state responses of discrete-time control systems
  3) Analyze stability of open-loop & closed-loop linear, time-invariant, discrete-time control systems
- **Unit Content:**
  Basic elements of discrete data control system and its advantages over the continuous time system, Pulse Transfer Function of cascade elements, closed loop systems and digital controller, Z-

transform analysis of Discrete-Time Control Systems, Mapping between s-plane & z-plane, stability analysis of closed loop systems in z-plane using Juri's Test, Bilinear Transformation and Root Locus

- **Content Delivery Methods:**
  Chalk and talk, Video lectures and power point presentations
- **Assessment Methods:**
  Design problems and theoretical aspects

Internal Continuous Assessment (ICA):

Minimum **eight** programs should be performed in the laboratory based on the entire syllabus.

Text Books:

1. I. J. Nagrath, M. Gopal "Control System Engineering", 5th Edition. New Age International Publishers.
2. Control System Engineering by R. Anandanatrajan, P Ramesh Babu, 2nd Edition, SciTech
3. Discrete-time Control Systems by K Ogata, Prentice Hall India, 2nd Ed
4. Digital Control Systems by B.C. Kuo, Saunders college Publishing, 2nd Ed

Reference Books:

1. Benjamin C. Kuo, "Automatic Control Engineering", Prentice Hall of India Pvt. Ltd.
2. K. Ogata, "Modern Control Engineering", Prentice Hall of India Pvt. Ltd.
3. M. Gopal, "Digital Control Engineering", Wiley Eastern, 1988
4. Control system principles and design, M. Gopal, TMH publication, 3rd edition, 2008
5. Feedback Control Systems, C. L. Phillips, R. D. Harbor PHI publication, 1988

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B. Tech. (Electrical) Semester-II
Open Elective-II
Operating Systems

Teaching Scheme	Examination Scheme
Theory: - 2 Hrs/Week, 2 Credits	**ESE –** 70 Marks
Tutorial: - 1 Hrs/Week, 1 Credit	**ICA -** 25Marks
	ISE - 30Marks

This course covers the classical internal algorithms and structures of operating systems, including CPU scheduling and memory management. It also includes the unifying concept of the operating system as a collection of cooperating sequential processes. It also covers topic such as file systems, memory management, virtual memory, and deadlocks.

- **Course Prerequisite:**

Student shall possess knowledge of data structure, microprocessors, and microcontrollers. Elementary knowledge of computer architecture, algorithms, and serial communication concepts is desirable. A strong programming skill is necessary.

- **Course Objectives:**

1. To introduce to student structure of operating system and its types.
2. To make student realize importance of processes and inter process communication.
3. To make student analyze and design algorithm for process scheduling, synchronization and removing deadlock.
4. To make student analyze memory management during process execution
5. To make student create directory structure and file system in an operating system

- **Course Outcomes:** After completion of this course,

1. Student can identify and describe structure, operations, and different types of operating system.
2. Student can describe the concept of process and inter process communication.
3. Student can analyze effect of different scheduling criteria on scheduling techniques.
4. Student can describe deadlock condition and implement methods to overcome deadlock.
5. Student can analyze memory management concepts like logical and physical addressing.
6. Student can make use of file systems, directories and different commands associated to it.

Section I

Unit 1–Introduction and overview of operating system No of lectures –05

- **Prerequisite:** Evolution of computer system and operating system. Concepts of basic computer system-hardware & software architecture, programming languages.
- **Objectives:**

1. To make student aware about operating system, its goals and various operations supported by it.
2. To make student acquaint with different types of operating systems and their significance.
3. To introduce to student structure of operating system.
4. To introduce to student operation of system call.

- **Outcomes:** After completing this unit, student -

1. Can explain goals and services provided by operating system.
2. Can draw and explain simple batch system and multi programming system.
3. Can explain significance of time-sharing system, real time operating system and distributed operating system.
4. Can draw and explain structure of general operating system.
5. Can explain the concept of system call.

- **Unit Content:**

Operating system, goals of an operating system, services of an operation system, classes of an operating system -simple batch system, multiprogramming system, time sharing system, real time system, distributed operating systems, structure of OS, system call and its uses.

- **Content Delivery Methods:**

Chalk and talk, power point presentations, video tutorials

- **Assessment Methods:**

Questions based upon goals and services of an operating system, descriptive questions to ensure understanding batch processing, real time system, and time sharing system distributed system, system call, block diagram of operating system structure.

Unit 2–Process management **No of lectures – 05**

- **Prerequisite:** Program execution environment in computer system, concepts of queue and buffer.
- **Objectives:**

1. To make student understand how to create a process.
2. To make student analyze operations on process.
3. To introduce to student concept of cooperation between processes.
4. To introduce student the notion of threads.
5. To make student understand inter process communication and its types.

- **Outcomes:** After completing this unit, student –

1. Can describe concepts of process.
2. Can draw and explain different states of process and process control block.
3. Can demonstrate operations on processes and implement the concepts like process creation using C programming.
4. Can describe the notion of threads
5. Can explain different types of inter process communication.

- **Unit Content:**

Process concept, process state diagram and process control block, operations on processes- creation & termination, cooperating processes, inter process communication, threads: multi- threading models and threading issues

- **Content Delivery Methods:**

Chalk and talk, power point presentation, C programs on threads

- **Assessment Methods:**

Questions based upon block diagram and descriptive questions to ensure understanding of the process state diagram and PCB, process creation and termination, threads and inter process communication.

Unit 3–Process scheduling & synchronization **No of lectures – 04**

- **Prerequisite:** Concept of system call and Process concepts.
- **Objectives:**

1. To introduce to student concept of process scheduling and different scheduling criteria
2. To make student implement FCFS, SJF, SRTF, priority and round-robin scheduling algorithms using C programming
3. To make student identify classical problems of synchronization
4. To make student analyze and resolve critical section problem.
5. To make student use synchronization tool: semaphore to avoid critical section problems

- **Outcomes:** After completing this unit, student –

1. Can design an algorithm for process scheduling and scheduling criterions.
2. Can describe analytical concepts related to FCFS, SJF, priority scheduling and round robin scheduling algorithms along with their implementation using C programming.
3. Can examine classical problem of synchronization and to analyze semaphore implementation.
4. Can explain critical section problem

- **Unit Content:**

Process scheduling concept, scheduling criteria, scheduling algorithms- non pre-emptive, pre-emptive, different scheduling algorithm- FCFS, SJF, SRTF, priority based, round robin, classical problems of synchronization- the critical section problem, semaphore as synchronization tool

- **Content Delivery Methods:**

Chalk and talk, power point presentation, animation, C programs

- **Assessment Methods:**

Numerical questions based upon process scheduling and descriptive questions to ensure understanding of the process scheduling and their algorithms, classical problems of synchronization and critical section problems.

Section II

Unit 4-Deadlock **No of lectures – 04**

- **Prerequisite:** Process & synchronization.
- **Objectives:**

1. To introduce to student concept of deadlock characterization.
2. To make student understand different methods for handling deadlocks
3. To make student investigate deadlock states.

- **Outcomes:** After completing this unit, student –

1. Can investigate deadlock and its characterizations
2. Can design & describe resource allocation graph to handle deadlock.
3. Can analyze and describe deadlock prevention methods to avoid deadlock.

- **Unit Content:**

Introduction to deadlock, deadlock characterization, methods for handling deadlocks, dead lock prevention, deadlock avoidance, deadlock detection , recovery from deadlock.

- **Content Delivery Methods:**

Chalk and talk, power point presentation, animation.

- **Assessment Methods:**

Questions based upon deadlock and deadlock characterization, descriptive question based on deadlock prevention and deadlock avoidance and detection methods.

Unit 5-Memory management **No of lectures – 03**

- **Prerequisite:** Memory storage schemes, primary memory, secondary memory, RAM partitioning
- **Objectives:**

1. To make student realize logical versus physical address space mapping.
2. To introduce to student concept of process swapping for effective utilization of memory.
3. To make student understand contiguous allocation of memory.
4. To make student explore paging & segmentation

- **Outcomes:** After completing this unit, student –

1. Can illustrate logical versus physical address mapping.
2. Can draw & describe need and procedure of process swapping.
3. Can portray types of memory allocation scheme along with memory fragmentation.
4. Can draw & describe paging and segmentation.

- **Unit Content:**

Background of memory, logical versus physical address space, swapping, contiguous memory allocation, paging, segmentation, segmentation with paging

- **Content Delivery Methods:**

Chalk and talk, power point presentation, animation.

- **Assessment Methods:**

Descriptive questions based on logical versus physical address mapping, swapping, contiguous memory allocation, paging & segmentation.

Unit 6- Virtual memory **No of lectures – 03**

- **Prerequisite:** Memory management

- **Objectives:**

1. To introduce to student basics of virtual memory management and demand paging
2. To make student analyze page replacement policy and solve problems related to it.
3. To make student realize frame allocation & thrashing
4. To make student understand demand segmentation.

- **Outcomes:** After completing this unit, student –

1. Can describe concept of virtual memory.
2. Can draw & describe demand paging.
3. Can describe and analyze page replacement algorithm.
4. Can draw and explain frame allocation & thrashing.

- **Unit Content:**

Background, demand paging, need of page replacement, page replacement algorithms, allocation of frames, thrashing concept, demand segmentation

- **Content Delivery Methods:**

Chalk and talk, power point presentation, animation

- **Assessment Methods:**

Descriptive question based upon demand paging, page replacement techniques & algorithm, allocation of frames, thrashing, and demand segmentation, page replacement -analytical problems based on page replacement algorithm

Unit 7- File system **No of lectures – 04**

- **Prerequisite:** Disk input output system & direct memory access
- **Objectives:**

1. To introduce to student concept of file system and directory.
2. To make student comprehend file system mounting and protection.
3. To make student apply file allocation methods.
4. To introduce to student concept of file system in Linux.

- **Outcomes:** After completing this unit, student –

1. Can demonstrate file system.
2. Can demonstrate & describe file access methods, file system mounting and protection.
3. Can demonstrate & describe file allocation methods.

- **Unit Content:**

File system concept, file access methods, directory structure, file-system mounting, protection, directory implementation, allocation methods, free-space management

- **Content Delivery Methods:**

Chalk and talk, power point presentation, animation, Linux file system utilities

- **Assessment Methods:**

Questions based upon file access method, file directories, file allocation methods, procedure description of file system mounting and protection, directory implementation

- ## Internal Continuous Assessment (ICA):

It consists of **minimum eight experiments** based on operations on process, system calls, scheduling algorithm, threads, memory management using C programming language over Linux platform.

Text Books:

1. Operating System Concepts -Silberschatz Galvin- John Wiley Publications
2. Operating System Concept Based Approach- Dahanjay M. Dhamdhare, 3rdEdition- Tata McGraw Hill

Reference Books:

1. Operating Systems Internals and Design Principles- William Stallings-5thEdition, Prentice Hall India
2. Operating System with Case Studies in UNIX, Netware and Windows NT-Achyut S. Godbole, Tata McGraw Hill
3. Operating System in Depth- Thomas W. Doeppner- Wiley Student Edition, Wiley India Pvt. Ltd

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B. Tech. (Electrical) Semester-II
Open Elective-II
Renewable Energy Sources

Teaching Scheme	Examination Scheme
Theory: - 2 Hrs/Week, 2 Credits	**ESE** – 70 Marks
Tutorial: - 1 Hrs/Week, 1 Credit	**ICA**-25Marks
	ISE- 30Marks

- **Course Objectives**

1. To study role and potential or renewable energy sources in modern power system
2. To understand different instruments or devices used and applications of renewable energy sources.

- **Course Outcomes**

1. To become familiar with the renewable energy sources and their applications to power generation.

SECTION-I

Unit- 1 Solar Radiation and its Measurement **No of lectures – 04**

- **Prerequisite:** Knowledge of solar Energy.
- **Objectives:**
  1. To introduce student to Solar Energy.
  2. To make student understand the measurement of solar radiation.
- **Outcomes:** After completing this unit, students
  1. Can understand the role and potential of Renewable sources.
  2. Can analyze different instruments for measurement of solar radiation.
- **Unit Content:**

Role and potential of new and renewable source, the solar energy option, physics of the sun, the solar constant, terrestrial and extra-terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data.

- **Content Delivery Methods:**

Chalk and talk, power point presentations.

- **Assessment Methods:**

Theory questions related to above content.

Unit- 2 Solar Energy Collection **No of lectures – 05**

- **Prerequisite:** Knowledge of Solar Energy Collection.
- **Objectives:**
  1. To introduce student to Solar Energy Collection methods.
- **Outcomes: After completing this unit, students –**
  1. Can understand the different methods for collection of solar energy
  2. Can analyze flat plate and concentrating solar collectors.
- **Unit Content:**

  Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.
- **Content Delivery Methods:**

  Chalk and talk, power point presentations.
- **Assessment Methods**

  Theory questions related to above content.

Unit- 3 Solar Energy Storage and Applications **No of lectures – 02**

- **Prerequisite:** Knowledge of solar energy storage and its applications.
- **Objectives:**

To introduce student to Solar Energy Storage methods.

- **Outcomes: After completing this unit, students –**

1. Can understand the different methods for storage of solar energy.
2. Can study the different applications of solar energy.

- **Unit Content:**

Different methods, Sensible, latent heat and stratified storage, solar ponds, Solar Applications-solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

- **Content Delivery Methods:**

Chalk and talk, power point presentations.

- **Assessment Methods:**

Theory questions related to above content.

Unit- 4 Wind Energy **No of lectures – 03**

- **Prerequisite:** Knowledge of Wind Energy and its applications.
- **Objectives:**

To introduce student to Wind Energy.

- **Outcomes: After completing this unit, students –**

1. Can understand the operation of wind energy.
2. Can define site selection considerations of wind energy.
3. Can define merits, demerits and applications of WECS.

- **Unit Content:**

Sources and potentials, site selection considerations, Basic components of a WECS, classification of WEC systems, advantages and disadvantages of WECS, horizontal and vertical axis windmills, performance characteristics of Wind-machines, Bet'z criteria.

Content Delivery Methods:

Chalk and talk, power point presentations.

- **Assessment Methods:**

Theory questions related to above content.

SECTION-II

Unit -5 Bio-Mass **No of lectures – 04**

- **Prerequisites:** Terms related to Bio-conversion
- **Objective:**

1. To revise basic concepts of Bio-Conversion
2. To make students understand IC Engine operation

- **Outcomes:**

After completion of this unit students can understand Bio-gas Power plant Process.

- **Unit Content:**

Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I. C. Engine operation and economic aspects

- **Content Delivery Methods:**

Chalk and talk, Videos

- **Assessment Methods:**

Concept understanding of Combustion process of Bio-gas

Unit-6 Geothermal Energy **No of lectures – 04**

- **Prerequisites:** Terms related to Geothermal
- **Objective:**

To revise basic concepts of Geothermal energy

- **Outcomes:**

After completion of this unit students can understand geothermal energy conversion

- **Unit Content:**

Resources, types of wells, methods of harnessing the energy, potential in India

- **Content Delivery Methods:**

Chalk and talk, Videos

- **Assessment Methods:**

Concept understanding of various geothermal energy plant in India

Unit-7 Ocean Energy **No of lectures – 04**

- **Prerequisites:** Terms related to thermodynamics
- **Objectives:**

1. To revise basic concepts of Ocean Energy
2. To make students understand energy conversion

- **Outcomes:**

After completion of this unit students can understand about OTECH

Unit Content:

OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles, Tidal and wave Energy: Potential and conversion techniques, mini-hydel power plants, and their economics

- **Content Delivery Methods:**

Chalk and talk, Videos

- **Assessment Methods:**

Concept understanding operation of Ocean thermal energy

Unit-8 Direct Energy Conversion **No of lectures – 02**

- **Prerequisites:** Terms related to DEC
- **Objectives:**

To revise basic concepts of Energy Conversion

- **Outcomes:**

After completion of this unit students can understand Carnot cycle

- **Unit Content:**

Need for DEC, Carnot cycle, limitations, principles of DEC

- **Content Delivery Methods:**

Chalk and talk, PPT

- **Assessment Methods:**

Concept understanding Direct Energy Conversion

Text books:

1. Non-Conventional Energy Sources, G D Rai, Khanna Publications
2. Renewable energy resources, Tiwari and Ghosal, Narosa.

References:

1. Renewable Energy Resources, Twidell & Wier, CRC Press (Taylor & Francis)
2. Renewable Energy Technologies, Ramesh & Kumar, Narosa
3. Renewable energy sources and emerging technologies, D. P. Kothari, K. C. Singhal, P.H.I.

ICA: Minimum six assignments on the above syllabus

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B. Tech. (Electrical) Semester-II
Open Elective-II
Fiber Optic Communications

Teaching Scheme	Examination Scheme
Theory: - 2 Hrs/Week, 2 Credits	**ESE –** 70 Marks
Tutorial: - 1 Hrs/Week, 1 Credit	**ICA-**25Marks
	ISE- 30Marks

This course introduces the basic concept of optical communication. It explains the basic working principle of optical fiber. It covers the study of basic optical devices as optical source, optical detector, and optical joints. It also introduces aspects of practical design of optical communication system.

- **Prerequisite:**

FOCT is a graduate level course, intended to expose the students to the physical layer elements and seamlessly provide a transition from the physical layer issues to data link layer issues in optical communication systems and networks.

- **Objectives:**

The objectives of this course are

1. To make students to understand basic working principle of optical fiber.
2. To introduce to student basic losses in optical fiber & reasons behind the losses.
3. To make students to understand the basics of optical sources (LASER & LED).
4. To make students to understand the basics of optical detectors.
5. To study the concepts of optical networks

- **Course outcomes:**

On successful completion of the course the student will be able to

1. Demonstrate working of optical fiber.
2. Explain transmission characteristics of optical fibers & concept of optical joints.
3. Illustrate different optical sources & optical detectors.
4. Solve the numerical to calculate the various parameters of optical sources & detectors.
5. Explain the different types of optical amplifier & optical networks.
6. Analyze the functional blocks in optical communication system.

SECTION -I

UNIT - 1 Overview of Optical Fiber Wave Guides **No of lectures – 04**

Overview of optical communication, other forms of communication system, introduction to vector nature of light, Propagation of light, Ray model & Wave model. Optical Fiber: Types, structure and wave guiding fundamentals, Optical fiber modes and analysis, Step and Graded index Fibers. Single mode fiber, Fiber material, fiber Fabrication.

Unit –II Transmission Characteristics of Optical Fibers and Optical Joints **No of lectures – 05**

Introduction, Attenuation, absorption- intrinsic & extrinsic, linear &nonlinear scattering losses, bending loss, dispersion- intermodal & intra modal, Fibers alignment and joint loss, fiber splices, connectors, fiber couplers& its types.

Unit III–Optical Source **No of lectures – 05**

Laser: Requirements of optical source, basic concept of LASER, optical emission from semiconductors, hetero junction structure, Semiconductor injection laser and structures, Injection laser characteristics. LED: LED structures, LED characteristics, Light Modulation.

SECTION -II

Unit IV-Optical Detectors **No of lectures – 04**

Introduction, requirements of optical detector, optical detection principles, performance parameters of detector- absorption, quantum efficiency, responsivity, cut off wavelength. Semiconductor photo diodes with and without internal gain, PN, PIN, Avalanche Photo diodes, Phototransistors.

Unit V-Optical Networks **No of lectures – 05**

Optical Networks: Introduction, networking terminology, optical network modes, SONET / SDH, SONET/SDH rings, Optical Ethernet, data buses, Fiber Distributed Data Interface (FDDI).

Unit VI-Fiber Optical Communication Systems **No of lectures – 05**

Introduction, Transmitter Design, Receiver Design, Noise equivalent model of receiver, Link Design, Wavelength Division Multiplexing (WDM), DWDM, Optical Time Division Multiplexing.

- **Internal Continuous Assessment (ICA):**

ICA consists of minimum 8Practicals based upon above curriculum.

Suggested List of Practical:

1. Setting up fiber optic analog & digital link.
2. Frequency modulation using fiber optic cable.
3. Pulse width Modulation using fiber optic cable.
4. Study of propagation loss in optical fiber.
5. Study of bending loss in optical fiber.
6. Measurement of optical power using optical power meter.
7. Measurement of Numerical Aperture.
8. Transmission of voice signal using FOC.
9. Study of WDM.
10. Study of LED output characteristics.

Text Books:

1. Optical Fiber Communications, John M. Senior, Pearson Education. 3rd Impression, 2007
2. Optical Fiber Communications, Gerd Keiser, 4th Ed., MGH, 2008
3. Optical Fiber Communications, D. C. Agarwal - S.Chand and company

Reference Books:

1. Optical Communications, David Gover – PHI
2. Fiber Optics communication, Hozold Kolimbiris - Pearson Education.
3. Fiber Optics Communication – 5th Edition, Palais-Pearson Education

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B. Tech. (Electrical) Semester-II
Open Elective-II
Sensors and Applications

Teaching Scheme	Examination Scheme
Theory: - 2 Hrs/Week, 2 Credits	**ESE –** 70 Marks
Tutorial: - 1 Hrs/Week, 1 Credit	**ICA-**25Marks
	ISE- 30Marks

This course provides good knowledge of working of different types of sensors used in various application areas. This course also provides knowledge of interfacing of electronic circuits with different sensors for its applications in different fields.

- **Course Prerequisite:**

Concept of internal characteristics of passive elements like resistor, capacitor, inductor etc., Diode and transistor working, knowledge of basic fundamentals of mechanical terms like position, strain, stress etc.

- **Course Objectives:**
  1. To introduce students with the basics of various sensors and its characteristics.
  2. To make students familiar with the working principle of different types of sensors and transducers.
  3. To introduce various signal conditioning and smoothing circuits for sensors
  4. To familiarize students with different sensor technologies and interfacing techniques.
  5. To introduce students with the concept of actuators.
- **Course Outcomes:** At the end of this course, Students will be able to
  1. Elaborate the concept of sensors and its characteristics.
  2. Describe the working principle of analog and digital sensors.
  3. Design sensor interface circuits for a given engineering problem.
  4. Select an appropriate sensor for a given engineering application based on interface technique, material and technology of a sensor.
  5. Describe the working principle of different types of actuators.

Section I

Unit 1: Sensors Fundamentals and Characteristics **No of lectures – 04**

Sensors, Signals and Systems, Sensor Classification, Units of Measurements, Sensor Characteristics

Unit 2: Physical Principles of Sensing **No of lectures – 05**

Electric Charges, Fields, and Potentials, Capacitance, Magnetism, Induction, Resistance, Piezoelectric Effect, Hall Effect, Temperature and Thermal Properties of Material, Heat Transfer, Light, Dynamic Models of Sensor Elements

Unit 3: Interface Electronic Circuits **No of lectures – 05**

Input Characteristics of Interface Circuits, Amplifiers, Excitation Circuits, Analog to Digital Converters, Direct Digitization and Processing, Bridge Circuits, Data Transmission, Batteries for Low Power Sensors

Section II

Unit 4: Sensors in Different Application Area **No of lectures – 05**

Occupancy and Motion Detectors, Position, Displacement, and Level, Velocity and Acceleration, Force, Strain, and Tactile Sensors, Pressure Sensors, Humidity and Moisture Sensors, Light Detectors, Temperature Sensors

Unit 5: Sensor Materials and Technologies **No of lectures – 04**

Materials, Surface Processing, Nanotechnology

Unit 6: Actuators **No of lectures – 05**

Introduction, Classification, Principle of Operation (Electrical Actuators, Electromagnetic Actuators, Electromechanical Actuators, Hydraulic and Pneumatic Actuators, Micro- and Nano-actuators), Selection Criteria.

- **Internal Continuous Assessment (ICA):**

ICA consists of minimum Ten Practical and/or assignments based upon above curriculum.

Text Books:

1. Handbook of Modern Sensors: Physical, Designs, and Applications, J. Fraden, AIP Press, Springer
2. Sensors and Actuators: Engineering System Instrumentation, Clarence W de Silva, CRC Press, 2nd Edition
3. Electrical and Electronic Measurements and instrumentation R.K Rajput S. Chand

Reference Books:

1. Sensors and Transducers, D. Patranabis, Prentice Hall India Learning Private Limited, New Delhi
2. A Course in Electronics and Electrical Measurements and Instruments, J.B. Gupta, S K Kataria & Sons
3. A Course in Electrical and Electronic Measurements and Instrumentation A. K. Sawhney, Dhanpat Rai & Co.(P) Ltd.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B. Tech. (Electrical) Semester-II
Self-Learning Module-II
HYBRID ELECTRIC VEHICLE DESIGN

Teaching Scheme	Examination Scheme
Theory: - 2 Credits	**ESE** – 50 Marks

- **Course Objectives: The students will be able to**
  1) Explain the basics of hybrid electric vehicles, their architecture, technologies and fundamentals.
  2) Design and component sizing of the power electronics devices used in hybrid electric vehicles.
  3) Analyze various electric drives suitable for hybrid electric vehicles
  4) Discuss different energy storage technologies used for hybrid electric vehicles and their control.
  5) Demonstrate different configurations of electric vehicles and its components, hybrid vehicle configuration by different techniques, sizing of components and design optimization and energy management.

- **Course Outcomes: After completing the course, the students will be able to**
  1) Explain the basics of hybrid electric vehicles, their architecture, technologies, and fundamentals.
  2) Analyse different power electronics devices and electrical machines in hybrid electric vehicles.
  3) Explain the use of different energy storage devices used for hybrid electric vehicles, their technologies and control and select appropriate technology
  4) Interpret working of different configurations of electric vehicles and its components, hybrid vehicle configuration, performance analysis and Energy Management strategies in HEVs

UNIT 1: Introduction to Hybrid Electric and Conventional Vehicles **No of Lectures-07**

Hybrid electric vehicles: History of Hybrid Electric Vehicles (HEVs), social and environmental importance of HEVs, Architectures of HEVs, Interdisciplinary Nature of HEVs, State of the Art of HEVs, Challenges and Key Technology of HEVs. Impact of modern electric drive on energy supplies.

Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, and mathematical models to describe vehicle performance.

UNIT 2: Electric Propulsion unit **No of Lectures-07**

Introduction to electric components used in HEVs, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT 3: Energy Storage System **No of Lectures-07**

Introduction to Energy Storage Requirements in HEVs, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices.

UNIT 4: Fundamentals of Regenerative Braking **No of Lectures-07**

Energy Consumption in Braking, Braking Power and Energy on Front and Rear Wheels, Brake System of HEVs, Antilock Brake System.

UNIT 5: Sizing the drive system **No of Lectures-07**

Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems.

UNIT 6: Energy Management Strategies **No of Lectures-07**

Introduction to energy management strategies used in hybrid electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

Reference Books:

1) Electric and Hybrid Vehicles: Design Fundamentals, Iqbal Hussein, CRC Press, 2003.

2) Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, CRC Press, 2004.

3) Electric Vehicle Technology Explained, James Larminie, John Lowry, Wiley, 2003.

4) Power Sources for Electric Vehicles, B D McNicol, D A J Rand, Elsevier publications, 1st Edition, 1998.

5) Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives, Chris Mi, M. Abul Masrur, 2nd Edition Wiley, 2017.

6) Build Your Own Electric Vehicle, Seth Leitman, MC Graw Hill, 1st Edition, 2013.

- **Internal Continuous Assessment (ICA):**

ICA shall consist of minimum two case studies and four assignments based on above syllabus.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B. Tech. (Electrical) Semester-II
Self-Learning Module-II
ELECTRICAL SAFETY

Teaching Scheme	Examination Scheme
Theory: - 2 Credits	**ESE –** 50 Marks

Prerequisite: Knowledge of electrical standard and measurement

Course Objectives –
Student should understand safety precautions during working on electrical installations**.**

Course Outcome-
Students will get acquitted with Electrical safety procedures

Unit I: - Significance of safety management in electrical plants.
Objective of safety management, procedure of "work permit" at site to do work on electrical plant, equipment, auxiliaries.

Unit II: - Safety clearances and creepages.
Adquet clearances to be provides between phases, phase to earth, work section and live parts, isolating distance, etc.

Unit III: -Electrical shocks
Primary shocks & secondary shocks their occurrence, effect of electrical shocks on human body, safety precautions against electric shocks, recommendations for preventing electric shocks.

Unit IV: - First aid for a person who gets electric shock
Removal of contact with live conductor, methods of artificial respirations, safety procedures during erection phase, during commissioning phase, and during operation and maintenance phase.

Unit V: -Electrical fires
Cause of different type of electric fires, how do deal with fire on electrical installations, actions to be taken in case of fire, prevention of electric fires, types of extinguishers used.

Text books:-

1. Testing commissioning operation & maintenance of electrical equipments by S. Rao. Khanna Publication.
2. Installation commissioning & maintenance of electrical equipments by Trilok Singh S. K. Kataria & Sons.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B. Tech. (Electrical) Semester-II
Self-Learning Module-II
Solar Photovoltaic System Design & Installation

Teaching Scheme	Examination Scheme
Theory: - 2 Credits	**ESE –** 50 Marks

Course prerequisite:
Basics of Electricity, Wires & Cables, Work, Power & Energy, Ohm's Law, Magnetism, Alternating Current, Power Generation, Distribution & Transmission.

- **Course Objectives**
  1) To make student to know solar photovoltaic.
  2) To make student to understand components of solar PV system, types of solar photovoltaic systems.
  3) To make student to understand components of installation tool kit and safety equipment
  4) To make student to understand installation of components.

- **Course Outcome: After successful completion of this course**
  1) Students will be able to know solar photovoltaic.
  2) Students will be able to understand components of solar PV system, types of solar photovoltaic systems.
  3) Students will be able to understand components of installation tool kit and safety equipment.
  4) Students will be able to understand installation of components.

Unit 1: Introduction to Renewable and Solar Energy
Renewable Energy and its prospects various RE sources, Introduction to Solar Energy and Solar Radiation, its importance, Differentiate solar PV and solar thermal energy, Solar Resource, Measurement, Instrumentation, and its applications.

Unit 2: Introduction of Photovoltaic Technology and its applications
Basics of Light to Energy Conversion, Brief History of Solar/PV cells, Physics of Energy Conversion in Solar Cell (Current and Voltage), Understanding basic terminologies of a PV cell (I-V Curve, efficiency, FF), Solar Cells to Module, Module name plate specifications, Module to Array and Basic Structure of PV module, Classification of PV Modules based upon technology, Brief on PV Cell/Module manufacturing process, Factors affecting output of a PV module (Temperature, Irradiance, Tilt angle, cell area, shadowing, dust, mismatch, PV module configurations, MPPT operation etc.), PV module defects and degradation in the field (Techniques for identification of defects), PV module Testing and Certification Standards, Applications of PV, different configurations of PV power system: Stand alone, Grid, hybrid system etc.

Unit 3: Components of a PV System: Battery, inverter and Charge controllers
Basics of standalone PV system, Balance of System (BOS)**,** Introduction: Batteries, type of batteries, operation and structure**,** Basic Terminologies of a Battery, Charging & Discharging Characteristics**,** Factors affecting Battery operation and Selection Criteria, Testing standards for batteries, Introduction: Inverter, type of Inverters, operation, make and specifications, Basic Terminologies of a Inverter and Characteristics, Factors affecting inverter operation and Selection Criteria, Testing standards for inverters, Basics of Charge controllers, operation and specifications, DC-DC converters, Types of charge controllers and selection criteria, Components of a grid connected SPV system (ACB, DB and cabling), Types of wires and selection criteria, wire sizing. Other components like: Junction Box, Lighting arresters, grounding etc.

Unit 4: Fundamentals of PV system sizing

Sizing, significance and steps involved in sizing, Load Estimation, analysis and basics on energy efficiency, Site survey and assessment, Shading analysis, Customer profiling and Role play, Inverter, Battery sizing and its aspects, Module sizing and its aspects. Lay out diagrams, Spacing of PV strings and placing of each component, Selection of modules, batteries and inverters from the market specifications, Various steps involved in sizing of grid connected PV systems, Introduction to single line diagram and its significance, Listing of various components required for a grid connected and standalone Solar power plant. (A check list of Each and every component), Understanding of various costs (Project heads) involved in the solar projects.

Unit 5 Installation of Solar Power plant

Preparation and general considerations for installation (DC and AC components), Installation of Array support structure and mounting of PV modules, Interconnection of modules, strings and Combiner boxes, Installation of other System components, i.e. Inverter, battery etc, Installation of AC and DC power distribution boxes, General safety consideration in the installation phase of solar power plant.

Text Books:

1. Solar Electricity Handbook - 2014 Edition: Michael Boxwell
2. Photovoltaics: System Design and Practice 1st Edition by Heinrich Häberlin
3. Solar PV Installer: Handbook

Reference Book:

1. Photovoltaics: Design and Installation Manual 1st Edition
2. The Ultimate Solar Power Design Guide by Lacho Pop,Dimi Avram

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B. Tech. (Electrical) Semester-II
Mini Hardware Project

Teaching Scheme	Examination Scheme
Practical: - 2Hrs/week 1 Credits	**ICA -** 25Marks
	OE – 25Marks

This course encourages student for project-based learning through development of hardware mini project in applied areas. The course aims to apply acquired skills of electronic circuit designing, digital design, instrumentation, microcontroller, electrical & electronic components specifications and their testing. The hardware project also provides experience of working in a team with set target. The project report writing allows student to gain knowledge of technical documentation of certain product. The entire experience in the project may be useful for entrepreneurship development.

Course prerequisite: Electrical & Electronic component identification and their testing, fundamentals of electronic circuit designing, concepts in digital designing, knowledge of various sensors, knowledge of control systems fundamentals, microcontrollers.

Course Objectives:

1. To encourage student to undertake and execute mini hardware project in a group which includes selection of appropriate hardware components, understanding their specifications and testing procedures.
2. To make student acquaintance with computer aided PCB designing tool
3. To develop electronic hardware assembly, soldering and testing skills amongst student
4. To nurture technical report witting skills amongst student
5. To understand the product development cycle through mini project.

Course Outcomes:

After successfully completing this course, the student shall be able to:

1. Understand, plan and execute a mini project with team.
2. Device electronic hardware by implementing knowledge of PCB design techniques, soldering techniques and hardware debugging techniques
3. Prepare technical report based on the mini project
4. Estimate cost of the mini project, deliver technical seminar over mini project.

Guidelines:

Project group shall consist of not more than 3 students. The mini project plan shall include phases group formation, mini project topic selection, circuit component selection, pre-testing of project over breadboard, PCB artwork designing using EDA tool, simulation, hardware assembly, testing, enclosure design, testing and analysis, presentation and report writing.

Domains for mini projects (but not limited to following):

Instrumentation and control systems
Automation and protective system
Application of electronics to power system
Electric drives
Electronics communication systems
Embedded systems
Renewable Energy systems
Disaster management systems

- ***Assessment Methods:***

Below scheme is recommended for ICA marks –

Selection of the project and pre circuit testing	20 %
Circuit design, simulation, PCB and assembly	30%
Results / Output from final assembly	10%
Mini project presentation seminar	20%
Project report	20%

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: ELECTRONICS & TELECOMMUNICATION ENGINEERING

Name of the Course: Third Year B. Tech (Sem. – I & II)

(Syllabus to be implemented from Academic Year 2022-23)

PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF SCIENCE & TECHNOLOGY
Electronics & Telecommunication Engineering

Programme Educational Objectives and Outcomes

A. Program Educational Objectives

1. To make students competent for professional career in Electronics & allied fields.
2. To build strong fundamental knowledge amongst student to pursue higher education and continue professional development in Electronics & other fields
3. To imbibe professional ethics, develop team spirit and effective communication skills to be successful leaders and managers with a holistic approach.
4. To nurture students to be sensitive to ethical, societal & environmental issues while conducting their professional work.

B. Program Outcomes

Engineering Graduate will be able to –

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of t h e engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

1. Graduates will be able to attain a **solid foundation** in Electronics and Communication Engineering with an ability to function in multidisciplinary environment.
2. Graduates will be able to use **techniques and skills** to design, analyze, synthesize, and simulate Electronics and Communication Engineering components and systems.
3. Graduate will be capable of **developing programs** in Assembly, High level and HDL languages using contemporary tools for software development.

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FACULTY OF SCIENCE & TECHNOLOGY

Credit System structure of T.Y. B.Tech. Electronics & Telecommunication Engineering ***W.E.F. 2022-23***

Semester I

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
ET311	Electromagnetic Field Theory	3	1	--	4	30	70	25	125
ET312	Microcontrollers and Applications	3	--	--	3	30	70	25	125
ET313	Digital Signal Processing	3	-	--	3	30	70	25	125
ET314	Open Elective-I	3	1	--	4	30	70	25	125
SLM31	Self Learning Module–I (HSS Course)	--	--	--	2	--	50	--	50
Sub Total		12	2	--	16	120	330	100	550
Course Code	***Laboratory Course Name***								
							ESE		
							POE	***OE***	
ET312	Microcontrollers and Applications	--	--	2	1	--	50	--	--	50
ET313	Digital Signal Processing	--	--	2	1	--	50	--	--	50
ET315	Electronic Software Lab-III	1	--	4	3	--	50	--	50	100
Sub Total		--	--	8	5	--	150		50	200
Grand Total		**13**	**2**	**8**	**21**	**120**	**480**		**150**	**750**

Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE- In Semester Exam, ESE - End Semester Exam, OE-Oral Examination, POE- Practical Oral Examination, ICA- Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination).

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF SCIENCE & TECHNOLOGY

Credit System structure of T.Y. B.Tech..Electronics& Telecommunication Engineering ***W.E.F. 2022-23***

Semester II

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
ET321	Antenna & Wave Propagation	3	1	--	4	30	70	25	125
ET322	Embedded System	3	--	--	3	30	70	25	125
ET323	Electronic System Design	3	--	--	3	30	70	25	125
ET324	Professional Elective-I	3	--	--	3	30	70	25	125
ET325	Open Elective-II	3	--	--	3	30	70	25	125
Sub Total		15	1	--	16	150	350	125	625
Course Code	***Laboratory Course Name***								
							ESE		
							POE	***OE***	
ET322	Embedded System	--	--	2	1	--	25	--	--	25
ET323	Electronic System Design	--	--	2	1	--	50	--	--	50
ET324	Professional Elective-I	--	--	2	1	--	--	--	--	--
ET325	Open Elective-II	--	--	2	1	--	--	--	--	--
ET327	Mini Project	--	--	2	1	--	--	25	25	50
Sub Total		--	--	10	5	--	100		25	125
Grand Total		**15**	**1**	**10**	**21**	**150**	**450**		**150**	**750**

Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE- In Semester Exam, ESE - End Semester Exam, OE-Oral Examination, POE- Practical Oral Examination, ICA- Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination).

 Note –

1. Batch size for the practical /tutorial shall be of 16 students. On forming the batches, if the strength of remaining student exceeds 8, then a new batch shall be formed.

2. Vocational Training (evaluated at Final Year Part-I) of minimum 15 days shall be completed in any vacation after S.Y. Part-I but before Final Year Part-I & the report shall be submitted and evaluated in Final Year Part-I.

3. Self-Learning Module I at T.Y. B.Tech.– Semester-I

   - Student shall select & enroll a Self Learning Module-I Course from PAH Solapur University, Solapur HSS Course List (SLM31). Student must appear and pass university examination.
   - Curriculum for Humanities and Social Sciences (HSS), Self Learning Module-I is common for all undergraduate engineering programs.
   - Minimum four assignments for Self Learning Module (SLM31) shall be submitted by the students which shall be evaluated by a Module Coordinator assigned by institute/department.

   OR

   - Student shall select and enroll for university approved minimum eight weeks MOOC based HSS course (SLM31), and complete its assignments. Student must appear and pass certificate examination conducted through MOOC courses.

4. Open Elective I & II shall be common and open for the students of the branches – Electronics Engineering, Electronics & Telecommunication Engineering and Electrical Engineering. Students of these branches can take any of these Open Electives. Syllabus and university examination question paper will be same for all these branches.

5. Student shall select Professional Elective-I from given course list. Student must appear and pass university examination.

6. Project group for T.Y. B.Tech. - Semester II – Mini Project shall not be of more than three students. This mini project may include simulation and/or Software and/or Hardware. Report of this work should be submitted at the end of semester.

8. ICA assessment shall be a continuous process based on student's performance in class tests, assignments, homework, subject seminars, quizzes, and laboratory books and their interaction and attendance for theory and lab sessions as applicable.

- **List of Open Electives -**

Sr.	Branch Offering Elective	Open Elective I	Open Elective II
1.	Electronics &Telecommunication Engineering	1. Managerial Economics 2. Project Management and Operation Research	1. Sensors and Applications 2. Open Source Technologies
2.	Electronics Engineering	Information Technology & Management	Operating Systems
3.	Electrical Engineering	Business Ethics	Power System Planning

- **List of Professional Elective I–**
  1. Optical Fiber Communication
  2. Image and Video Processing
  3. Multimedia Communication Technology
- **List of Self Learning Modules (HSS Course) (SLM 31)–**
  1. MOOC/University Defined Courses

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T. Y. B.Tech (Electronics& Telecommunication Engineering)
Semester-I

ET311: ELECTROMAGNETIC FIELD THEORY

Teaching Scheme:
Lectures – 3 Hours/week, 3 Credits
Tutorial – 1 Hour/week, 1 Credit

Examination Scheme:
ESE – 70 Marks
ISE – 30 Marks
ICA– 25 Marks

This course introduces electromagnetic field theory which deals with electric and magnetic field vectors. The course also introduces theoretical and analytical aspects of electromagnetic field, electromagnetic wave propagation and transmission lines.

Course Prerequisite:
Student shall have knowledge of vector operations.

Course Objectives:

1. To learn basic coordinate system, significance of divergence, gradient, curl and its applications to EM Waves.
2. To familiarize with the different concepts of electrostatic and magneto static fields.
3. To describe Maxwell's equations for different fields.
4. To expose the students to the ideas of EM waves and propagation through different media.
5. To derive transmission line equations and parameters.

Course Outcomes:
At the end of this course, Students will be able to,

1. Define and recognize different co-ordinate systems and apply divergence, gradient, curl to EM waves.
2. Derive the laws of electrostatic, magneto static fields and electromagnetic wave equation.
3. Apply Maxwell's equations for static, Time varying and Harmonic field.
4. Calculate transmission line parameters.
5. Apply knowledge of Smith chart to determine transmission line parameters.

Section- I

Unit 1: Vector calculus **(05)**

Scalars and vectors, vector algebra, coordinate system, differential length, surface and volume, point and vector transformations.

Unit 2: Electrostatics **(08)**

Coulomb's law & electric field intensity, electric field intensity for different charge configurations, Electric flux and flux density, Gauss's law and its applications, divergence theorem, electrostatic potential, potential gradient, electric dipole, electrostatic energy density, boundary conditions for electrostatic field.

Unit 3: Static magnetic field **(08)**

Biot Savart's law, Ampere's circuital law and its applications, Stroke's theorem, magnetic flux density, current carrying conductors in magnetic fields, torque on loop, energy stored in magnetic field, boundary conditions for magneto static field.

Section- II

Unit 4: Maxwell's equations **(07)**

Continuity equation for static conditions, displacement current and conduction current density, Maxwell's equations in integral form and point form, Maxwell's equations for static case, time varying field, harmonically varying field.

Unit 5: Electromagnetic wave propagation **(07)**

Wave propagation in dielectric & conducting media, modification in wave equations for sinusoidal time variations, propagation in good conductor, skin effect, Poynting theorem, power flow in uniform plane wave

Unit 6: Transmission lines **(07)**

Transmission line sections as circuit elements, Transmission line equations using field theory and circuit theory, transmission line primary constant (R,L,C,G) and secondary (Z_0, γ) constant , reflection coefficient, transmission coefficient, VSWR, Smith Chart and solution of transmission line problems using Smith Chart,.

- **Internal Continuous Assessment (ICA):**

ICA consists of **minimum eight tutorials** based upon above curriculum. Tutorial shall include numerical problems and derivations.

- **Text Books:**

1. Electromagnetic Engineering, William Hyte, 7th Edition, Tata McGraw Hill
2. Electromagnetic Waves, R.K. Shevgaonkar, Tata McGraw Hill
3. Electromagnetics by John D. Kraus - McGraw Hill Third Edition
4. Electromagnetic field theory & Transmission Lines, GSN Raju, Pearson Education

- **Reference Books:**

1. Electromagnetic Schaum's outline series by J.A.Edminister - Tata McGraw Hill
2. Problems and solutions in electromagnetic, William Hyte, Tata McGraw Hill
3. Electromagnetic Waves and Transmission Lines, Rao, Prentice Hall India Publications
4. Applied Electromagnetics by F. Ulaby (2001 Media Edition) – PHI

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T. Y. B.Tech (Electronics& Telecommunication Engineering)
Semester-I

ET312: MICROCONTROLLERS AND APPLICATIONS

Teaching Scheme:
Lectures – 3 Hours/week, 3 Credits
Practical – 2 Hours/week, 1 Credit

Examination Scheme:
ESE – 70 Marks
ISE – 30 Marks
ICA – 25 Marks
POE – 50 Marks

This course introduces Basics of microcontroller's theory which includes internal details of MCS51 series and PIC Microcontroller. The course also introduces Assembly level as well Embedded C Level programming aspects of both microcontrollers, Memory interfacing and Interfacing various I/O devices

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Course Prerequisite:
Student shall have knowledge of Digital Electronics.

Course Objectives:
1. To provide an introduction to microcontroller families and details of RISC and CISC microcontrollers.
2. To describe Core features and Peripheral features of Microcontrollers
3. To explain and practice assembly language and Embedded C programming techniques
4. To demonstrate and perform hardware interfacing and design for various applications.

Course Outcomes:
At the end of this course, Students will be able to,
1. Expose the fundamental features and operation of contemporary microcontroller
2. Demonstrate and perform hardware interfacing.
3. Explore the students to the fundamentals of CISC and RISC Microcontroller architectures
4. Introduce the various core and peripheral features in microcontroller family.
5. Develop applications programs in assembly language and C language for microcontrollers

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Section- I

Unit 1: : Introduction of Microcontroller (05)

Introduction, Microprocessor and Microcontrollers, CISC & RISC Microcontroller, Harvard and von Neumann architecture, Development platforms and tools for programming for Microcontroller.

Unit 2: The 8051 Architecture and Instructions (08)

8051 Microcontroller Hardware, Addressing modes, Instruction set ,Input / Output Pins, ports and Circuits, External Memory, Counters and Timers, Serial Data Input/ output, interrupts. Fundamentals of C programming.

.

Unit 3: Programming Microcontroller (8051) (08)

Programming in assembly and C for Input/ Output Ports, Serial Port Programming, Timer Programming and Interrupt Programming. Interfacing Switches, LED, Relay, Buzzer, LCD display, Matrix keyboard, Stepper Motor

Section-II

Unit 4: PIC Microcontrollers (05)

PIC Microcontrollers Introduction, Architecture, features, Configuration word and Instruction Set

Unit 5: PIC 16F877A Microcontroller Core Features (08)

Functional pin description, various registers, Program memory and data memory organization, Input / output ports, Interrupts, various kinds of RESET

Unit 6: Peripheral Features and Programming (08)

Input/ output ports Timers, Capture/ compare / PWM (CCP) Modules in PIC 16F877, Internal ADC, The Watchdog Timer. The Universal Synchronous Asynchronous Receiver Transmitter (USART) module.

- **Internal Continuous Assessment (ICA):**

ICA consists of minimum Eight Practical based upon above curriculum. Equal weightage should be given to 8051and PIC 16F877A. Students should be introduced to assembly and embedded C programming and minimum four practical's should be taken using embedded C programming

- **Suggested List of Practical's:**

1. Arithmetic and Logic operations
2. Interfacing of Switches, LEDs and Buzzer.
3. Interfacing of Matrix Keyboard
4. Interfacing of LCD Display.
5. Use of Timer for generation of time delays
6. Use of Timer as counter.
7. Interfacing of Stepper motor.
8. Speed control of DC Motor using PWM.
9. Use of ADC of PIC Microcontrollers.
10. Use of Interrupts for any Application.
11. Use of CCP Module of PIC Controller
12. Serial communication.
13. Study of any one Industrial application using Microcontroller.

- **Text Books:**

1. The 8051 Microcontroller Architecture, programming and Applications by Kenneth Ayala Penram International (Third Edition)
2. The 8051 Microcontroller and Embedded systems by Muhammad Ali Mazidi Pearson Education Asia LPE (Second Edition)
3. Designs with PIC Microcontrollers by John B. Peatman Pearson Education Asia LPE
4. PIC Microcontroller & Embedded Systems – Mazidi – Pearson Education
5. Microcontrollers [Theory and Applications] by Ajay V Deshmukh- Tata McGraw Hill Education. Education

- **Reference Books:**

1. 8051 Microcontrollers programming and practice by Mike Predcko.
2. Data sheets of MCS51 family microcontrollers, PIC 16F877A Flash microcontrollers,
3. 8051 Microcontroller by I Stott, Mackenzie, Rathel & Phan – Fourth Edition - Pearson
4. Designing & Customizing of PIC Microcontrollers by Mike Predcko

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T. Y. B.Tech (Electronics& Telecommunication Engineering)
Semester-I

ET313: Digital Signal Processing

Teaching Scheme:
Lectures – 3 Hours/week, 3 Credits
Practical – 2 Hours/week, 1 Credit

Examination Scheme:
ESE – 70 Marks
ISE – 30 Marks
ICA– 25 Marks
POE – 50 Marks

The digital computers are large and expensive as a result their use was limited to general purpose Application. The development of powerful, smaller, faster and cheaper digital circuits and are performing complex digital processing functions and tasks. This course covers basic analysis tools and techniques for digital signal processing of signals. This course also presents design and implementation of Finite and Infinite Impulse Response Filter and also applications of DSP.

Course Prerequisite:
Student shall have knowledge of signals and system, basic knowledge of mathematics and transforming tools like Fourier transform, Laplace and Z-transform.

Course Objectives:

1. To interpret the concept of stability in the DSP system.
2. To analyze the given signal and convert time to frequency domain and vice versa using FT and Z transforming tools.
3. To draw the structure for realization of a given system.
4. To design FIR and IIR filters.
5. To describe audio, Telecommunication and Radar processing applications of DSP

Course Outcomes:

. At the end of this course, Students will be able to,

1. Solve problems based on Correlation and DFT.
2. Analyze response of the system using linear filtering.
3. Calculate FFT of the Discrete signal.
4. Calculate and analyze FIR & IIR filter coefficients using different techniques.
5. Realize transfer function of FIR & IIR filters using different methods.
6 .Apply concepts of DSP in various applications

Section- I

Unit 1: Introduction (02)

Introduction to DSP system, co-relation and its properties, Digital transfer function, stability Consideration. Types of DSP systems (No problems included)

Unit 2: Discrete Fourier Transform (07)

Frequency Domain Sampling and Reconstruction of Discrete Time Signals, DFT as linear Transformation, relation between DFT and Z transform, Properties of DFT, Computation of DFT & IDFT, multiplication of two DFTs and circular convolution.

.

Unit 3: Linear Filtering Method Based on DFT (06)

Use of DFT in linear filtering, Filtering of long data sequences such as Overlap-save and Overlap add method, Frequency analysis of signals using DFT.

Unit 4: FFT Algorithm (06)

Divide and conquer approach, Radix-2 FFT algorithm for the computation of DFT and IDFT, decimation in time (DIT) and decimation in frequency (DIF) algorithms.

Section- II

Unit 5: Realization of Digital Linear Systems (06)

Structures for realization of Discrete time systems
Structures for FIR Filters: Direct form, Cascade form & Lattice Structure.
Structures for IIR Filters: Direct form, Cascade form & parallel form.

Unit 6: FIR Filter Design (06)

FIR filter design: Introduction to FIR filters, Design of FIR filter using Fourier series method, design of FIR filters using windowing technique, FIR filter design using frequency sampling technique(type-I).

Unit 7: IIR Filter Design (06)

Analog low pass buttreworth filter and its design. IIR Filter Design by Impulse Invariance, IIR Filter Design by Bilinear Transformation (problems on filter design up to 3rd order only), Characteristics of Butterworth filter.

Unit 8: Application (03)

Application of DSP in Audio processing, telecommunication & Radar signal processing

- **Internal Continuous Assessment (ICA):**

  ICA consists of minimum ten experiments based upon above curriculum.

- **Suggested List of Practical:**

1. Introduction to MATLAB.
2. Waveform generation using discrete time signals using MATLAB.
3. To implement auto co-relation and cross co-relation using MATLAB
4. To implement linear convolution using MATLAB and C-language.
5. Implementation of DFT and IDFT using MATLAB and C-language.
6. To implement circular convolution using MATLAB and C-language.
7. Fast convolution using Overlap add/Overlap save method using MATLAB.
8. Design of FIR filter using windowing technique.
9. Design of FIR filter using frequency sampling method.
10. Design of IIR filter using impulse invariant technique.
11. To design Butterworth filter using Bilinear transformation technique.
12. Introduction to Matlab Simulink.
13. Verification of sampling theorem using Matlab Simulink.

- **Text Books:**

1. Digital Signal Processing – Principles, Algorithms and ApplicationsJohn G Proakis-4th edition, Pearson Education
2. Digital Signal Processing by S Salivahanan, A Vallavaraj& C Gnanapriya –2nedition, TMH.
3. Discrete time signal ProcessingA.V. Oppenheim & R.W. Schafer.- Low price edition, John Wiley

- **Reference Books:**

1. Digital Signal Processing Ramesh Babu -4th Edition, Scientic Publication.
2. Digital Signal Processing Dr. Shaila D. Apte, Second edition, Wiley India.
3. Essentials of Digital Signal Processing using MATLAB Vinay K. Ingle & John G. Proakis, Cengage Learning, 2012
4. Digital Signal Processing- A Practical Approach, E. C. Ifleachor and B. W. Jervis, Second Edition, Pearson education.
5. Theory and Application of Digital Signal Processing Digital Rabiner& Gold-First edition, Prentice Hall
6. Digital Signal Processing S. Palani& D. Kalaiyarasi, Ane's Student Edition, Ane Books Pvt. Ltd New Delhi

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T. Y. B.Tech (Electronics& Telecommunication Engineering)

Semester-I

ET314.1: OPEN ELECETIVE-I

Managerial Economics

Teaching Scheme:
Lectures– 3 Hours/week, 3 Credits
Tutorial – 1 Hour/week, 1 Credit

Examination Scheme:
ESE – 70 Marks
ISE – 30Marks
ICA– 25 Marks

This course introduces basics of economics and concepts related to economics. The course also introduces theoretical and practical aspects of decision making for managers.

Course Prerequisite:
Student shall have knowledge basic management principles.

Course Objectives:

1. To make students aware to concepts of managerial economics
2. To introduce students to concepts of demand, supply and market
3. To introduce different tools for demand analysis and forecasting
4. To make students aware about production and cost functions
5. To make students aware about correlation of pricing with market, demand and supply

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Course Outcomes:
At the end of this course, Students will be able to,

1. Elaborate the concepts of managerial economics
2. Analyze the issues related to demand, supply and market
3. Use different tools for demand analysis and forecasting
4. Analyze the production and cost functions
5. Decide price on the basis of market, demand and supply

Section – I

Unit 1: Introduction: (07)

Meaning and Definition of Managerial Economics, Characteristics of Managerial Economics, Nature of Managerial Economics, Economics contribution to managerial decision, Scope of Managerial Economics –Microeconomics and Macroeconomics, Basics of Mathematical Tools – Statistics and Operational Research

Unit 2: Theory of Demand **(08)**

Concept of Demand, Supply, Market Equilibrium, Measuring value of market exchange, changes in Market equilibrium, Price ceilings and Price floors, Demand Schedule and Demand Curve, Approaches to Consumer demand analysis, Analysis of consumer behavior – Cardinal behavior and ordinal approach

Unit 3: Elasticity of Demand and Market Analysis **(06)**

Types Of Elasticity of Demand -Price Elasticity & Income Elasticity, Total Revenue and Marginal Revenue, Factors Affecting Elasticity of Demand, Importance of Elasticity of Demand, Elasticity for Nonlinear Demand Functions, Elasticity of Supply

Section – II

Unit 4: Demand Forecasting **(08)**

Concept of Demand Forecasting , Demand Forecasting Process ,Methods of Demand Forecasting- Survey Methods – Consumer survey and Opinion Poll, Statistical Method – Trend Projection, Barometric Method, Econometric Method, Simultaneous equation, Linear Regression Model, Multiple Regression, Basic concepts used in Linear Programming, Application of Linear Programming Techniques

Unit 5: Production Function and Cost Analysis **(06)**

Concept of production , Production Function, Theory of cost concepts, Determinants of Costs ,Cost of Production, Breakeven analysis- Linear, Non-linear,

Unit 6: Market Structure and Pricing Decision **(07)**

Objective of Market Structure, Demand side of market, Supply side of Market, Market Structure and Degree of Competition, Pricing Decision under Perfect Competition, Price Leadership

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- **Internal Continuous Assessment (ICA):**
  ICA consists of minimum eight tutorials based upon above curriculum. Tutorial shall include case studies related to above curriculum.
- **Text Books:**
  1. Managerial Economics by D. N. Dwivedi – 8th Edition- Vikas Publications
  2. Managerial Economics Foundations of Business Analysis and Strategy- C. R. Thomas & Maurice – 8th Edition- McGraw Hill
- **Reference Books:**
  1. Managerial Economics Concepts and Applications - C. R. Thomas & Maurice – 8th Edition- MCGraw Hill
  2. Managerial Economics- Mathur N.D- Shivam Book House Private Limited, Jaipur

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T. Y. B.Tech (Electronics& Telecommunication Engineering)

Semester-I

ET314.2: OPEN ELECETIVE-I

Project Management and Operation Research

Teaching Scheme:
Lectures– 3 Hours/week, 3 Credits
Tutorial – 1 Hour/week, 1 Credit

Examination Scheme:
ESE – 70 Marks
ISE – 30Marks
ICA– 25 Marks

Course Prerequisite:

Software and its applications, management skills, Concept of projects.

Course Objectives:

1. To the successful development and implementation of all project's procedures.
2. To the achievement of the project's main goal within the given constraints.
3. To impart knowledge in concepts of Operations Research
4. To analyze models associated with Operations Research.

Course Outcomes:

At the end of this course, Students will be able to,

1. To understand fundamental components of Project Management.
2. To understand different aspects of activity planning, Scheduling and risk Management techniques.
3. To know about Operations Research and LPP.
4. To understand different models used in Operations Research

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Section – I

Unit 1: Project Management **(07)**

Concepts of project management, objectives and function of project management, categories of project, project evaluation, project planning, project failure, project life cycle concept and cost components.

Unit 2: Project Planning and Scheduling **(08)**

Work Breakdown structure (WBS) and linear responsibility chart, Interface Co-ordination and concurrent engineering, Project cost estimation and budgeting, Top down and bottoms up budgeting, Networking and Scheduling techniques (PERT, GANTT chart (no numerical)).

Unit 3: Risk Management **(06)**

Risk & its categories, risk management planning, risk identification and risk register, Qualitative and quantitative risk assessment, Risk response strategies for positive and negative risks.

Section – II

Unit 4: Introduction of Operation Research **(07)**

Definition of operations research, Characteristics of operations research and its other aspects, Models of operations research, Limitations of operations research.

Unit 5: Linear Programming Problem & Replacement Model **(08)**

Introduction to LPP, Applications of LPP, Advantages of LPP, Formulation of problem, Graphical Method, Simplex method. Replacement Model–Introduction**,** Need for replacement, failure mechanism, Categories of replacement problems.

Unit 6: Assignment Model, Location and Layouts of facilities **(06)**

Introduction, applications of assignment models, types of assignment problems, Methods to solve balanced and unbalanced assignment problems, facility location, General Procedure for making location decisions, factors affecting location decision.

- **Internal Continuous Assessment (ICA):**

  ICA consists of minimum eight tutorials based upon above curriculum. Tutorial shall include case studies related to above curriculum.

- **Text Books:**

1. Hamdy Taha, "Operations Research – An Introduction", 7th edition PHI (2003)
2. S. D. Sharma, "Operation Research", Kedarnath and Rannalt Pub.
3. Hira and Gupta, "Operation Research", S. Chand and Co.
4. K Nagrajan, "Project Management", New Age International Publication
5. Pawan Jhabak, "Project Management", Himalaya Publishing House.

- **Reference Books:**

1. Rechard Newton, "Project Management- Step by Step", PEARSON
2. P Rama Murthy, "Operations Research", 2nd edition New Age International Publication

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T. Y. B.Tech (Electronics & Telecommunication Engineering)

Semester-I

ET316: ELECTRONIC SOFTWARE LAB-III

Teaching Scheme:
Practical – 4 Hours/week, 2 Credit
Tutorial – 1 Hour/week, 1 Credit

Examination Scheme:
POE - 50 Marks

This course introduces Java Programming from basics to advanced Java concepts. The importance of Java language cannot be denied as it has already started ruling over the entire Software Industry. The aim of this course is to provide students with an understanding of the object-oriented design and programming techniques. Java, a prime object-oriented programming language, is used to illustrate this programming paradigm

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Course Prerequisite:
Students must be familiar with basic programming languages like C

Course Objectives:

1. To make students aware of Object Oriented features in Java.
2. To introduce students the ability of Java runtime library APIs
3. To make students facilitate error handling exceptions.
4. To make students aware of Java runtime library APIs for designing GUI applications

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Course Outcomes:

At the end of this course, Students will be able to,

1. Implement Object oriented features and server-side programming
2. Use Java runtime library APIs for implementing functionality of various applications
3. Implement exceptional handling through Java programming for a given problem.
4. Select appropriate Java runtime library APIs to create GUI and web application using Java language.

Section – I

Unit 1: Basics of Java and Strings in Java (07)

Basics: Java Runtime Environment, Naming Conventions, Language Basics: Variables, Operators, Expressions, Statements, Blocks, Control flow Statements, Input and Output, Data Types, Arrays,

Type Casting. Fundamentals: String Class and Methods, Immutability of Strings, String Buffer Class and Methods, String Builder class and Methods.

Unit 2: Introduction to OOPs (07)

Objects and Classes, Fields and Methods, Abstraction, Encapsulation, Inheritance, Polymorphism, Type Compatibility and Conversion, Overriding Methods, Access control, Modifiers, Constructors, Abstract classes, Nested classes, Packages, Wrapper classes, Interfaces, Object Life time & Garbage Collection.

Unit 3: Exceptions, Error Handling and Basic IO (07)

Exceptions and Error Handling: Exceptions and Errors, Catching and Handling Exceptions, The try Block, The catch Blocks, The finally Block, Throwing Exceptions, Chained Exceptions, Custom Exceptions. J Unit Testing Framework. Basic I/O: I/O Streams, Byte Streams, Character Streams, Buffered Streams, Scanning and Formatting, Data Streams, Object Streams , File I/O Classes: Reading, Writing, and Creating Files and Directories.

Section – II

Unit 4: Java Collections Framework (07)

Introduction, The Arrays Class, Searching and sorting arrays of primitive data types, Sorting Arrays of Objects, The Comparable and Comparator Interfaces, Sorting using Comparable & Comparator, Collections: Lists, Sets, Maps, Trees, Iterators and Collections, The Collection Class.

Unit 5 : Multithreading and Networking (07)

Multithreading: Creating Threads, Thread scheduling and priority, Thread interruptions and Synchronization. Network Programming: InetAddress, URLs, Socket (TCP & UDP) communication in Java, Servlet Programming.

Unit 6: GUI Programming using Swing & JDBC (07)

Swing package, Layouts, Events, Listeners and Event handling, and Swing Components. Introduction to JDBC, JDBC Drivers & Architecture, CRUD operations Using JDBC API.

- **Internal Continuous Assessment (ICA):**

Students should undertake minimum 08 practicals/assignments based on above topics.

- **Text Book:**

1. Head First Java – Kathy Sierra, Bert Bates, O'Reily Publication
2. The Java TM Programming Language By Ken Arnold, James Gosling, David Holmes, Pearson Publication
3. Core Java for Beginners- RashmiKanta Das, Vikas Publishing House Pvt. Ltd
4. Programming with Java, Balaguruswamy, TMH 5. Internet and Java Programming, Tanweer Alam, Khanna Publishing House

- **Reference Books:**

1. The Java Language Specification, Java SE 8 Edition Book by James Gosling, Oracle Inc. (eResource: http://docs.oracle.com/javase/specs/)
2. Java: The Complete Reference 8 Edition - Herbert Schildt , Tata McGraw - Hill Education
3. Head First Servlets and JSP – Bryan Bosham, Kathy Sierra, Bert Bates, O'Reily Publication
4. The JavaTM Tutorials. Oracle Inc. (e-Resource: http://docs.oracle.com/javase/tutorial/)
5. Java Server Programming for Professionals - Ivan Bayross, Sharanam Shah, Cynthia Bayross And Vaishali Shah, Shroff Publishers and Distributors Pvt. Ltd, 2nd Edition

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T. Y. B.Tech (Electronics& Telecommunication Engineering)

Semester-II

ET321: ANTENNA AND WAVE PROPOGATION

Teaching Scheme:	**Examination Scheme:**
Lectures– 3 Hours/week, 3 Credits	**ESE – 70 Marks**
Tutorial – 1 Hours/week, 1 Credit	**ISE – 30 Marks**
	ICA– 25 Marks

This course introduces Antenna and Wave Propagation which deals with different types of antenna, and propagation of wave over ground and through atmosphere. The course also introduces theoretical and analytical aspects of wave propagation and radiating system.

Course Prerequisite:

Student shall have knowledge of Electromagnetic Fundamentals.

Course Objectives:

The student will learn and understand

1. Basics of antenna
2. Various types of antenna and radiation mechanism of antenna
3. Techniques used for antenna parameters measurement
4. Wave propagation over ground, through troposphere and inosphere.

Course Outcomes:

At the end of this course, Students will be able to,

1. Identify basic antenna parameters.
2. Analyze radiation pattern of various antennas.
3. Illustrate techniques for antenna parameter measurements.
4. Identify the characteristics of radio wave propagation.
5. Understand the various applications of antenna.

Section-I

Unit 1:Antenna Fundamentals: (06)

Comparison between an antenna & transmission line, Radiation Principle, Antenna parameters: Beam area, Beam width, Polarization, Radiation Intensity, Beam Efficiency, Directivity and

directive gain, radiation resistance, radiation efficiency, Antenna aperture-physical and effective apertures, effective height, antenna field zones.

Unit 2: Antenna Arrays: (07)

Arrays of two isotropic point sources, non isotropic Sources, principle of pattern multiplication, linear arrays of n elements, Broadside, End-fire radiation pattern, directivity, Beam-width and null directions, array factor.

Unit 3: HF, VHF and UHF Antennas: (08)

Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, Radiated Power, Radiation Resistance.

Helical Antennas: Helical geometry, transmission and radiation modes, wide band characteristics of helical antenna.

Slot antenna: Patterns of slot antenna, Babinet's principle and complementary antennas, impedance of slot antennas. (Excluding mathematical derivations for Helical and Slot Antennas. The problems on Helical and Slot Antennas will be included.)

Section-II

Unit 4: UHF and Microwave Antennas: (07)

Important horn shapes, Design equation of horn antenna, Optimum Horn, Uses of horn antenna.

Reflector Antennas: Introduction, Plane Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods.

Microstrip Antennas: Introduction, Advantages and Limitations, Various microstrip patch configurations, Radiation mechanism, Feeding techniques, Applications of microstrip antenna.

Unit 5: Special Antennas: (06)

Introduction of frequency independent antennas –Spiral antenna, Log periodic antenna, Modern antennas- Reconfigurable antenna, Active antenna, Smart antenna.

Antenna Measurements: Measurement of Gain, Radiation pattern and Polarization.

Unit 6: Radio Wave Propagation: (08)

Modes of propagation, structure of atmosphere, ground wave propagation, Tropospheric propagation, Duct propagation, Troposcatter propagation, flat earth and curved earth concept. Sky wave propagation- Virtual Height, Critical frequency, Maximum usable frequency, Skip distance, Fading, Multi hop propagation.

- **Internal Continuous Assessment (ICA):**

  ICA consists of minimum eight tutorials based on above curriculum

- **Text Books:**

1. Antennas for All Applications – John D. Kraus and R. J. Marhefka, and Ahmad S. Khan TMH, New Delhi, 4th ed., (Special Indian Edition) 2010. Electromagnetic field theory & Transmission Lines, GSN Raju, Pearson Education
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd edition 2000

- **Reference Books:**

1. Antenna Theory - C.A. Balanis, John Wiley & Sons, 3rd ed., 2005.
2. Antennas and Wave Propagation – K.D. Prasad, SatyaPrakashan, Tech India Publications, New Delhi, 2001.
3. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi.
4. Antennas – John D. Kraus, McGraw-Hill (International Edition), 2nd Ed. 1988.

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Semester-II

ET322: EMBEDDED SYSTEMS

Teaching Scheme:
Lectures – 3 Hours/week, 3 Credits
Practical – 2 Hours/week, 1 Credit

Examination Scheme:
ESE – 70 Marks
ISE – 30Marks
ICA – 25 Marks
POE – 25 Marks

This course introduces Embedded System Design with software and hardware perspective. The course also introduces practical design aspects of embedded system.

Course Prerequisite:
Student shall have knowledge digital circuits, basic C programming, Microcontroller fundamentals.

Course Objectives:
1. To make student realize different aspects and application areas of embedded systems.
2. To make student understand ARM core architecture.
3. To make student understand interfacing of input & output devices
4. To introduce to student concepts of Real time operating system.

Course Outcomes:
At the end of this course, Students will be able to,
1. Student can describe hardware and software architecture of embedded system.
2. Student can describe ARM7TDMI core architecture and Controller based on this architecture
3. Student can write C program for different applications for LPC2148microcontroller.
4. Student can interface different peripherals with LPC2148 microcontroller.
5. Student can describe microcontroller based real time systems for different applications.

Section - I

Unit 1: Embedded System Introduction (05)

Introduction to Embedded System, History, Design challenges, optimizing design metrics, time to market, applications of embedded systems and recent trends in embedded systems, embedded design concepts and definitions, energy and power analysis and program size optimization

Unit 2: System Architecture **(08)**

Introduction to ARM7TDMI core architecture, ARM extension family, Pipeline, LPC 2148, ARM instruction set, thumb instruction set, memory management, Bus architecture.

Unit 3: On Chip Peripherals **(08)**

Study of on-chip peripherals like I/O ports, PLL, timers / counters, interrupts, on-chip ADC, DAC, RTC module, WDT, PWM.

Section – II

Unit 4: Interfacing and Programming **(08)**

Introduction to Embedded C Programming, Basic embedded C programs for on-chip peripherals studied in system architecture like PLL, timers, ADC, DAC. Interfacing of devices – LED, Switches (buttons), 7-segment display, LCD display, DC motor.

Unit 5: Real Time Operating System **(09)**

Architecture of kernel, task scheduler, Threads, Process, ISR, Semaphores, mailbox, message queues, pipes, events, timers, memory management, RTOS services in contrast with traditional OS, introduction to µcosII.

Unit 6: Case Studies **(04)**

Case studies like Digital Camera, Smart Card System based ATM and Mobile Internet Device.

- **Internal Continuous Assessment:**

ICA consists of 8 to 10 practical's based upon above curriculum.

- **Suggested Practical's List:**

1. Arithmetic and Logic operations
2. Interfacing of Switch, LED / Buzzer / Relay
3. Interfacing of LCD Display.
4. Interfacing matrix Keypad and display key pressed on LCD / Seven Segment Display
5. Use of Timer for generation of time delays
6. Use of Interrupts for any Application
7. Use of ADC of Microcontroller.
8. Interfacing of Stepper motor.
9. Interfacing of DC Motor.
10. USART Serial communication.
11. Creating two tasks, which will print some characters on the serial port, Start the scheduler and observe the behavior.
12. Implementing a semaphore for any given task switching using RTOS on microcontroller board.
13. Implementing a Mailbox for task communication.

- **Text books:**

1. Embedded Systems: Architecture, Programming And Design by Rajkamal Tata McGraw-Hill Education
2. Frank Vahid - Embedded Systems - Wiley India
3. ARM System Developer's Guide, Designing and Optimizing System Software - Andrew N. Sloss , Dominic Symes, Chris Wright - Morgan Kaufmann Publisher.
4. Embedded systems software primer - David Simon – Pearson
5. MicroC / OS-II, Jean J Labrose - Indian Low Price Edition

- **Reference Books:**

1. DR.K.V.K.K. Prasad - Embedded / real time system – Dreamtech
2. Embedded real systems Programming – Iyer, Gupta, TMH
3. Embedded systems: a contemporary design tool, James K. Peckol- Wiley India
4. Datasheet of LPC 2148.
5. Application Handbook of Embedded System

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T. Y. B.Tech (Electronics& Telecommunication Engineering)

Semester-II

ET323: ELECTRONIC SYSTEM DESIGN

Teaching Scheme	**Examination Scheme**
Lectures – 3 Hours/week, 3 Credits	**ESE – 70 Marks**
Practical – 2 Hour/week, 1 Credit	**ISE – 30 Marks**
	ICA– 25 Marks
	POE– 50 Marks

This course introduces construction, characteristics of power electronics devices and its applications. The course also introduces design of different electronics systems such as frequency synthesizer, frequency counter, time period measurement. This course also covers design of industrial controllers and aspects of PLC & automation.

Course Prerequisite:

Student shall have knowledge of Basic Electronics, Linear Integrated Circuits and Digital Electronics

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Course Objectives:

1. To describe the concept and applications of power electronic devices.
2. To design and analyze timer, frequency counters and digital voltmeters.
3. To design applications of Phase Locked Loop (PLL) and industrial process control.
4. To provide introduction of the concept of PLC and its applications.

Course Outcomes:

At the end of this course, Students will be able to,

1.Describe construction, working & analyze characteristics of thyristors.

2.Analyze AC and DC power control circuits using thyristors.

3. Design and implement timers, frequency counters, digital voltmeters and frequency synthesizers.

4.Design and simulate Communication system components for system design.

5.Design and analyze controllers for industrial applications.

Section I

Unit 1: Introduction to Power Semiconductor Devices (07)

SCR - construction, working, VI characteristics, turn on and turn off methods (Class A, B, C, D). TRIAC - construction, working, VI Characteristics. DIAC - construction, working, VI Characteristics.

Unit 2: Power Electronics Applications (06)

Single phase half wave controlled rectifier, center tapped full wave controlled rectifier, fully controlled bridge rectifier, AC power control using DIAC & TRIAC and its applications.

Unit 3: Modulator, Demodulator & PLL (08)

Balanced modulator principle, IC 1596, applications of IC 1596 as AM modulator & Mixer. PLL-Working Principle, design consideration, FM detector, FSK demodulator, PSK demodulator, design of frequency synthesizer using LM565.

Section II

Unit 4: Timer, Counters &Digital Voltmeter (07)

Design of Timer using XR 2240, Design of counter using IC 74C926 for the time & event counting, Design of 3 ½ digit Multi-range DVM using discrete components.

Unit 5: Signal Conditioning Circuits (06)

Signal conditioning for sensors PT 100, LM 35, Thermocouples (J & K type), current loop Interface (4mA to 20mA), zero & span circuit, offset V to I & I to V converter, V to V converter.

Unit 6: Design of Controllers and PLC Applications (08)

Design of analog ON/OFF controller and proportional controller for controlling process, PLC architecture and applications, bottle filling plant & elevator control.

- **Internal Continuous Assessment:**

ICA consists of minimum eight practical from following suggestive list.

- **Suggestive List of Practical's:**

1. VI Characteristics of SCR.
2. VI characteristics of TRIAC & DIAC.
3. Single phase half wave controlled rectifier.
4. Lamp dimmer using TRIAC & DIAC.
5. AM simulation using MATLAB SIMULINK.
6. PLL application using MATLAB SIMULINK.
7. Implementation of frequency division circuit using IC.
8. Application implementation using PLC.

9. Temperature controller using OPAMP.
10. V to V Converter.
11. Simulation of Display design.
12. Design and simulate 3 ½ digit DVM.

- **Text Books:**

1. Power Electronics, circuits, devices & applications by M. H. Rashid, Pearson Education, 3rd edition.
2. Power Electronics by P. C. Sen, TATA Mc. Graw Hill, 2nd Edition.
3. Power Electronics by M. D. Singh & K. B. Khanchandani, TATA Mc. Graw Hill, 2nd Edition.
4. Introduction to System Design Using Integrated Circuits by B. S. Sonde, NewAge International Publishers, 2nd Edition.

- **Reference Books:**

1. Integrated Circuits by K. R. Botkar, Khanna publishers, 10th Edition.
2. Programmable Logic Controllers by Job Den Otter, Prentice Hall International Editions.
3. Programmable Logic Controllers by John Web & Ronald Reis, PHI Publications, 5th edition.
4. Process Control Instrumentation Technology by Curtis. D. Joshon, Pearson Education, 8th edition.
5. Data sheets of Analog and digital ICs used for design using Web resources.

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T. Y. B.Tech (Electronics& Telecommunication Engineering)
Semester-II

ET324.1 (Professional Elective-I)- Optical Fiber Communication

Teaching Scheme:	**Examination Scheme:**
Lectures – 3 Hours/week, 3 Credits	**ESE – 70 Marks**
Practical – 2 Hours/week, 1 Credit	**ISE – 30 Marks**
	ICA– 25 Marks

This course introduces the basic concept of optical communication. It explains the basic working principle of optical fiber. It covers the study of basic optical devices as optical source, optical detector and optical joints. It also introduces aspects of practical design of optical communication system.

Course Prerequisite:

Student should have knowledge of basic communication system, light reflection, refraction process.

Course Objectives:

1. To make students to understand basic working principle of optical fiber.
2. To introduce to student basic losses in optical fiber & reasons behind the losses.
3. To make students to understand the basics of optical sources (LASER & LED).
4. To make students to understand the basics of optical detectors.
5. To study the concepts of optical networks.

Course Outcomes:

After completion of syllabus students should be able to

1. Demonstrate working of optical fiber.
2. Explain transmission characteristics of optical fibers & concept of optical joints.
3. Illustrate different optical sources & optical detectors.
4. Solve the numerical to calculate the various parameters of optical sources & detectors.
5. Explain the different types of optical amplifier & optical networks.
6. Analyze the functional blocks in optical communication system.

Section I

Unit 1– Introduction **(06)**

Introduction, Historical development, general optical communication system, advantages, disadvantages, optical fiber waveguides, ray theory ,mode theory, Types of optical fibers, single

mode ,multimode fiber, step index & graded index fibers, applications of optical fiber communication.

Unit 2– Optical Fiber losses and Joints (07)

Introduction, Attenuation, absorption- intrinsic & extrinsic, linear &non linear scattering losses, bending loss, dispersion- intermodal & intramodal, Fibers alignment and joint loss, fiber splices, connectors, fiber couplers & its types.

Unit 3– Optical Sources (08)

LASER: Requirements of optical source, basic concept of LASER, optical emission from semiconductors, double heterojunction (DH) structure, Semiconductor injection laser and structures, Injection laser characteristics.

LED: LED structures, LED characteristics. Introduction of Light Modulation.

Section II

Unit 4-Optical Detectors (08)

Introduction, requirements of optical detector, optical detection principles, performance parameters of detector- absorption, quantum efficiency, responsivity, cut off wavelength.

Semiconductor photo diodes with and without internal gain:- PN, PIN, Avalanche Photo diodes, Phototransistors.

Unit 5-Optical Networks (06)

Optical Networks: Introduction, networking terminology, optical network modes, SONET / SDH, Optical Ethernet, Fiber Distributed Data Interface (FDDI), data buses.

Unit 6-Fiber Optical Communication Systems (07)

Introduction, Transmitter Design, Receiver Design, Noise equivalent model of receiver, Link Design, Wavelength Division Multiplexing (WDM), DWDM, Optical Time Division Multiplexing (OTDM).

- **Internal Continuous Assessment (ICA):**

ICA consists of minimum eight Practical's from suggestive list

- **Suggested List of Practical's:**

1. Setting up fiber optic analog & digital link.
2. Frequency modulation using fiber optic cable.
3. Pulse width Modulation using fiber optic cable.

4. Study of propagation loss in optical fiber.
5. Study of bending loss in optical fiber.
6. Measurement of optical power using optical power meter.
7. Measurement of Numerical Aperture.
8. Transmission of voice signal using FOC.
9. Study of WDM.
10. Study of LED output characteristics.

- **Text Books:**

1. Optical Fiber Communications, John M. Senior, Pearson Education. 3rd Impression, 2007
2. Optical Fiber Communications, Gerd Keiser, 4th Ed., MGH, 2008
3. Optical Fiber Communications ,D.C. Agarwal - S.Chand and company

- **Reference Books:**

1. Optical Communications, David Gover – PHI
2. Fiber Optics communication, HozoldKolimbiris - Pearson Education.
3. Fiber Optics Communication – 5th Edition, Palais-Pearson Education

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Semester-II

ET324.2 (Professional Elective-I)- Image and Video Processing

Teaching Scheme:	**Examination Scheme:**
Lectures– 3 Hours/week, 3 Credits	**ESE – 70 Marks**
Practical – 2 Hours/week, 1 Credit	**ISE –30 Marks**
	ICA- 25 Marks

This course covers fundamental notions in image and video processing, as well as covers most popular techniques used, such as edge detection, motion estimation, segmentation, and case studies.

Course Prerequisite:

Student shall have knowledge of Digital Signal Processing

Course Objectives:

1. To describe and performs basic operations on image and video.
2. To design and apply filter on images in spatial and frequency domain.
3. To analyze and implement algorithm for image and video processing application using modern tools.
4. To select and apply appropriate technique for preprocessing, segmentation and feature extraction of images and videos in real time applications.

Course Outcomes:

After completion of syllabus students should be able to

1. Describe and performs basic operations on image and video.
2. Design and apply filter on images in spatial and frequency domain.
3. Analyze and implement algorithm for image and video processing application using modern tools.
4. Select and apply appropriate technique for preprocessing, segmentation and feature extraction of images and videos in real time applications.

Section I

Unit 1: Image fundamentals **(07)**

Image acquisition, sampling and quantization, image resolution, basic relationship between pixels, color images, RGB, HSI and other models

Discrete Fourier Transform, Discrete Cosine Transform, KL Transform

Unit 2: Image Enhancement **(07)**

Spatial Domain: Point Processing: Digital Negative, contrast stretching, thresholding, gray level slicing, bit plane slicing, log transform and power law transform.

Neighborhood Processing: Averaging filters, order statistics filters, high pass filters and high boost filters.

Frequency Domain: DFT for filtering, Ideal, Gaussian and Butterworth filters for smoothening and sharpening, and Homomorphic filters.

Histogram Modeling: Histogram equalization and histogram specification**.**

Unit 3: Image segmentation and Morphology **(07)**

Point, line and edge detection, edge linking using Hough transform and graph theoretic approach, thresholding, and region based segmentation. Dilation, erosion, opening, closing, hit or miss transform, thinning and thickening, and boundary extraction on binary images

Section II

Unit 4: Image Restoration **(06)**

Degradation model, noise models, estimation of degradation function by modeling, restoration using Weiner filters and Inverse filters.

Unit 5: Video Formation, Perception and Representation: **(07)**

Digital Video Sampling: Video Frame classifications, I, P and B frames, Notation, ITU-RBT 601Digital Video formats, Digital video quality measure.

Video Capture and display: Principle of color video camera, video camera, digital video.

Sampling of video Signals: Required sampling rates, sampling in two dimensions and three dimensions, progressive versus interlaced scans.

Unit 6: Two Dimensional Motion Estimation (08)

Optical Flow: 2-D motion Vs optical flow, optical flow equations, motion representation, motion estimation criteria, optimization method.

Pixel based motion estimation: Regularization using motion smoothing constraints, using multipoint neighborhood.

Block Matching Algorithms: Exhaustive block matching algorithms, phase correlation method, Binary feature matching.

Multi resolution Motion Estimation: General formulation, Hierarchical blocks matching Algorithms.

- **Internal Continuous Assessment(ICA):**

Minimum Eight Laboratory experiments must be conducted on above topics for ICA.

- **Text Books:**

1. Gonzales and Woods--Digital Image Processing, Pearson Education, India, Third Edition
2. Murat Tekalp--Digital Video Processing, Pearson, 2010.
3. A.I.Bovik--Handbook on Image and Video Processing", Academic Press.

- ***Reference Books:***

1. Anil K. Jain, ―Fundamentals of Image Processing, Prentice Hall of India, First Edition, 1989.
2. John W. Woods, ―Multidimensional Signal, Image and Video Processing, Academic Press 2012
3. J.R. Ohm , ―Multimedia Communication Technology", Springer Publication.

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Semester-II

ET324.3 (Professional Elective-I)- Multimedia Communication Technology

Teaching Scheme:
Lectures– 3 Hours/week, 3 Credits
Practical – 2 Hours/week, 1 Credit

Examination Scheme:
ESE – 70 Marks
ISE –30 Marks
ICA- 25 Marks

Course Objectives:

1. After learning this course, students will get benefit to learn and understand the working of real life video system and the different elements of video system.
2. Students will get insight on functioning of individual blocks, different standards of compression and they will be acquainted with different types of analog, digital TV systems.

Course Outcomes:

After completion of syllabus students should be able to

1. Illustrate working of monochrome and color television transmitter and receiver.
2. Understand and compare different types of modern color televisions.
3. Acquire knowledge of latest digital TV systems and applications.
4. Understand the concept of multimedia and data representation.
5. Analyze different audio and video compression techniques.

Section– I

Unit 1: Fundamentals of Colour Television (07)

Aspect ratio, scanning, perception of brightness and colour, colour mixing, composite video signal, video bandwidth, CCIR-B Standards, synchronization details, video displays: LCD vs LED.

Unit 2: Colors Standards and Digital Video (07)

Color Spectrum, compatibility, Bandwidth of colour TV signal, Standards: NTSC, PAL, SECAM colour system, interleaving process

Unit 3: Digital TV (07)

Digital video, resolution, digital video formats, DTH, Video compression: MPEG-1, MPEG-2, MPEG-4.

Section-II

Unit 4: Audio and Video Recording Systems (06)

Digital sound, sound recording, CD/ DVD player, MP3 player, Blue Ray DVD Player, ITU-T(G) compression standards, multichannel/Dolby 5.1sound in DTV.

Unit 5: Basics of Digital Audio (08)

Digitization of sound, What is sound, Digitization, Nyquist Theorem, Signal to Noise ratio, Signal to Quantization noise ratio, Linear and Non linear Quantization,

Unit 6: Lossless Compression Algorithms (07)

Lossless Compression Algorithms: Introduction, Run-Length Coding, Variable-Length Coding (VLC), Arithmetic Coding

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- **Internal Continuous Assessment (ICA):**

ICA shall be based upon minimum Eight Experiments from following list.

- **Suggested List of Practical's**

1. Study of Disc Reproducing System.
2. To perform analysis of Composite Video Signal
3. Study the Yagi-uda antenna
4. Study of color pattern generator with pattern analysis
5. Study of CD/ DVD Player
6. Study of DT/HDTV
7. Study of Satellite System
8. Study of LED TV System
9. Study of audio and video coding scheme (soft)
10. Record speech & perform compression & decompression.

- **Text books:**

1. A.M. Dhake, Television and video Engineering, TMH Publication, 2nd Edition,2001
2. Kelth jack, Video Demystified: A Handbook for the Digital Engineer, 5th Edition, Newnes, 2007.
3. R.G. Gupta, Audio and Video Systems, McGraw Hill l Education (India), 2nd Edition, 2010.

- **Reference Books:**

1. S. P. Bali, Color Television Theory and Practice, McGraw Hill Education (India), 1994
2. A.M. Tekalp, Digital Video, Prentice Hall, 1995.
3. R.P. Gulathi, Modern Television Practice, 4th edition, New Age International Publisher, 2014
4. Zi-Niam Li and Mark Drew, Fundamentals of Multimedia, Pearson, 2004.
5. Khalid Sayood, Data Compression, PHI.
6. R.P. Gulati, Monochrome and Colour Television. 3rdedition, New Age International Publisher, 2014

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T. Y. B.Tech (Electronics& Telecommunication Engineering)
Semester-II

ET325.1 (Open Elective-II)- Sensors and Applications

Teaching Scheme:	**Examination Scheme:**
Lectures– 3 Hours/week, 3 Credits	**ESE – 70 Marks**
Practical – 2 Hours/week, 1 Credit	**ISE – 30 Marks**
	ICA – 25 Marks

This course provides good knowledge of working of different types of sensors used in various application areas. This course also provides knowledge of interfacing of electronic circuits with different sensors for its applications in different fields.

Course Prerequisite:

Concept of internal characteristics of passive elements like resistor, capacitor, inductor etc., Diode and transistor working, knowledge of basic fundamentals of mechanical terms like position, strain, stress etc.

Course Objectives:

1. To introduce students with the basics of various sensors and its characteristics.
2. To make students familiar with the working principle of different types of sensors andtransducers.
3. To introduce various signal conditioning and smoothing circuits for sensors
4. To interface various sensors with Arduino
5. To interface various sensors with Rapberry Pi

Course Outcomes:

After completion of syllabus students should be able to

1. Elaborate the concept of sensors and its characteristics.
2. Describe the working principle of analog and digital sensors.
3. Design sensor interface circuits for a given engineering problem.
4. Interface different sensors with Arduino and Raspberry Pi

Section– I

Unit 1: Sensors Fundamentals and Characteristics (06)

Sensors, Signals and Systems, Sensor Classification, Units of Measurements, Sensor Characteristics

.

Unit 2: Physical Principles of Sensing (08)

Electric Charges, Fields, and Potentials, Capacitance, Magnetism, Induction, Resistance, Piezoelectric Effect, Hall Effect, Temperature and Thermal Properties of Material, Heat Transfer, Light, Dynamic Models of Sensor Element

Unit 3: Interface Electronic Circuits (07)

Input Characteristics of Interface Circuits, Amplifiers, Excitation Circuits, Analog to Digital Converters, Direct Digitization and Processing, Bridge Circuits, Data Transmission, Batteries for Low Power Sensors

Section-II

Unit 4: Installation of Arduino and Raspberry Pi (06)

Introduction to Arduino and Raspberry Pi, Arduino setup and installation, Raspberry Pi basic setup and Installation, Interfacing of LED with Arduino/Raspberry Pi.

Unit 5: Interface `various Sensors using Arduino (07)

Interface Ultrasonic Sensor, PIR Sensor, IR Sensor, Smoke & Gas Sensor, Capacitive touch Sensor, Potentiometer Interfacing, Temperature Sensor, LDR, Accelerometer Sensor (MPU 6050), Atmospheric Pressure Sensor (GY 65), Soil Moisture detection Sensor using Arduino

Unit 6: Interface `various Sensors using Raspberry Pi (08)

Interface Ultrasonic Sensor, PIR Sensor, IR Sensor, Smoke & Gas Sensor, Capacitive touch Sensor,Potentiometer Interfacing, Temperature Sensor, LDR, Accelerometer Sensor(MPU6050), Atmospheric Pressure Sensor(GY 65), Soil Moisture detection Sensor using Raspberry Pi

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- **Internal Continuous Assessment (ICA):**
  ICA shall be based upon minimum Eight Experiments based upon above curriculum.
- **Text books:**

1. J. Fraden, Handbook of Modern Sensors: Physical, Designs, and Applications, AIP Press, Springer
2. Sensors and Actuators Engineering System Instrumentation By Clarence W deSilva
3. Electrical and Electronic Measurements and instrumentation R.K Rajput S. Chand

- **Reference Books:**

1. D. Patranabis, Sensors and Transducers, PHI Publication, New Delhi
2. A Course in Electronics and Electrical Measurements and Instruments, J.B. Gupta, Katson Books
3. A Course in Electrical and Electronic Measurements and Instrumentation, A.K.Sawheny, Dhanpat Rai
4. Sensors and Actuators, Engineering System Instrumentation (second edition) by Clarence W. Desilva, CRC press is an imprint of Taylor and Francis Group.
5. Mechatronic Systems, Sensors and Actuators (Fundamental Modeling) edited by Robert H. Bishop, CRC press is an imprint of Taylor and Francis Group.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T. Y. B.Tech (Electronics& Telecommunication Engineering)
Semester-II

ET325.2 (Open Elective-II)- Open Source Technologies

Teaching Scheme:	**Examination Scheme:**
Lectures – 3 Hours/week, 3 Credits	**ESE – 70 Marks**
Practical – 2 Hours/week, 1 Credit	**ISE – 30 Marks**
	ICA – 25 Marks

Course Objectives:

1. To introduce the concept of Open Source Software.
2. To enable students to learn Linux Environment.
3. To make students well versed Shell Programming
4. To make students understand working of Version Control System

Course Outcomes:

On successful completion of this course students should be able

1. To work on Open Source Software platforms.
2. To install and work on Linux.
3. To perform Shell Programming.
4. To install and work on Version Control System (GIT)

Section-I

Unit 1: Over View of Open Source Software (06)

Need of Open Sources, Advantages of Open sources, Applications, FOSS – FOSS usage, Free Software Movement, Commercial Aspect of Open Source Movement, Licensing, Certification, Open Source Software Development Model, comparison with close source / Proprietary software, Free Software, Open source vs source available Widely used open source software license :Apache License, BSD license, GNU General Public License, GNU Lesser General Public License, MIT License, Eclipse Public License and Mozilla Public License.

Unit 2: Open Source Operating System (05)

Installation of Linux: Theory about Multiboot Environment, Hard DiskPartitioning, Swap space, LVM, and Boot loader Command Line: Basic File System Management Task, Working with files, Piping and Redirection, Working with VI editor, use of sed and understanding FHS of Linux.

Unit 3: Open Source Operating System: System Administrator Task (05)

Job management, Process Management, Mounting Open Source Devices and file system working with Linux, Backup, working with user, group and permission, Managing Operating

System: Software. Understanding Boot process and related System files, Common kernel Management Task.

Unit 4: Open source Operating System: Network and Security Administration (05)

Basic networking commands, Configuration of Apache Web servers, DNS servers, DHCP servers, mail Servers, NFS, FTP servers. Securing servers with IP tables. Setting up cryptographic services, SSL, Managing Certificate with Open SSL, working with the GNU Privacy guard.

Section-II

Unit 5: Open source Operating System: Shell Programming (05)

Bash Shell Scripting, Executing Script, Working with Variables and Input, Using Control Structures, Script control, handling with signals, Creating functions, working sed and gawk - Working with web using shell script: Downloading web page as formatted text file and parsing for data, working URL etc.

Unit 6: Version Control Systems GIT (05)

Introduction: What is a Version Control System (VCS). Distributed vs Non-distributed VCS. What is Git and where did it come from. Alternatives to Git Cloud-based solutions (Github, Gitlab, BitBucketetc). Installation and Configuration: Obtaining Git, installing Git, Common configuration options, GUI tools. Key Terminology: Clone, Working Tree, Checkout, Staging area, Add, Commit, Push, Pull, Stash

Unit 7: GIT Local and Remote Repository Actions (06)

Git - Local Repository Actions, Creating a repository (git init), Checking status (git status), Adding files to a repository (git add), Committing files (git commit), Removing staged files (git reset), Removing committed files (git rm), Checking logs (git log), Git - Remote Repository Actions, Creating a remote repository (git init), Cloning repositories (git clone), Updating the remote repository from the local (git push), Updating the local repository from the remote (git pull), Tagging in Git, What are Git Tags?, Listing tags, Lightweight tags, Displaying tag details (tag show), Annotated tags, Checking out tags, Pushing tags, Pulling tags

Unit 8: Branching in Git (05)

What is a branch, A note about and lt; HEAD and gt; ,Listing branches, Create new branch, Checkout branch, Pushing branches, Pulling branches, Merging in Git, Fetching Changes (git fetch), Rebasing (git rebase), Git Pull, Git Workflows, Different ways of using Git, Centralised, Feature Branch, Gitflow Workflow, Forking Workflow. Git - Stashing Changes, What is Stashing? Creating a branch from a Stash.

- **Internal Continuous Assessment (ICA):**

ICA shall be based upon minimum Eight Experiments from following list.

- **Suggested List of Practical's**

1. Linux installation, disk partitioning, logical volume manager
2. Commands for files and directory handling(cd, ls, cp, rm, mkdir, rmdir, pwd, file, more, less, cat).
3. File permission, changing permission and ownership (chmod, chown)Process commands (kill, ps, who, top), Creating and editing files with Vi-editor
4. Managing user accounts (add, delete, modify users), Becoming super user, Creating and managing groups, Disk partition and sizes (df, du, dd etc.), Installing and removing packages (RPM, apt-get, yum..)
5. Service monitoring commands (uname, hostname, dnsip, nslookup, dig), Setting IPv4 and IPv6 static addressing
6. Remote file transfer (sshscp, ftp)
7. Shell programming in bash: Statement (Conditional, looping, case)
8. Installation and Configuration of GIT
9. Creating a repository, Addition and deletion of files to repository
10. Create and checkout a new branch.
11. Pushing branches, Pulling branches, Merging in Git
12. Create branch from stash

- **Textbooks:**

1) Open Source Technologyby Kailash Vadera and Bhavyesh Gandhi
2) Linux Command Line and Shell Scripting Bible by Richard Blum (Author), Christine Bresnahan
3) Learn Version Control with Git: A step-by-step course for the complete beginner, by Tobias Günther
4) Online Content: https://docs.github.com/en/get-started/using-git/about-git
5) Understanding Open Source and Free Software Licensing - By Andrew M. St. Laurent, Oreily Media

E- Resource available at: http://oreilly.com/openbook/osfreesoft/book/index.html

- **Reference Books:**

1) Managing Open Source Projects: A Wiley Tech Brief (Technology Briefs Series Book 24) by Jan Sandred
2) OpenSource: Technology and Policy By Fadi P. Deek and James A.M .McHugh, Cambridge University Press.
3) Ubuntu 20.04 Essentials: A Guide to Ubuntu 20.04 Desktop and Server Editions Ubuntu 20.04 Essentials: A Guide to Ubuntu 20.04 Desktop and Server Editions
4) Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer, by Tsitoara.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T. Y. B.Tech (Electronics& Telecommunication Engineering)
Semester-II

ET326: MINI HARDWARE PROJECT

Teaching Scheme:
Practical – 2 Hours/week, 1 Credit

Examination Scheme:
ICA – 25 Marks
OE – 25 Marks

This course is introduced to enable students to apply the knowledge and skills learned out of courses studied to solve/implement predefined practical problem. The Project work may be beyond the scope of curriculum of courses for learning additional skills, developing the ability to define, design, analysis and implementation of the problem and lead to its accomplishment with proper planning.

Course Prerequisite:
Student shall have knowledge of PCB designing, circuit designing, testing, soldering.

Course Objectives:
1. To produce PCB artwork using an appropriate EDA tool.
2. To practice good soldering, testing, fault detection and effective trouble-shooting.
3. To design and implement application based hardware project.
4. To present technical seminar and display the project.

Course Outcomes:
At the end of this course, Students will be able to,
1. Produce PCB artwork using an appropriate EDA tool.
2. Practice good soldering, testing, fault detection and effective trouble-shooting.
3. Design and implement application based hardware project.
4. Present technical seminar and display the project.

- **Guidelines for project implementation:**

1) Project group should be not more than 3 students per group.

2) Domains for projects may be based on a particular application from the following, but not limited to:

   i. Instrumentation and Control Systems

   ii. Electronic Communication Systems

   iii. Biomedical Electronics

iv. Power Electronics

v. Audio, Video Systems

vi. Embedded Systems

vii. Mechatronics Systems

3) Week 1 & 2: Formation of groups, searching of an application based hardware project

4) Week 3 & 4: Finalization of Mini project & Distribution of work.

5) Week 5 & 6: PCB artwork design using an appropriate EDA tool & Simulation.

6) Week 7 & 8: Procurement of electronic components for the project & PCB manufacturing.

7) Week 9, 10 & 11: Hardware assembly, testing, fabrication

8) Week 12: Demo, Group presentation & report submission

- **Internal Continuous Assessment (ICA):**

1. The seminar shall consist of the Literature Survey, Market survey, Basic project work and applications of Mini project.
2. Seminar Assessment shall be based on Innovative Idea, Presentation skill, depth of understanding, Applications, Future Scope and Individual Contribution.
3. A certified copy of seminar/ project report shall be required to be presented at the time of final submission.

- **Text Books:**

1. Thomas C Hayes, Paul Horowitz, —The Art of Electronics, Newens Publication
2. Jim Williams (Editor) — Analog Circuit Design: Art, Science and Personalities, EDN series for Design Engineers
3. M Ashraf Rizvi — Effective Technical Communication, Tata McGraw Hill Education Pvt. Ltd.

- **Reference Books:**

1. Robert Boylested, — Essentials of Circuit Analysis‖, PHI Publications
2. Meenakshi Raman, Sangeeta Sharma — Technical Communication, Principles and Practice, Oxford University Press
3. A.E. Ward, Angus — Electronic Product Design, Stanley thornes Publishers, UK.
4. C Muralikrishna, Sunita Mishra, — Communication Skills for Engineers, Pearson

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science and Technology

Credit System structure of T.Y. B. Tech. Mechanical Engineering W.E.F. 2022-2023 [Semester V]

Semester V: Theory Courses

Course code	Name of Theory Course	Hrs./week				Credits	Examination Scheme			
		L	T	P	D		ISE	ESE	ICA	Total
ME 311	Design of Machine Elements	3	-	-	-	3	30	70	-	100
ME 312	CAD-CAM-CAE	3	-	-	-	3	30	70	-	100
ME 313	Metallurgy	3	-	-	-	3	30	70	-	100
ME 314	Industrial Engineering	3	-	-	-	3	30	70	-	100
ME 315 P	Professional Elective -III	3	-	-	-	3	30	70	-	100
ME 316	Advanced Programming Concepts – I(Python)	1	-	-	-	1				
SLH31	Self Learning -HSS	-	-	-	-	#2	-	50	-	50
	Sub Total	16	-	-	-	16	150	400	-	550

Semester V: Laboratory / Tutorial Courses

Course code	*Name of Laboratory /Tutorial Course*	*Hrs./week*				*Credits*	*Examination Scheme*				
		L	*T*	*P*	D		*ISE*	*ESE*		*ICA*	*Total*
								POE	*OE*		
ME 311	Design of Machine Elements	-	-	2	-	1	-	-	-	25	25
ME 312	CAD CAM CAE	-	-	2	-	1	-	-	-	25	25
ME 313	Metallurgy	-	-	2	-	1	-	-	25	25	50
ME 315 P	Professional Elective -III	-	-	2	-	1	-	-	-	25	25
ME 316	Advanced Programming Concepts - I(Python)	-	-	2	-	1	-	-	-	25	25
Me 317	Workshop Practice - II	-	-	2	-	1	-	-	-	50	50
ME 318	Metrology	-	-	2	-	1	-	25	-	25	50
	Sub Total	-	-	14	-	07	-	50		200	250
	Grand Total	**16**	-	14	-	23	150	450		200	800

Note:# Indicates credits over and above

Abbreviations: *L- Lectures, P –Practical, T- Tutorial, D- Drawing, ISE- In Semester Examination, ESE - End Semester Examination (University Examination for Theory & / POE & / Oral), ICA- Internal Continuous Assessment.*

Professional Elective –III: A. Gas Turbines, B. Tool Engineering, C. Industrial Hydraulics Pneumatics D. Mechanical Vibrations

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science and Technology

Credit System structure of T.Y. B. Tech. Mechanical Engineering W.E.F. 2022-2023 [Semester VI]

Semester VI : Theory Courses

Course code	*Name of Theory Course*	Hrs./week				Credits	Examination Scheme			
		L	T	P	D		ISE	ESE	ICA	Total
ME 321	Transmission System Design	3	-	-	-	3	30	70	-	100
ME 322	Instrumentation and Control Engineering	3	-	-	-	3	30	70	-	100
ME 323	Heat Transfer	3	-	-	-	3	30	70	-	100
ME 324	Industrial & Quality Management	3	-	-	-	3	30	70	-	100
ME 325 P	Professional Elective - IV	3	-	-	-	3	30	70	-	100
ME 327	Advanced Programming Concepts – II(Java)	1	-	-	-	1	-	-	-	-
	Sub Total	**16**	**-**	**-**	**-**	**16**	**150**	**350**	**-**	**500**

Semester VI : Laboratory / Tutorial Courses

Course code	*Name of Laboratory / Tutorial Course*	*Hrs./week*				*Credits*	*Examination Scheme*				
		L	*T*	*P*	D		*ISE*	*ESE*		*ICA*	*Total*
								POE	*OE*		
ME 321	Transmission System Design	-	-	2	-	1	-	-	25	25	50
ME 322	Instrumentation and Control Engineering	-	-	2	-	1	-	-	-	25	25
ME 323	Heat Transfer	-	-	2	-	1	-	25	-	25	50
ME 324	Industrial & Quality Management	-	1	-	-	1	-	-	-	25	25
ME 325 P	Professional Elective - IV	-	-	2	-	1	-	-	-	25	25
ME 326	Workshop Practice - III	-	-	2	-	1	-	-	-	50	50
ME 327	Advanced Programming Concepts – II (Java)	-	-	2	-	1	-	-	-	25	25
ME 328	Mini Project	-	1	-	-	1	-	-	-	50	50
	Sub Total		02	12	-	08	-	50		250	300
	Grand Total	**16**	02	12	-	24	150	400		250	800

Abbreviations: *L- Lectures, P –Practical, T- Tutorial, D- Drawing, ISE- in Semester Examination, ESE - End Semester Examination (University Examination for Theory & / POE & / Oral), ICA- Internal Continuous Assessment.*

Professional Elective – IV: A. Project Management, B. Industrial Product Design C. Plastic Engineering, D. Railway Transportation System.

- **Note** –

1. Batch size for the practical /tutorial shall be of 15 students. On forming the batches, if the strength of remaining students exceeds 07, then a new batch shall be formed.
2. Industrial Training (evaluated at Final Year Sem.-I) of minimum 30 days shall be completed in any vacation after S.Y. Sem.-IV but before Final Year Sem.VII & the report shall be submitted and evaluated in Final Year Sem.-VII.
3. Students shall select one Self Learning Module at T.Y. Sem. V from Humanities and Social Sciences.
4. Curriculum for Humanities and Social Sciences Self Learning Modules is common for all under graduate programmes of faculty of Engineering and Technology.

5. **For T. Y. Sem. V**

A. Student can select a Self Learning Course from PAH Solapur University, Solapur HSS Course List and appear for its examination as and when conducted by PAH Solapur University, Solapur

OR

B. Student can enroll for National Programme on Technology Enhanced Learning (NPTEL) course, complete its assignments and Appear for certificate examination as and when conducted by NPTEL.

For more details about Self Learning Course (HSS), please refer to separate rule document available from PAH Solapur University, Solapur (http://sus.ac.in/uploads/engineering/Eng%20Revised%20Semester%20Pattern/Self%20Learning-%20H.S.S.%20courses%20All%20Engg.Branches_2014-15.pdf). More details about NPTEL are available at http://nptel.ac.in

6. ICA assessment shall be a continuous process based on student's attendance and performance in class tests, assignments, homework, seminars, quizzes, case studies and journals, as applicable.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Third Year B.Tech. (Mechanical Engineering)

Semester-V

ME 311: Design of Machine Elements

Teaching Scheme
Lectures: 03 Hours/week, 03 Credits
Practical: 02 Hours/week, 01 Credit

Examination Scheme
ESE: 70 Marks
ISE: 30 Marks
ICA: 25 Marks

Course Introduction:
This course seeks to introduce machine design and discusses various procedures, requirements, design methods. It introduces engineering materials and describes the different kinds of irons, steels and alloys used in engineering design with IS Codes. A further content explains in detail the manufacturing considerations in design. Components design procedures for design against static load and fluctuating load is also covered in content of the course. The features and varieties of threaded joints, and welded joints are explained with design considerations. Similarly design of shafts and keys with IS codes, design of couplings; springs and selection of belt drives from manufacturers catalogue is covered in content of the course.

Course Prerequisite:
Student shall have knowledge of function of machine elements such as keys, couplings, pulleys, levers, joints etc. A sound background of analysis of mechanical elements is essential for successful completion of this course.

Course Objectives:
The course aims to :

1. To design machine elements such as springs, shafts, joints, levers, etc.
2. To design mechanical component subjected to fluctuating loads.
3. To implement standardization in design of machine elements.
4. To develop proper approach and logics while designing of different mechanical parts / components.

Course Outcomes:
At the end of this course, student will be able to:

1. Design the machine elements subjected to axial loads
2. Design mechanical component subjected to fluctuating loads.
3. Implement standardization in design of machine elements.
4. Design the machine elements subjected to twisting and bending moments.
5. Develop practical and theoretical approaches to different mechanical component designs.
6. Analyse and design mechanical components on the basis of different design aspects.

Section I

Unit-1: Fundamentals of machine design and Design against static load **No. of lectures-09**

Procedure of machine design, Procedure of design of machine element, Types of loads, Factor of safety- its selection and significance, Theories of elastic failure and their applications, selection of preferred sizes, (No Numerical treatment) Socket and Spigot Cotter joint, knuckle joint, levers (lever loaded safety valve and right-angled bell crank lever) (Numerical treatment).

Unit-2: Design against fluctuating loads **No. of lectures-06**

Stress concentration causes and remedies, fatigue failure, endurance limit, notch sensitivity, Goodman and Soderberg diagram, Modified Goodman diagram, design for finite and infinite life under reversed and fluctuating stresses. (Numerical Treatment).

Unit-3: Selection of Belt **No. of lectures-05**

Selection of flat and V belt from standard manufacturers' catalogue / Design data book. (Numerical Treatment).

Section II

Unit-4: Manufacturing considerations in Design and Design of shafts, keys and couplings **No. of lectures-09**

Design considerations for casting, Design considerations for forging, Design considerations for machined parts, Design for manufacture and assembly.

Materials for shaft, Design of solid and hollow shaft on strength basis (maximum principal stress theory and Maximum shear stress theory) and on basis of torsional rigidity, ASME code for shaft design. Splined shaft (Introductory treatment).

Design of square and flat keys.

Types of couplings- Muff, Rigid flange. (Numerical treatment excluding Splined shaft).

Unit-5: Design of springs **No. of lectures-05**

Types of springs and their applications, terminology of helical spring, styles of end, spring materials, stress and deflection in helical spring, series and parallel springs, introduction to leaf spring. (Numerical treatment excluding leaf spring).

पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।

Unit-6: Design of Joints **No. of lectures-06**

Bolted joint- Simple analysis, eccentrically loaded bolted joints in shear, eccentric load parallel to axis of bolt, eccentric load perpendicular to axis of bolt (Numerical limited to static loading).

Welded Joints- Strength of butt welds, transverse fillet welds, axially loaded unsymmetrical lap joint, eccentrically loaded welded joint in shear (Numerical treatment).

Internal Continuous Assessment (ICA): Following eight assignments to be completed :

Part A: Assignment based on the following.

1. Selection of materials for engineering applications as per IS codes, composition and properties.
2. Selection of belts.
3. Design of helical springs subjected to static load.
4. Design of bolted and welded joints.
5. Design of shaft using ASME codes.
6. Manufacturing Considerations in Design.

Part B

7. Design and drawing of Turn buckle.
8. Design and drawing of rocker arm.

Note- Students are required to draw assembly and details of above Mechanical Components on drawing sheet (Sr. No. 7&8) (Suitable software may also be used)

Text Books:

1. "Design of Machine Elements", V.B. Bhandari, 4th edition, McGraw Hill.
2. "Machine Design Data Book", V.B. Bhandari, 2nd edition.

Reference Books

1. Design of Machine Element by J.F. Shigley, McGraw Hill Publications.
2. Design of Machine Element by M.F. Spotts, Pearson Education Publication.
3. Design Data: Data Book of Engineers by PSG College - Kalaikathir Achchagam - Coimbatore.

पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Third Year B.Tech. (Mechanical Engineering)

Semester-V

ME 312 : CAD-CAM-CAE

Teaching Scheme	**Examination Scheme**
Lectures: 03 Hours/week, 03 Credits	**ESE : 70 Marks**
Practical : 02Hours/week, 01 Credit	**ISE : 30 Marks**
	ICA : 25 Marks

Course Introduction:

Now-a-days industries cannot survive worldwide competition unless they introduce new products with better quality, at lower cost, and with shorter lead time. Accordingly, they have tried to use the computer's huge memory capacity, fast processing speed, and user-friendly interactive graphics capabilities to automate and bind together thus reducing the time and cost of product development and production. Computer-Aided Design (CAD), Computer-Aided Manufacturing (CAM), and computer-aided engineering (CAE) are the technologies used for this purpose during the development of mechanical product with best quality and lowest cost. Students must have knowledge of CAD, CAM and CAE. Therefore, this course contains syllabus related to CAD, CAM and CAE activities.

Course Objectives:

The course aims to :

1. Create an awareness regarding Geometric Modeling activities in Industries.
2. Create an awareness regarding CAM activities in Manufacturing Industries.
3. Develop part programming capabilities for CNC machines.
4. Empower students to learn advanced tools in Automation.
5. Utilize modern tools for design, analysis and manufacturing activities.

Course Outcomes:

At the end of this course, student will be able to:

1. Solve CAD related problems from industries.
2. Elaborate the concept of geometric modelling
3. Create solid model in CAD/CAM/CAE environment according to predefined parameters
4. Analyze Geometric transformations and FEA applications to mechanical component.
5. Solve CAM related problems of manufacturing industries.
6. Develop CNC part programming to operate CNC milling & turning machine to manufacture a Mechanical part.

Section I

Unit-1: Introduction to CAD / CAM/CAE **No. of lectures- 04**

Product Cycle and CAD / CAM/CAE, Advantages of CAD / CAM/CAE, Hardware used for CAD/CAM/CAE system, List of input/output devices, Functions of Graphics Software, `Selection of CAD / CAM/ CAE Software.

Unit-2: Computer Graphics and Geometric Modeling **No. of lectures- 08**

Geometric Transformations, Homogeneous Coordinates, Windowing and Viewing Transformations, Coordinate Transformations, Standardization in Graphics Software, CAD / CAM Data Exchange. Introduction to Geometric Modeling and its types, Parametric representation of basic entities like line and circle, Introduction to basic curves - Bezier, B-Spline, NURBS, concept of CSG and Boolean operations, Feature based modeling.

Unit-3: Finite element method and Automation **No. of lectures- 08**

Finite element method: Definition, Types of analysis, terms used in FEM, types of nodes and elements, General Steps of the FEM, Structural and thermal analysis of 1-D bar elements, Introduction to latest FEA software.

Automation: Concept & Definition of Automation, Types, Advantages and Limitations of Automation, Automation and CAD/CAM, CIM and CAD / CAM, Group Technology, part family, Classification and Codification System, Merits and Demerits of Group Technology, CAPP, Retrieval and Generative type of CAPP, MRP, concept of ERP, concept of Rapid Prototyping.

Section II

पुण्यश्लोक अहिल्यादेवी होळकर
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Unit-4: Fundamentals of NC system **No. of lectures- 06**

Evolution of NC and Retrofitting, Elements of NC Manufacturing System, concept of work zero and machine zero, Types of NC systems, Structure, Drives and other devices, Steps in NC Manufacturing, Advantages and Disadvantages of NC Technology, Flexible Manufacturing System (FMS), Elements of FMS, Applications of FMS, Merits and Demerits in FMS.

Unit-5: CNC- DNC Technology and Tooling **No. of lectures- 06**

Classification of CNC machine tools, CNC controllers, Features and Advantages of CNC, Adaptive Control, Advantages of Adaptive Control, Direct Numerical Control, Types of Direct Numerical Control, Advantages and Disadvantages of Direct Numerical Control, Tool holders, Adapters, Tool magazines, Automatic tool changers, Pallets, Tool setting, Modular tooling.

Unit-6: Manual Part Programming **No. of lectures- 08**

Principles of an NC Program, Word Address Format (WAF), Machining Formulas, Tool Length and Cutter Diameter Compensation, Canned Cycles for Lathe, Milling and Drilling, Introductory treatment of Subprogram, Subroutines, DO Loop, Macros.

Internal Continuous Assessment (ICA):

List of Experiments/Assignments/Case Studies, etc.

1. Assignment on Modeling & Drafting of any two mechanical components.
2. Assignment on Modeling of simple Assembly of around 3-5 machine components.
3. Assignment on Elements used in FEM analysis
4. Assignment on Rapid Prototyping
5. Assignment on FEA based structural analysis of simple mechanical component.
6. Assignment on FEA based thermal analysis of simple mechanical component.
7. Part programming of one job using CAM software or Programming and manufacturing of one job on CNC lathe or CNC Milling machine.
8. Assignment based on Industrial visit and its report based on CNC/FMS/Automation.

Text Books:

1. Introduction to CAD/CAM, Rao P.N., -Tata McGraw Hill Publishing Co.
2. Automation, Production Systems and Computer Integrated Manufacturing, Grover M.P.- Prentice Hall of India
3. Numerical Control -Computer Aided Manufacturing, Kundra, Rao, Tiwari- TMHillPub.Co.
4. CAD/CAM/CAE, Chougule N.K.- SCITECH Publications (I) Pvt. Ltd.
5. CAD/CAM/CIM, P. Radhakrishanan.

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Reference Books

1. Introduction to CAD/CAM, Rao P.N., -Tata McGraw Hill Publishing Co.
2. Automation, Production Systems and Computer Integrated Manufacturing, Grover M.P.- Prentice Hall of India
3. Numerical Control -Computer Aided Manufacturing, Kundra, Rao, Tiwari- TM Hill Pub. Co.
4. CAD/CAM/CAE, Chougule N.K.- SCITECH Publications (I) Pvt. Ltd.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Third Year B.Tech. (Mechanical Engineering)

Semester-V

ME 313 : Metallurgy

Teaching Scheme	**Examination Scheme**
Lectures : 03 Hours/week, 03 Credits	**ESE : 70 Marks**
Practical : 02 Hours/week, 01 Credit	**OE : 25 Marks**
	ISE : 30 Marks
	ICA : 25 Marks

Course Introduction: Metallurgy is an art of extracting the pure metals from its ore. Its full scope is in:

a) Mixing two or more metals to form an Alloy.

b) Shaping the metals & alloys by different processes such as Casting, Forming, and Joining etc.

c) Undergoing suitable Heat treatment for modifying the properties.

d) And finally, in Inspecting & testing before putting the products in to use.

Course Objectives:

The course aims to:

1. Identify Structures, composition, properties, applications of materials and their selection for design purpose.
2. Carry out testing of materials and its significance
3. Acquire knowledge of heat treatment processes for different engineering materials.
4. Acquire knowledge of powder metallurgy process and composite materials with its applications

Course Outcomes:

At the end of this course, student will be able to:

1. Select ferrous alloys for engineering applications.
2. Demonstrate the significance of heat treatment processes for engineering applications.
3. Apply powder metallurgy for manufacturing of products.
4. Establish the characteristics of non-ferrous alloys.
5. Select suitable non-destructive testing method for products.
6. Establish the characteristics of composite materials.

Section I

Unit-1: Introduction to ferrous alloys **No. of lectures-06**

Brief classification of Metals, Concept of alloying, Classification of cooling curves, Types of equilibrium diagram, Lever rule, phase rule, Solid solution & its types, Intermetallic compounds, allotropy

Unit-2: Ferrous metals and alloys **No. of lectures-10**

Fe-Fe3C equilibrium diagram, critical temperatures, Plain carbon steels: composition, applications & properties, Effect of alloying elements on steels, Eutectic, Eutectoid and Peritectic transformations, Plain carbon steels, classification, composition, properties &applications, Types of cast irons, composition, properties, applications. Alloy steels, alloying elements added to steels and their purpose.
Study of composition, properties and applications of following alloying steels.
1. HSLA steels 2. Spring steels 3. Silicon steels
4. Hadfield 'Mn' steels 5. HCHC steels 6. Water hardening steels
7. Oil hardening steel 8. Air hardening steel 9. Hot working tool and Die steel 10. Chisel steels
11. HSS 12. ONHS 13. Stainless steels and its types 14. Invar 15. Steels for subzero applications

Unit-3: Non-ferrous alloys, composites and Nano materials **No. of lectures-04**

Non-ferrous alloys
Copper alloys: brasses, bronzes. Aluminum alloys: Al-Si alloy, Al-Cu alloy.
Steps in precipitation hardening (Steps only), Pb-Sn alloys, Study of Babbits. Introduction to Ni alloys.
Composite materials: Classification, properties and Applications
Nano materials – Concept, effect of particle size on mechanical properties.

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Section II

Unit-4: Heat treatments of steel **No. of lectures-10**

Objectives of Heat Treatment, TTT and CCT diagram for eutectoid Steel (Introductory treatment only)
Annealing - purposes, types, applications, limitations.
Normalizing- purposes, types, applications, limitations.
Hardening & Tempering: purposes, types, applications. Types of Tempering, structural changes during tempering, Subzero treatment.
Methods of hardening such as Austempering, Martempering, limitations of these process, Surface hardening treatments.
Carburising – types, Nitradiing. Cyaniding and carbinitriding – Purposes, chemistry of process, applications, limitations.
Induction hardening , Flame hardening – Concept process, advantages, limitations and applications.

Unit-5: Destructive and Non-Destructive testing **No. of lectures-06**

A. Destructive testing methods, test procedure in brief, significance of
i) Tensile testing ii) Hardness testing iii) Impact testing iv) Creep v) Fatigue testing.
B. Study of Non-Destructive Testing methods (NDT) such as
i) dye penetrant test ii) magnetic Particle test iii) Ultrasonic test iv) Radiography test v) Eddy current test. Introduction to advanced NDT methods.

Unit-6: Introduction to powder metallurgy **No. of lectures-04**

Significance, steps in powder metallurgy process, Applications, Methods of powder manufacture, mixing / blending, compaction methods, sintering processes & types, advantages & limitations, Typical powder metallurgy applications and their flow chart: - Self lubricated bearings, cemented carbide cutting tools, friction materials, etc

Internal Continuous Assessment (ICA): Any eight experiments out of the following)

1. Study of metallurgical microscope
2. Study of specimen preparation for microstructure observations
3. Study of microstructures of P.C. steels
4. Study of microstructures of white, grey, S.G. iron, Malleable iron
5. Study of microstructures of Bronzes, brasses
6. Demonstration of Annealing, Normalizing, Hardening and Tempering
7. Demonstration of Tensile, Impact, and Hardness tests.
8. Demonstration of at least one NDT method
9. Study of microstructures of carburized, nitrided, Induction hardened steels
10. Demonstration of Macro examination such as Spark test

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Text Books:

1. Material Science and Metallurgy – Dr. Kodgire (Everest, Pune).
2. Engineering Metallurgy I & II – A. S. Gholap& M. S. Kulkarni
3. Introduction to Engg. Materials – B. K. Agarwal (TMH).

Reference Books

1. Heat treatment principles and technique - Rajan Sharma & Sharma
2. Introduction to Physical metallurgy – Avner, TMH.
3. Engineering Metallurgy Vol. I & II – R. A. Higgins (ELBS).
4. Engineering Metallurgy – E. C. Rollason (ELBS)
5. Engineering Metallurgy - Lakthin (MIR Publishers).

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Third Year B.TECH. (Mechanical Engineering)

Semester-V

ME 314 : Industrial Engineering

Teaching Scheme
Lectures: 03Hours/week, 03 Credits

Examination Scheme
ESE: 70Marks
ISE: 30Marks

Course Introduction:

Industrial Engineering is concerned with the design, improvement and installation of integrated system of people, material, information, equipment and energy. Its draws upon specialized knowledge and skill in the mathematical, physical and social science together with the principles and methods of engineering analysis and design, to specify, predict and evaluate the results to be obtained from such systems. This course includes, Introduction of basic concepts of IE and its applications to improve productivity for manufacturing and service sector. To understand concept of method study, work measurement, Job evaluation and merit rating for improving overall productivity. To acquire knowledge about plant layout, facility location, safety and ergonomic consideration
for improving productivity.

Course Objectives:

The course aims to:

1. To apply concept of productivity and illustrate different methods to improve it.
2. To acquire about knowledge of charts and apply for method study
3. To understand concepts of ergonomics and industrial safety
4. To establish standard time for work.
5. To select facility location and design plant layout.
6. To acquire knowledge of job evaluation and merit rating

Course Outcomes:

At the end of this course, student will be able to:

1. Analyze & measure productivity.
2. Perform method study
3. Apply knowledge of ergonomics and industrial safety
4. Perform work measurement’
5. Select facility location and design plant layout
6. Apply knowledge of job evaluation and merit rating

Section I

Unit-1 : Introduction to Industrial Engineering **No. of lectures- 06**

Definitions and meaning of I.E., contribution by F.W. Taylor, Gilbreth, objectives of I.E.
Productivity - Factors affecting productivity and ways to improve productivity.
Work Study – Definitions, objectives, Importance of work study procedure, Relation of work study with – work Simplification, Human Relation. (Numerical treatment)

Unit-2: Method Study **No. of lectures-08**

Definition, objective, Scope of method study, Basic procedure symbols and recording of facts, Charting conventions, Charts – Operation process chart, Flow process chart, Multiple activity chart, Two handed process chart, Diagrams – Flow and string diagram, travel chart Templets and models, Micro motion study. Therbligs simo chart, Critical examination and selection, Implementation method

Unit-3: Ergonomics and Industrial Safety **No. of lectures-06**

Definition, Man Machine system, Types of display, types of control, manual material handling, Anthropometry, Design of work place and working conditions, ILO Norms. Definition of accident, Cause of accident, Prevention of accident, safety measures factor acts, minimum wages act, Employers state Insurance act.

Section II

Unit-4: Work Measurements **No. of lectures- 07**

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Definition, objective and techniques of work measurement, time study, stop watch method, performance rating, allowance, relaxation interference contingency, policy, calculation of standard time, work sampling its need and procedure, predetermined motion time study(PMTS). (Numerical treatment)

Unit-5: Facility Locations and Plant Layout **No. of lectures-07**

a) Factors affecting site selection:
- Intangible factors for facility location, tangible factor for facility location, advantages and disadvantages of facility location in urban and rural areas.

b) Plant Layout:
- Characterization of an efficient layout objectives of plant layout, principles of plant layout, procedure in planning layout, types of plant, layout product/line layout, process/functional layout, fixed position/static layout, cellular/Group Technology layout, selection of material handling equipment.

Unit-6: Job Evalutions and Merit Rating **No. of lectures-06**

Job evalution: objectives, advantages and procedure, job analysis, job description, job specification, methods of evolution. Merit rating: Objectives and Method of Merit rating.

Text Books:

1. Industrial engineering and Production management by Martand Telsang. (S. Chand)
2. Engineering management by A. K. Gupta (S. Chand)
3. Industrial Engineering and Management by O. P. Khanna.

Reference Books

1. Introduction to work study by ILO. (Universal Publication)
2. Work Study by O. P. Khanna. (Dhanpat Rai and Sons)

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Third Year B.Tech. (Mechanical Engineering)

Semester-V

Professional Elective - III

ME 315 (A) GAS TURBINES

*Teaching Scheme	*Examination Scheme
Lectures : 03 Hours/week, 03 Credits	ESE : 70 Marks
Practical : 02Hours/week, 01 Credit	ISE : 30 Marks
	ICA : 25 Marks

Course Introduction:

The aim of the course is to provide fundamental knowledge and understanding about the functionality of turbine turbines. This knowledge will enable the students how a turbine can be highly efficient while having the least impact on environment. That is to aim for a green energy to contribute in sustainable development.

Course Objectives:

During this course, student is expected to:

1) Study the classification of gas turbines and its applications
2) Study Analysis of gas turbine cycles
3) Study Basic gas dynamics
4) Study dynamic compressors and their performance parameters.
5) Explain types of combustion chambers in gas turbines

Course Outcomes:

At the end of this course, student will be able to:

1) Classify and distinguish gas turbine cycles.
2) Analyze the gas turbine cycles
3) Discuss gas dynamics terms, construction, working and performance of centrifugal compressors
4) Discuss gas dynamics terms, construction, working and performance of axial compressors
5) Draw T-S diagram, Velocity diagrams and calculate work, efficiency.
6) Select combustion chamber and gas turbine materials.

Section I

Unit-1: Introduction No. of lectures **No. of lectures- 04**

Development of gas turbine, Classification of gas turbines, Comparison of Gas turbine and reciprocating I.C. Engines, Comparison of Gas turbine and steam turbine, Applications of gas turbines

Unit-2: Analysis of gas Turbine Cycles No. of lectures **No. of lectures- 08**

Brayton cycle and its analysis, Effect of maximum temperature on cycle efficiency and work ratio, Optimum pressure ratio for maximum work output, Intermediate temperature for optimum work and equation for maximum work output. Actual gas turbine cycle, effect of parameters on performance of cycle. Methods of improving the thermal efficiency and specific work output of gas turbine cycle, Gas turbine cycle with regeneration, intercoolingreheating. Gas turbine cycle with water injection. (Numerical treatment)

Unit-3: Basic gas Dynamics No. of lectures **No. of lectures- 08**

Introduction , Propagation of small disturbance-the velocity of sound, Mach number, Mach cone and Mach angle, Total or stagnation properties, One-dimensional adiabatic flow, Isentropic flow, Isentropic flow in a passage of variable cross-section area, Flow through a convergent nozzle-effect of pressure ratio, Flow through a convergent-divergent nozzle. (Numerical treatment)

Section II

Unit-4: Centrifugal Compressors No. of lectures **No. of lectures- 08**

Steady flow compressors, Construction and working of centrifugal compressor, Representation of processes in suction pipe, impeller, diffuser and delivery pipe on T-S diagram, Actual and isentropic work done, Analysis of centrifugal compressors-velocity diagrams, Euler work, ideal power, width of impeller blades, vane shapes and their characteristics. Slip factor, power input factor, Pressure coefficient, prewhirl(Numerical treatment)

Unit-5: Axial flow compressors No. of lectures **No. of lectures- 08**

Introduction, Components and working of axial flow compressor, velocity diagrams for axial flow compressors, representation of processes on T-S for single stage compression, degree of reaction, relation between blade angles for 50% degree of reaction, work input factor, polytropic efficiency, Surging and chocking, losses in axial flow compressors, comparison between axial flow and centrifugal compressors (Numerical treatment).

Unit-6: Gas Turbine Combustion Chamber No. of lectures **No. of lectures- 04**

Introduction, requirements, combustion process in gas turbines, types of combustion chamber, gas turbine materials- requirements and selection, fuels for gas turbine, cooling of gas turbine blades

Internal Continuous Assessment (ICA):

Following assignments to be completed

1. Assignment based on introduction of gas turbines
2. Assignment based on analysis of gas turbine cycles

3. Assignment based on actual gas turbine cycles
4. Assignment based on basic gas dynamics
5. Assignment based on flow through nozzles
6. Assignment based on centrifugal compressors
7. Assignment axial flow compressors
8. Assignment based on gas turbine chambers

Text Books:

1. Gas Turbines, V. Ganeshan, Tata McGraw Hill Education
2. Gas Turbines and Jet & Rocket Propulsion, Dr.Mathur&R.P.Sharma, Standard Publishers, New Delhi
3. Applied Thermodynamics-VI,B.L.Singhal, Tech-Max Publications,Pune

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Third Year B.Tech. (Mechanical Engineering)

Semester-V

Professional Elective - III

ME 315 (B) : Tool Engineering

Teaching Scheme
Lectures– 03 Hours/week, 03Credits
Practical – 02 Hour/week, 01Credit

Examination Scheme
ESE–70Marks
ISE –30Marks
ICA- 25Marks

Course Introduction:
This course seeks to provide an introduction to tool engineering and discusses various procedures, requirements, tooling methods. It introduces engineering materials and describes the different kinds of tools, jig & fixture used in industries. A further content explains in detail the design of press tool draw tool jig & fixture as well as tool nomenclature and geometry.

Course Objectives: During this course, students are expected:
1. To enlighten the students about the basics in mechanics of cutting & non cutting operations.
2. To explain the students about the basics in economics of cutting & non cutting operations.
3. To explain the concepts, principles & practices in designing jig and Fixture.
4. To elaborate the concepts, principles & practices in designing .

Course Outcomes: At the end of this course, students will be able to:
1. Students are able to do the calculations involved in the mechanics of machine
2. Students are able to design & draw the tools & tooling for the given situation & operation
3. Students are able to conceive & develop solutions for cutting and non cutting operations.
4. Students are able to conceive contrivances to overcome present problems of the real world.
5. Students are able to select appropriate material.
6. Students are able to prepare & develop sequence of operation for particular component.

Section-I

Unit 1– Basics of Tool Engineering **No of lectures – 08**

a) Single point cutting tools- Geometry & Tool signature as per ASA system & ORS system, effect of geometry on tool life, cutting force, surface finish.
b) Types of metal cutting process –orthogonal and oblique cutting, Force analysis for orthogonal cutting, types of chips, chip thickness ratio, shear angle, Tool dynamometers and Merchant circle.
c) Geometry and nomenclature of multi point cutting tool like a drill, milling cutter, broaches, and reamers.
d) Cutting tool materials - types, composition, properties and applications

Unit 2– Machinability & Tool Life **No of lectures –04**

a) Machinability Index, factors affecting Machinability.
b) Tool life- Flank & crater wear, effect of variables on tool life, Taylor's equation of tool life
c) Coolants- Heat generation, types of coolants.

Unit 3– Press Tools **No of lectures –08**

a) Elements of press tools, types of dies, types of operations.
b) Design of die for cutting operation, mechanics of shearing, cutting force estimation, punch & die clearance, stock strip lay out, design of punches & die block functioning & place of other elements.
c) Centre of pressure, selection of die set & press
d) Design of drawing dies determination of blank size, no. of draws, stage wise component drawing, drawing radii, clearance, and estimation of drawing force.
e) Types of Bending die, related estimates.

Section-II

Unit 4–Locating & Clamping Devices for jig and fixture. **No of lectures – 08**

a) Definition concept of locating and clamping.
b) Types of locating and clamping devices.
c) Types of redundant locations.
d) Fool proofing and indexing techniques.

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Unit 5–Design of Jigs & Fixtures **No of lectures – 08**

a) Design of Jigs- Principles of Jig design, types &applications, types of bushes &selection, use of standard parts, design procedure & drawing.
b) Design of Fixtures- Principles of Fixture design, standard elements & types of fixtures, design of milling fixtures.

Unit 6– Economics of Tooling **No of lectures – 04**

a) Elements of cost: methods of depreciation
b) Estimation of total cost & sales price
c) Break- even analysis for equipment selection
d) Economics of small tool selection, equipment replacement
e) Economic Order Quantity for Batch production

Internal Continuous Assessment (ICA) :

Following eight assignments / exercises/experiments:

1. Exercise on theory of metal cutting.

2. Design and drawing of press tool for particular component.
3. Design and drawing of draw tool for particular component.
4. Design and drawing of a jig for given component.
5. Design and drawing of milling fixture for particular component.
6. Demonstration of lathe tool dynamometer
7. Drawing sheet on geometry and nomenclature of multi point cutting tool like a drill, milling cutter, broaches, reamers.
8. Software modeling - Jig design- Exercise & modeling

*__Note:__ Any engineering software package suitable for modeling may be used.

Text Books:

1. Text Book of Production Engineering – P.C.Sharma (S.Chand Publication)
2. Machine Tool Engineering – G.R. Nagpal (khanna Publication)
3. Press Tools – P.H.Joshi (S.Chand Publication)
4. Jigs & Fixtures - P.H.Joshi (S.Chand Publication)

Reference Books:

1. Metal cutting Theory & tool design- Mr. Arshinnov (MIR Publication)
2. Fundamentals of Tool design- ASTME Publication
3. Tool design – Donaldson (TMH Publication)
4. Jig & Fixture Design – Kempster (ELBS Publication)

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Third Year B.Tech. (Mechanical Engineering)

Semester-V

Professional Elective - III

ME 315 (C) : Industrial Hydraulics & Pneumatics

Teaching Scheme	**Examination Scheme**
Lectures : 03 Hours/week, 03 Credits	**ESE : 70 Marks**
Practical : 02Hours/week, 01 Credit	**ISE : 30 Marks**
	ICA : 25 Marks

Course Introduction:

This course introduces hydraulic system & pneumatic system. Initially it covers the construction & working of various components of fluid power systems. Preparation of hydraulic & pneumatic circuit diagrams for various applications using the ISO symbols of hydraulic & pneumatic components is covered. Inclusion of use of catalogues of hydraulic & pneumatic component manufacturers for selection of components is also done in this course. Students will be made familiar with use of software for hydraulic & pneumatic circuit design.

Course Objectives:

The course aims to:

1. Understand advantages & disadvantages of fluid power systems.
2. Become familiar with the construction and function of the different hydraulic & pneumatic components/ devices.
3. Know suitability of any hydraulic & pneumatic components for specific application.
4. Understand the operation of basic circuits

Course outcomes:

At the end of this course, students will be able to

1. Choose hydraulic & pneumatic systems for proper applications
2. Explain construction & working of hydraulic & pneumatic system components/ devices
3. Select appropriate actuators for a particular application
4. Draw symbols of hydraulic & pneumatic system components/ devices
5. Prepare hydraulic & pneumatic circuits for various applications
6. Identify process flow on a hydraulics or pneumatic schematic

Section I

Unit-1: Introduction to Fluid Power System & Hydraulic Actuators **No. of lectures-06**

Fluid Power System: Introduction, Types, advantages, limitations & applications. Basic components of Hydraulic system, Hydraulic Actuators- Linear & Rotary, Types, Working, Construction, Cushioning effects, Calculation of velocity & force, Seals & Packing- Types, materials, applications

Unit-2: Pumps, Accumulators, Intensifiers & Valves **No. of lectures-08**

Pumps- Classification, construction, operation, advantages, applications, Pump performance, Characteristics. System components: Accumulators, Intensifiers, their types, working, applications,

Hydraulic Pressure control valves- Direct acting type, pilot operated, sequence, counter balancing, unloading, pressure reducing, Construction & Working, Direction control valves- Types, construction & working, Spool actuationmethods, spool centre positions. Flow control valves- Compensated & Non-Compensated, Construction & Working, One way valve. Symbols of above components/ devices

Unit-3: Hydraulic circuits **No. of lectures-06**

Simple circuit, Speed control circuits: Meter in, Meter out & bleed off circuits, Regenerative circuit, Sequencing circuit, Counter balancing, Synchronizing, Circuits with accumulator & intensifier

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Section II

Unit-4: Introduction to Pneumatic system & Actuators **No. of lectures-06**

Pneumatic system: Advantages, limitations & applications of pneumatic system, Comparison of hydraulic & pneumatic system, ISO symbols used in pneumatic circuits, pneumatic cylinders and air motors, types, construction and working

Unit-5: Pneumatic System Elements & Valves **No. of lectures-08**

Air compressors, types, working, selection criteria, FRL unit, construction and working, Direction control valves, Flow control valves and pressure control valves – types and working, Quick Exhaust valve, time delay valve

Unit-6: Pneumatic circuits **No. of lectures-06**

Simple Pneumatic circuits, time delay circuit, Pneumatic clamping system, Pneumatic braking systems, Pneumatic power tools

Internal Continuous Assessment (ICA): Any 8 from given list of experiments

1. ISO symbols for different components of Hydraulic and Pneumatic system
2. Study of hydraulic valves
3. Study of pneumatic valves
4. Demonstration of Hydraulic speed control circuits
5. Demonstration of hydraulic speed control circuits
6. Demonstration of Traverse & feed circuit
7. Demonstration of sequencing circuit
8. Demonstration of pneumatic circuits
9. Test on Gear/Vane/Piston pump and plotting of performance characteristic
10. Software use for hydraulic & pneumatic circuit design
11. Design of hydraulic/pneumatic circuit for practical application, Selection of different components such as reservoir, various valves, actuators, filters, pumps based on design. (Students are advised to refer manufacturers' catalogues)
12. Visit to Service station of Earth Moving equipment (Note: Students should write visit report based on the observations made during the visit)

Text Books:

1. Oil Hydraulics- Principle & Maintenance, S. R. Majumdar, Tata McGraw Hill
2. Hydraulics and Pneumatics H.L.Stewart – Industrial Press
3. Pneumatics- Principle & Maintenance, S. R. Majumdar, Tata McGraw Hill
4. Fluid Power with Applications, Anthony Esposito, Pearson Education

Reference Books

1. Eaton-Vickers Industrial Hydraulics Manual
2. Festo's Manual on Pneumatic Principle, applications
3. Hydraulics And Pneumatics, Jagadeesha T, Dreamtech Press

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Third Year B.TECH. (Mechanical Engineering)

Semester-V

Professional Elective - III

ME315 (D) : Mechanical Vibrations

Teaching Scheme	**Examination Scheme**
Lectures:03Hours/week, 03 Credits	**ESE: 70Marks**
Practical :02Hours/week, 01Credit	**ISE: 30Marks**
	ICA: 25Marks

Course Introduction:

Vibration is a common phenomenon existing in a mechanical system. Mechanical structures and systems are susceptible to vibrations, i.e. periodic changes in the physical state. Vibrations can both be a hindrance and a benefit to machines. In this course, we will learn how one can predict vibrations and interpret the measured vibrations using analytical and experimental means. The topic covered in the syllabus are damped and undamped free and forced vibration, Analysis of single-DOF, Two-DOF and multi-degree-of-freedom vibratory systems using energy conservation principles, vibration absorber and vibration measuring instruments.

Course Objectives:

The course aims to :

1. Study basic concepts of vibration
2. Develop competency in understanding vibration in systems
3. Develop analytical competency in solving vibration problems
4. Understand the various instrument used vibration measurement and techniques to control the vibrations

Course Outcomes:

At the end of this course, student will be able to:

1. Explain basic concepts of vibration in mechanical systems
2. Estimate natural frequency for single DOF undamped & damped free vibratory systems.
3. Determine response to forced vibrations due to excitation forces and Compute the parameters of vibration isolation system
4. Analyze vibration response of two DOF vibratory system
5. Estimate natural frequencies for multi-DOF vibratory systems
6. Describe the vibration measurement instrument and condition monitoring techniques for industrial / real life applications.

Section I

Unit-1: Fundamentals of Vibration **No. of lectures-05**

Vibration and Oscillation, Causes and effects of vibrations, Parameters of vibration, Damping, Motion-periodic, non-periodic, harmonic, non-harmonic, Degree of freedom, Static equilibrium position, classification of vibration, steps involved in vibration analysis, simple harmonic motion, vector and complex method of representing vibration, fourier series and harmonic analysis.

Unit-2: Free Single Degree of freedom of Vibration system **No. of lectures-08**

Undamped Free Vibration: Vibration system, Derivations for spring-mass systems, Methods of Analysis –D'Alembert's principal, newton, Energy, Lagrangian and Rayleigh method, Natural frequencies of simple systems, springs in series and parallel, Torsional and transverse vibrations, Effect of the mass of spring.

Damped Free Vibration: Types of damping, Analysis with viscous damping – Derivations for over, critical and underdamped systems, Logarithmic decrement and damping materials.

Unit-3: Forced Single Degree of freedom of Vibration system **No. of lectures-07**

Forced Vibration: Introduction, Analysis of forced vibration with constant harmonic excitation – magnification factor, rotating and reciprocating unbalances and excitation of support

Vibration Isolation and Control: Force Transmissibility, motion transmissibility, typical isolators & mounts. Introduction to Semi-Active and Active Vibration control, Energy dissipated due to damping.

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Section II

Unit-4:Systems with two Degree of freedom **No. of lectures-08**

Principal mode and natural frequencies of vibration, normal mode and natural frequency of systems-Spring mass system, double pendulum, torsional system, geared system, undamped dynamic vibration absorber.

Unit-5:Multi-Degree of Freedom Vibration system **No. of lectures-06**

Introduction, Free vibration of Multi DOF system: flexibility and stiffness influence, Rayleigh's method, Matrix iteration method, Holzer's method.

Unit-6: Vibration Measurement and condition monitoring **No. of lectures-06**

Vibration Measuring Instruments: Principal of seismic Instruments, Vibrometers, accelerometer-undamped and damped, Exciter and FFT analyzer.

Condition Monitoring: Introduction to conditioning monitoring and fault diagnosis, Condition & Vibration Monitoring Techniques, vibration data collection. Experimental modal analysis, Signature analysis.

Internal Continuous Assessment (ICA):
List of Experiments/Assignments/Case Studies, etc.
Minimum 8 experiments out of following list:

1. Experiment on equivalent spring mass system
2. Experiment on study of forced vibration characteristics with and without damping
3. Determine logarithmic decrement for single degree of freedom system
4. Experiment on free torsional vibration of single or two rotor system
5. Experiment on vibration isolation system and prediction of force and motion transmissibility of system
6. Assignment on two DOF system for determination of natural frequencies
7. Assignment on Multi DOF system for determination of natural frequencies
8. Introduction to FFT analyzer and prediction of spectral response of vibrating machine
9. At least two case studies in detail based on condition monitoring and fault diagnosis

Text Books:

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1. Mechanical Vibrations by S.S. Rao, fourth edition, Pearson Education
2. Mechanical Vibrations by G. K. Grover
3. Fundamentals of Mechanical Vibration by S. Graham Kelly, Tata McGraw Hll
4. Vibration Analysis by P. Srinivasan, Tata McGraw Hill
5. Mechanical Vibrations- Schaum's outline series, William W. Seto, McGraw Hill

Reference Books

1. Elements of Vibration Analysis by Leonard Meirovitch, McGrmv- Hill, New York
2. Mechanical Vibrations by J.P.Den Hartog, McGraw Hill Book Company Inc
3. Mechanical Vibrations by Den, Chambil, Hinckle
4. Theory of Vibration with Applications, by W. Thomson, 2nd edition, Pearson Education

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Third Year B.Tech. (Mechanical Engineering)

Semester-V

ME 316 Advanced Programming Concepts – I (Python)

Teaching Scheme
Lectures : 01 Hour/week, 01 Credits
Practical : 02Hours/week, 01 Credit

Examination Scheme
ICA : 25 Marks

Course Introduction:

By the end of this course, students will have gained a fundamental understanding of programming in Python by creating a variety of scripts and applications for the Web and for systems development. Python is a versatile programming language, suitable for projects ranging from small scripts to large systems. The course emphasizes best practices such as version control, unit testing and recommended styles and idioms. Students will explore the large standard library of Python, which supports many common programming tasks.

Course Objectives:

The course aims to :

1. Introduce the core components of python programming language.
2. Introduce procedural and object-oriented style for writing Python scripts.
3. Introduce standard library packages and modules in Python.
4. Study exception and file handling in python

Course Outcomes:

At the end of this course, student will be able to:

1. Describe basic concepts in Python programming
2. Write python script using procedure-oriented approach
3. Use Python standard library modules in writing Python scripts for problem solving
4. Write Python scripts in object-oriented approach.
5. Apply file handling options available in Python in programming
6. Exhibit ability to use python to provide solution to a given problem.

Section I

Unit-1: Introduction to python **No. of lectures-02**

Introducing the Python Interpreter, Program Execution, Execution Model Variations, The Interactive Prompt, System Command Lines and Files.

Unit-2: - Introduction to Python Programming basic concept **No. of lectures-03**

Data types and variables, Collection data types, Control structures, loops and functions, String handling.

Unit-3: Exception Handling **No. of lectures-02**

Definition, types of exception, try block, catch block, finally block, custom exception.

Section II

Unit-4: File Handling **No. of lectures-02**

Introduction, Data Streams, Creating Your Own Data Streams, Access Modes, Writing Data to a File, Reading Data from a File

Unit-5: The Object-Oriented Approach: Classes, Methods, Objects. **No. of lectures-03**

Basic concepts of object programming, A short journey from procedural to object approach, Properties, Methods, Inheritance - one of object programming foundations.

Unit-6: Python Standard Library Modules and Packages **No. of lectures-02**

Regular expression operations, Basic date and time types, General calendar-related functions, Container datatypes, NumPy, Shallow and deep copy operations, Mathematical functions.

Internal Continuous Assessment (ICA)

1. Two computer programs on data types, variables, basic input-output operations, basic operators.
2. Two computer programs on control structures.
3. Two computer programs Loops, Lists data types.
4. Two computer programs on Functions.
5. Two computer programs on Dictionary data type.
6. Two computer programs on Modules, Package and String
7. Tny two computer programs on Tuple data type.
8. Two computer programs on Object-Oriented Approach: Classes, Methods and Objects
9. WAP using Inheritance Concept.
10. Two computer programs on the Standard Objective Features; Exception Handling and Working with Files.

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* Note: Use suitable Python IDE.

Text Books:

1. e-Resource: Python 2.7.16 documentation https://docs.python.org/2/
2. e-Resource: Python 3.7.3 documentation https://docs.python.org/3/
3. Programming in Python 3, Second Edition, Mark Summerfield

Reference Books:

1. Python Cookbook, Third Edition, David Beazley and Brian K. Jones, Shroff Publishers
2. Distributors Pvt. Ltd., ISBN: 978-93-5110-140-6
3. Learning Python FIFTH EDITION Mark Lutz
4. Programming Python (English) 4Th Edition Mark Lutz
5. Testing Python, David Sale, Wiley India (P) Ltd., ISBN :978-81-265-5277-1

e-resources:

1. Python 2.7.16 documentation - https://docs.python.org/2/
2. Python 3.7.3 documentation - https://docs.python.org/3/

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Third Year B.TECH. (Mechanical Engineering)

Semester- V

ME 317: Mechanical Workshop – II

Teaching Scheme
Practical: 02Hours/week, 01 Credit

Examination Scheme
ICA: 50 Marks

Course Introduction:
This course is important to understand fundamentals of machine shop starts from safety measures, practical use of measuring tools, use of all conventional machine tools, operations of all conventional machines, use of tolerances, fits and finally their practical use and applications.

Course Objectives:
The course aims to:

1. Learn and understand different machining operations practically studied in theory subjects.
2. Get hands on experience of machining operations such as grinding, drilling, shaping, turning etc.
3. Develop skills to operate different machine tools.
4. Apply tolerances on job.

Course Outcomes:
At the end of this course, student will be able to:

1. Grind the tools.
2. Operate different machine tools such as grinders, lathes, milling, drilling machines etc.
3. Machine the component as per specified dimensions.
4. Apply tolerances on job.

Course Contents

1. Tool grinding demonstration and actual grinding to understand the tool geometry (01 turns)
2. One composite job in M.S. consisting of one component and inclusive of following operation shall be performed by students (Any 5 Operations)
3. Facing, Turning, Step turning, Chamfering, Grooving, drilling, Knurling.
4. At least one dimension of the job shall carry close tolerance (04 turns)
5. Preparation of process sheet for the above job (01 turn)

Note : Students shall prepare a work book involving brief write up regarding machine/machines employed for job. Students should prepare a work book which involves a process sheet for each job and inspection report of the job. Based on the job performed, attendance record, work book, internal viva, faculty may carry internal assessment.

Text Books:

1. Workshop Technology (Volume VI) by Raghuvanshi.
2. Workshop Technology (Volume VI) by Hajra Chowdhary.
3. Workshop Technology (Volume VI) by W.A.J. Chapman
4. Production Technology by P. C. Sharma.
5. Production Technology – HMT Handbook.
6. Production Technology (Volume VI) by Gupte - Patel.
7. P. L. Jain, Principles of Foundry Technology.
8. P.N. Rao, Manufacturing Technology: Foundry, Forming and Welding.

Reference Books

1. Manufacturing Processes & systems by Phillip F. Ostwald, Jairo Munoz-Wiley India.
2. Fundamentals of modern Manufacturing by Mikel P. Groover-Wiley India

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Third Year B.TECH. (Mechanical Engineering)

Semester-V

ME 318 : Metrology

Teaching Scheme
Practical : 02Hours/week, 01 Credit

Examination Scheme
POE : 25 Marks
ICA : 25 Marks

Course Introduction:

The students of Mechanical Engineering branch are basically concerned with manufacturing various machine components in shops as per given drawing. Today the industrial processing and manufacturing techniques have become complex and complicated and their control is very much difficult by human judgment only. Therefore, the exact and precise measurements are the basic need of the industries. This course of Metrology & Instrumentation, therefore, provides required knowledge and skills and creates self confidence in students so that they can work on shop floor independently for accurate and precise measurements and manufacturing.

Course Objectives:

The course aims to:

1. Calibrate the instruments like vernier calliper and micrometer.

2. Perform angle measurement using a sine bar.

3. Measure various gear tooth elements using gear tooth vernier caliper.

4. Use dial indicator to check Lathe machine parameters like parallelism, squareness, alignment

5. Measure effective diameter of a screw thread.

6. Select adequate limits and fits for various applications.

Course Outcomes:

At the end of this course, student will be able to:

1. Calibrate the instruments like vernier calliper and micrometer.

2. Perform angle measurement using a sine bar.

3. Measure various gear tooth elements using gear tooth vernier caliper.

4. Use dial indicator to check Lathe machine parameters like parallelism, squareness, alignment etc.

5. Measure effective diameter of a screw thread.

6. Select adequate limits and fits for various applications.

Internal Continuous Assessment (ICA):

Any six from the following to be completed and two assignments are compulsory

1. Calibration of Vernier caliper and micrometer.
2. Angle measurement using Sine bar or sine centre in combination with slip gauges
3. Measure gear tooth elements using gear tooth vernier caliper.
4. Use dial indicator to check Lathe machine parameters like parallelism, squareness, alignment or measure run out of a cylindrical component.
5. Use of floating carriage micrometer to measure minor, major and effective diameter of screw thread.
6. Measure effective diameter of a screw thread using a profile projector
7. A visit to a metrology laboratory in an industry

List of Assignments:

1. Assignment based on Limits, Fits
2. Assignment based on gauge design.

Text Books:

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1. Gupta. I.C., Engineering Metrology", Dhanpatrai Publications, 2005.
2. Jain R.K., Engineering Metrology", Khanna Publishers, 2009.
3. Rajput R K, Measurement and Metrology", S K Kataria and Sons, 2013.
4. A K Bewoor and V A Kulkarni, Metrology and Measurement, McGraw Hill Education (IND) Pvt Ltd, 2017

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Third Year B.Tech. (Mechanical Engineering)

Semester-VI

ME 321 : Transmission System Design

***Teaching Scheme**	***Examination Scheme**
Lectures : 03 Hours/week, 03 Credits	**ESE : 70 Marks**
Practical : 02Hours/week, 01 Credit	**ISE : 30 Marks**
	ICA : 25 Marks
	OE : 25 Marks

Course Introduction:

This course seeks to provide an introduction to design of various machine elements required in transmission system and discusses various design procedures, requirements and design methods. It introduces the design procedure for various types of gears like spur gear, helical gear, bevel gear and worm gear along with the introduction to AGMA standard. The different types of bearings, their significance and the selection of the rolling contact bearings from Manufacturer's Catalogue and the design considerations for sliding contact bearing are also included in the course content. Design of friction drives such as clutches and brakes is included

Course Objectives:

The course aims to:

1. Apply the process of design of the Spur gears.
2. Apply the helical gear design process.
3. Apply the design process for the bevel gear.
4. Apply the design process for the Worm gear.
5. Select the suitable bearing for particular application from manufacturer’s catalogue.
6. Apply the design concepts of clutches and brakes.

Course Outcomes:

At the end of this course, student will be able to:

1. Design the spur gear considering criterion of bending and wear for particular application.
2. Design the helical gear considering criterion of bending and wear as per required application.
3. Design the Bevel gear considering criterion of bending and wear at particular location.
4. Design the worm gear considering criterion of strength, wear and thermal as per requirement.
5. Select the bearing from manufacturer’s catalogue and to use for suitable application.
6. Calculate of dimensions of clutches and brakes required for an application

Section I

Unit-1: Spur Gears **No. of lectures-08**

Design considerations of gears, gear materials, types of gear tooth failures, hunting tooth, gear tooth loads, minimum number of teeth, face width, Lewis equation, Spott's equation, Buckingham's' Equation (Introductory treatment), gear design for maximum power transmission, Introduction to AGMA code.

Unit-2: Helical Gears **No. of lectures- 04**

Introduction to helical gears, Virtual number of teeth, force analysis, Design of helical gears based on beam strength and wear considerations Pressure angle in the normal and transverse plane. Effective load on gear tooth.

Unit-3: Worm Gears **No. of lectures- 08**

Terminology and geometrical relations, materials, standard dimensions and recommendations of worm gearing, force analysis of worm drive, friction in worm gear, efficiency and design criteria of worm drive as per IS7443-1974, load rating of worm drive, strength and wear rating of worm gear, thermal considerations in worm drive.

Section II

Unit-4: Bevel Gears **No. of lectures- 05**

Introduction to bevel gears, Terminology and geometrical relation, Virtual number of teeth**,** force analysis, mounting of bevel gears, Design of bevel gears based on beam strength and wear strength, dynamic tooth load. Effective load on gear tooth.

Unit-5: Rolling Contact and Sliding Contact Bearings **No. of lectures-10**

Rolling Contact bearing: Types, static and dynamic load capacities, Stribeck's equation, Equivalent bearing load, load life relationship, bearing life, load factor, selection of bearing from manufactures catalogue. Ball and Roller bearing, Design for variable load and speed, Bearings with probability of survival other than 90 %.Lubrication and mountings, dismounting and preloading of bearings.

Sliding contact Bearing: Bearing material and their properties, bearing types and their construction details, Hydrodynamic lubrication: Performance analysis of Hydrodynamic bearing by Raimondi and Boyd method. Introduction to hydro static bearings (Introductory Treatment).

Unit-6: Friction clutches and Brakes **No. of lectures-05**

Clutches: Design of plate clutches (Single plate and Multi-plate clutch),coneclutches,centrifugal clutch, Energy equation and thermal considerations in clutches.

Brakes: Introduction, Energy equations, Band and Block brakes , external shoe brakes , Internal expanding shoe brake, Disc brake, thermal considerations**.**

Internal Continuous Assessment (ICA):
List of Experiments/Assignments/Case Studies, etc.
(1- mandatory and any 7 out of remaining 9)

1. Design and drawing gear box using design data book.
2. Practice examples on design of spur gear.
3. Practice examples on design of helical gear.
4. Practice examples on design of bevel gear.
5. Practice examples on design of worm gear.
6. Practice examples on design of clutches.
7. Practice examples on design of brakes
8. Assignment on Rolling contact bearing
9. Assignment on sliding contact bearing
10. A case study on failure analysis of gear

Text Books:

1. Bhandari V, "Design of Machine Elements", 4th Edition, Tata McGraw-Hill Book Co, 2017.
2. Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett "Mechanical Engineering Design", Tata McGraw-Hill.

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Reference Books:

1. Machine Design by Robert L. Norton.
2. Machine Design by Hall, Holowenko, Schaum's outline series.
3. Hand book of Mechanical Design, 2nd Edition, Gitin Maitra, L. Prasad "Tata McGrawHill,
4. Design of Machine Elements, C.S.Sharma, Kamlesh Purohit, Prentice Hall of India, Pvt. Ltd.
5. Design of Machine Elements M. F. Spotts, T. E. Shoup and L. E. Hornberger, 8th Edition, Printice Hall, 2003.
6. PSG Design Data Book

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Third Year B.Tech. (Mechanical Engineering)

Semester-VI

ME 322 : Instrumentation and Control Engineering

Teaching Scheme	**Examination Scheme**
Lectures : 03 Hours/week, 03 Credits	**ESE : 70 Marks**
Practical : 02Hours/week, 01 Credit	**ISE : 30 Marks**
	ICA : 25 Marks

Course Introduction:

In recent years, importance of Instrumentation & Control systems has been rapidly increasing in all fields of engineering. The applications of Instrumentation & Control cover a very wide range, from design of precision control devices such as delicate electronic equipment to the design of massive equipments such as those are used for the manufacture of steel or other industrial processes. The principles of control theory are applicable to the engineering as well as non – engineering fields.

Course Objectives:

The course aims to:

1. Analyse the generalised measurement system, identify various static & dynamic characteristics of instruments, make use of various measuring instruments for measurement of temperature, pressure and vacuum.
2. Use various measuring instruments for measurement of displacement, speed and flow.
3. Use various measuring instruments for measurement of Force, torque and strain.
4. Identify manual & automatic control systems, open and closed loop systems, various modes of control, to apply block diagram algebra to determine transfer function of a given control system
5. Construct Root Locus for a given control system and comment on system stability.
6. Construct Bode Plots for a given control system and comment on system stability.

Course Outcomes:

At the end of this course, student will be able to:

1. Analyse the generalised measurement system, identify various static & dynamic characteristics of instruments, make use of various measuring instruments for measurement of temperature, pressure and vacuum.
2. Use various measuring instruments for measurement of displacement, speed and flow.

3. Use various measuring instruments for measurement of Force, torque and strain.
4. Identify manual & automatic control systems, open and closed loop systems, various modes of control, to apply block diagram algebra to determine transfer function of a given control system
5. Construct Root Locus for a given control system and comment on system stability.
6. Construct Bode Plots for a given control system and comment on system stability.

Section I

Unit-1: Introduction to Instrumentation, Temperature & Pressure Measurement **No. of lectures-08**

Generalized measurement system & its functional elements, Static & Dynamic characteristics and terms, calibration, classification of sensors & transducers.
Measurement of Temperature : Concept of Temperature, scales, Thermometer, Thermocouples, RTDs, Thermistors, Measurement of Pressure & vacuum : Terminology of pressure & vacuum, Bourdon tube, Deadweight pressure gauge, Diaphragm gauge, Vacuum gauges- McLeod's gauge, Ionization gauge

Unit-2: Measurement of Displacement, Speed and Flow **No. of lectures-06**

Measurement of Linear Position & displacement : Potentiometer, LVDT
Angular Speed Measurement : Mechanical Tachometer, Inductive pickup, Photoelectric pickup, Stroboscope, Measurement of fluid flow : Rate meters and Quantity Meters, Turbine Meter, Rotameter, Domestic Watermeter, Hot wire anemometer

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Unit-3: Measurement of Force, Torque and Strain **No. of lectures-06**

Force measurement : Hydraulic & Pneumatic Load Cells, Proving Ring , Torque Measurement using dynamometers, Types of dynamometers, Strain gauges, Classification, Relation for Gauge Factor, Strain gauge load cell, half bridge and full bridge network circuits

Section II

Unit-4: Fundamentals of Automatic Control No. of lectures-0**8**

Control – Need, Control System, Manual and automatic control systems, Open loop and Closed loop (feedback) control systems, Modes of Control : P - Control, P+I Control, P+I+D Control, Block diagram Algebra: General representation of a feedback control system, transfer functions, rules of block diagram algebra, reduction of block diagram to obtain closed loop transfer function.

Unit-5: Root Locus method **No. of lectures-06**

Significance of Root locus, angle and magnitude conditions, pole-zero plot, sections of R.L. on the real axis, Asymptotes & Centroid, breakaway points, intersection with imaginary axis, angles of departure and arrival, construction of root locus (on graph paper) using general rules and steps, comment on stability

Unit-6: Bode Plots **No. of lectures-06**

Magnitude and Phase angle plots, standard form of open loop T.F. G(jω) H(jω), Bode plots for standard factors of G(jω) H(jω),steps to sketch Bode plots for following factors :System gain K, Poles & zeroes at the origin, simple poles & simple zeroes, frequency response specifications, Construction of Bode plots using a semilog paper, calculation of Gain Margin and Phase margin, comment on system stability

Internal Continuous Assessment (ICA):

Part-A Any four of the following experiments to be completed :

1. Temperature Measurement using thermocouples, RTD, Thermistor.
2. Testing of mechanical pressure gauge using Dead Weight pressure tester.
3. Vacuum measurement using U tube manometer & Mechanical Vacuum Gauge.
4. Displacement Measurement using LVDT
5. Angular speed measurement using mechanical tachometer, stroboscope, photoelectric pickup, inductive pickup.
6. Flow measurement using Rotameter.
7. Measurement of bending strain or load using strain gauges.
8. Force Measurement using proving ring, load cells.
9. Measurement of torque by a dynamometer

Part-B Any four of the following to be completed

1. An experiment on DC/AC motor speed control (open loop / closed loop)
2. An experiment to demonstrate various modes of control: P, P+I, P+D & P+I+D.
3. Assignment on determination of transfer function using block diagram algebra
4. Assignment on construction of root locus for a given representation of a feedback control system
5. Assignment on construction of Bode Plots for a given representation of a feedback control system

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Text Books:

1. Mechanical Measurement & Control: Dr. D. S. Kumar
2. Automatic control Engineering: F. H. Raven., McGraw Hill International editions, New Delhi, Fifth edition.

3. Control Systems: U.A. Bakshi and V.U. Bakshi : Technical Publications, Pune, Fifth revised Edition –2007.

Reference Books

1. Mechanical Measurements : Dr Sirohi & Dr. Radhakrikshan.
2. Mechanical Measurements : Beckwith & Buck
3. Modern Control Engineering: K.Ogata, Prentice Hall of India Pvt. Ltd., New Delhi., 4th Edition.
4. Process Control: C. Johnson: Prentice Hall of India Pvt. Ltd., 1996.

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Third Year B.Tech. (Mechanical Engineering)

Semester-VI

ME 323 : Heat Transfer

Teaching Scheme
Lectures:03Hours/week, 03Credits
Practical :02Hours/week, 01Credit

Examination Scheme
ESE: 70Marks
POE: 25 Marks
ISE: 30Marks
ICA: 25Marks

Course Introduction:

This course deals with study of various modes of heat transfer such as conduction, convectionand radiation. After completing the course, the students will be able to formulate and analyzea heat Transfer problem involving any of the three modes of heat transfer. The students willbe able to obtain exact solutions for the temperature variation using analytical methods wherepossible or employ approximate methods or empirical correlations to evaluate the rate of heattransfer.The students will be able to analyze the performance of devices such as heat exchangers andalso estimate the insulation needed to reduce heat losses wherever necessary.

Course Objectives:

The course aims to:

1. To classify and study the important modes of heat transfer.
2. To formulate and apply the general three-dimensional heat conduction equations t
3. To elaborate the mechanism of radiative heat transfer
4. To elaborate the mechanism of convective heat transfer
5. To demonstrate and explain mechanism of boiling and condensation.
6. To describe the various two-phase heat transfer phenomenon

Course Outcomes:

At the end of this course, student will be able to:

1. Compare and distinguish the Modes of heat transfer.
2. Apply the laws of conduction heat transfer to the analysis
3. Apply the different laws to the radiation heat transfer.
4. Analyze heat transfer in case of natural & forced convection
5. Explain heat transfer in boiling & condensation.
6. Analyze the effectiveness, rating of heat exchangers.

Section I

Unit-1: Conduction **No. of lectures-08**

Modes of Heat Transfer-

Modes of heat transfer. Basic laws of heat transfer, Thermal conductivity and its variation with temperature for various Engineering materials (Description Treatment).

Steady State Heat Conduction-

Derivation of Generalized Heat Conduction equation in Cartesian co-ordinate & its reduction to Fourier, Laplace and Poisson's equations. Generalized Heat conduction equation in cylindrical and spherical coordinates (no derivation) and its reduction to one-dimension (1D) heat conduction through plane wall, cylinder, sphere. Heat Transfer Applications: composites, critical radius of insulation for cylinder and sphere. One dimensional steady state heat conduction with uniform heat generation for wall & cylinder (Numerical Treatment)

Unsteady State Heat Conduction-

Systems with negligible internal resistance, Biot and Fourier number and their significance, Lumped Heat capacity Analysis (Numerical Treatment)

Unit-2: Extended Surfaces **No. of lectures- 04**

Types and applications of fins, Governing equation for constant cross section area fins, Solution for fins with convective tip, adequately long (with insulated end) and infinitely long. Fin effectiveness and efficiency (Numerical Treatment)

Unit-3: Radiation **No. of lectures-08**

Nature of thermal radiation, definitions of absorptivity, reflectivity, transmissivity, monochromatic emissive power. Total emissive power and emissivity, Concept of black body& gray body, Kirchhoffs law, Weins law and Plancks law. Lambert cosine rule, Intensity of radiation. Energy exchange by radiation between two black surfaces with non-absorbing medium in between and in absence of reradiating surfaces.

Concept of radiation shape factor and its properties (Description only). Energy exchange by radiation between two gray surfaces without absorbing medium and absence of reradiation and Radiosity. Radiation network method, network for two surfaces which see each other. (Numerical Treatment)

Section II

Unit-4: Convection **No. of lectures- 08**

Forced Convection-

Mechanism of convection and its types, Concept of Hydrodynamic and thermal boundary layer, local and average convective coefficient. Dimensional analysis, dimensionless numbers and their physical significance, Empirical correlations for internal and external flow in forced convection problems. (Numerical Treatment)

Natural Convection-

Introduction, Dimensional analysis, dimensionless numbers and their physical significance, Empirical correlations for natural convection problems. (Numerical Treatment)

Unit-5: Boiling and condensation **No. of lectures-06**

Boiling Heat Transfer, types of boiling, Pool boiling curves, Force boiling phenomenon, Condensation Heat transfer, Film wise and drop wise condensation. Introduction of Heat pipe (Construction, working, advantages and applications) (Descriptive Treatment)

Unit-6: Heat Exchangers **No. of lectures-06**

Classification & Types of Heat exchangers, Fouling factor, and Overall heat transfer coefficient, Analysis by LMTD and NTU method for parallel and counter flow, Design consideration for Heat exchangers. (Numerical Treatment).

Internal Continuous Assessment (ICA):

Any 08 Experiments based on following list

1. Determination of thermal conductivity of insulating powder.
2. Determination of thermal conductivity& thermal resistance of Composite wall .
3. Determination of thermal conductivity of metal rod .
4. Determination of Heat Transfer Coefficient for natural convection.
5. Determination of Heat Transfer Coefficient for forced convection.
6. Determination of Emissivity of test plate.
7. Determination of Stefan Boltzmann Constant.
8. Determination of critical heat flux in boiling heat transfer.
9. Determination of heat transfer coefficient in dropwise and film wise condensation.
10. Determination of LMTD and effectiveness of Heat Exchanger.
11. Heat Pipe Demonstration/Trial.
12. Determination of temperature distribution, fin efficiency in Natural /forced convection.
13. Computer programme for any one of the above experiment.

Instructions for Practical Exam:

1. Four to Five experiments may be selected for Practical Examination.

2. The Number of Students for each practical set up may not be more than 04 Students.

Text Books:

1. A Text Book on Heat Transfer by Dr. S. P.Sukhatme, Orient Longman Publication, Hyderabad
2. Heat Transfer by P.K. Nag, Tata McGraw hill Publishing Company Ltd., New Delhi.
3. Engineering Heat and Mass Transfer, Mahesh M.Rathore,University Science Press, New Delhi-110002

4. Heat and Mass Transfer by Dr. D. S.Kumar S.K. Kataria& Sons, Delhi.
5. Heat and Mass Transfer, S.C. Arrora and S. Dokoundwar, DhanpatRai and Sons, Delhi.

Reference Books

1. Heat Transfer by J.P. Holman , McGraw Hill Book Company, New York.
2. Fundamentals of Heat and Mass Transfer by R.C. Sachdev, Willey Eastern Ltd.,
3. Heat Transfer – A Practical approach by – Ynus -A – Cengel(TatacGraw Hill)
4. Fundamentals of Heat & Mass Transfer (Fifth Edi.), Frank P.Incropera, David P.

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Third Year B.Tech. (Mechanical Engineering)

Semester-VI

ME 324 : Industrial & Quality Management

Teaching Scheme	**Examination Scheme**
Lectures : 03 Hours/week, 03 Credits	**ESE : 70 Marks**
Practical : 01 Hours/week, 01 Credit	**ISE : 30 Marks**
	ICA : 25 Marks

Course Introduction:

Industrial management involves studying structure and organization of industrial organisations. The knowledge of Industrial management comprises of those fields of business administration that are necessary for the success of companies within manufacturing sector and the encompassing services (primarily operations management, marketing and financial management). This subject is having two sections wherein, Section I is about general functions of Management applicable to industrial & other organizations whereas Section II contains concept of quality, total quality management and Quality control tools and techniques applicable to understand quality issues in manufacturing and service industry.

Course Prerequisite:

1. Knowledge of various manufacturing process.
2. Knowledge of industrial working environment through industrial training and Industrial visits.
3. Mathematics concepts, Probability Basics, Analytical Approach with exposure to industrial activities.

Course Objectives:

The course aims to :

1. To give the students an overview of the general functions of Management applicable to industrial & other organizations
2. To give insight to the philosophy & techniques of quality management applicable to industry
3. To make students aware about different motivational techniques and leadership styles
4. To give the students overview of working of various departments
5. To introduce various statistical process controls to students

Course Outcomes:

At the end of this course, students will be able to:

1. Understand basics of Industrial Management and their functions.
2. Discuss and demonstrate management functions to various organisations.
3. Explain and apply various quality control/statistical tools for industrial / organizational problems.
4. Understand working of various departments in industry
5. Understand various tools and techniques of total quality management used in industry

Section I

Unit-1: Introduction to Management and Industrial Functions: No. of lectures-06

Nature, purpose & scope of Management. System's approach to Management, Functions of Managers, Social responsibility & Ethics in Managing.

Introduction to Industrial Organizations: Production /Operations Management, Marketing Management, Financial Management

Unit-2: Planning, Organizing and Staffing No. of lectures-08

Planning: Meaning, Types of plans, steps in planning, planning process, decision making.

Organizing: Nature & purpose of organizing, Organization structure, Span & levels, Departmentation, Authority & responsibility, centralised Vs decentralised organisation.

Staffing: Definition, Human resource management & selection, Performance appraisal, Training & development.

Unit-3: Leading and Controlling No. of lectures-06

Leading: Human factors in managing, Motivation, 'Carrot & Stick' theory, Maslow's theory of Hierarchy of needs, leadership styles, communication: process. Types- oral, written & nonverbal.

Controlling: Process of controlling, control techniques.

Section II

Unit-4: Introduction to Quality No. of lectures-08

Definition of Quality, Elements of quality, quality specifications. Factors affecting quality of design & quality of conformance, quality control, quality costs.

Benchmarking, Quality Management Systems, Environmental Management System

Unit-5: Total Quality Management No. of lectures-06

Quality Gurus, Customer satisfaction, continuous process improvement, employee involvement, supplier partnership, Tools of quality control: Check sheets, graphs, Pareto analysis, cause & effect diagram, Scatter diagram, control charts, Six Sigma.

Unit-6: Statistical Process Control No. of lectures-06

Introduction to SPC, Control charts for variable & attributes, interpretation & applications of X-bar, R, P & C charts, Process capability. Acceptance sampling, sampling plans- types single & double, Operating characteristic curve, Producer & consumer risks. (Numerical treatment only on P & C charts and on sampling plans)

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Internal Continuous Assessment (ICA):
List of Experiments/Assignments/Case Studies, etc.
Minimum 8 assignments based on above topic out of which 2 case studies related to industry /organisation.

Text Books:
1. Essentials of Management – Koontz Weihrich By TMH
2. Principles of Management & Administration – D. Chandra Bose. PHI
3. Statistical Quality Control – M. Mahajan By Dhanpat Rai & Co.
4. Total Quality Management – Besterfield & Others PHI

Reference Books
Principles of Management – Tripathy, Reddy by TMH

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Third Year B.Tech. (Mechanical Engineering)
Semester-V
Professional Elective –IV
ME 325 (A) : Project Management

Teaching Scheme	**Examination Scheme**
Lectures : 03 Hours/week, 03 Credits	**ESE : 70 Marks**
Practical : 02 Hours/week, 01 Credit	**ISE : 30 Marks**
	ICA : 25 Marks

Course Introduction:

Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements. It is broken into five different categories like planning, scheduling, monitoring and controlling. Some software might be used to help or manage various projects, with each project having unique requirements.

Course Objectives:

The course aims to:

1. To understand the concepts of Project Management for planning to execution of projects.
2. To carry out the feasibility analysis in Project Management using analysis tools for risk, cost estimation.
3. To enable for the use of planning, scheduling, monitoring and controlling methods in Project Management
4. To make them capable to analyze, apply and appreciate contemporary project management software available in market.

Course Outcomes:

At the end of this course, student will be able to:

1. Describe concept, importance & Professional responsibilities of project management
2. Implement various techniques used to analyze risks in the projects.
3. Use various techniques used for cost estimation of a project.
4. Use methods for planning and scheduling of a project
5. Use methods for monitoring and control of a project.
6. Understand use of computer Applications at various stages of a project.

Section I

Unit-1: Introduction to Project Management **No. of lectures-** 06

Definition & Characteristics of Project, Classification of Projects, Project Management, Benefits, Project Management Process, Role of Project Manager. Project Lifecycle.

Unit-2: Project Management Techniques and Risk Management **No. of lectures-** 08

Feasibility Studies, Numerical Models (Payback Period, Return on Investment, Net Present Value, Internal rate of Return), Scoring Models, Break Even Analysis.

Project Risk Management: Introduction of Risk Management, Role of Risk Management in Overall Project Management, Steps in Risk Management, Risk Identification, Risk Analysis, Reducing Risks.

Unit-3: Project Cost Estimating **No. of lectures-** 06

Estimating terminology, Project Costs, Estimating Methods (Jobbing, Factoring, Inflation, Economies of Sales, Unit Rates, Day Work), Analogous Estimating, Parametric Estimating, Bottom-Up Estimating, Three-Point Estimates, Monte Carlo Simulation, Project Budgeting, Resource Allocation, Cost Forecasts.

Section II

Unit-4: Project Planning and Scheduling **No. of lectures-**06

Project Planning: Introduction, Need of Project Planning, Project Life Cycle, Roles, Responsibility and Team Work, Project Planning Process, Work Breakdown Structure (WBS)

Scheduling: Introduction, Development of Project Network, Time Estimation, Determination of the Critical Path, PERT Model (Numerical Treatment)

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Unit-5: Project Monitoring and Control **No. of lectures-**08

Project Execution and Control: Introduction, Project Execution, Project Control Process, Purpose of Project Execution and Control.

Project Management Information System: Introduction, Project Management Information System (PMIS), Planning of PMIS, Design of PMIS.

Project Performance Measurement and Evaluation: Introduction, Performance Measurement, Productivity, Project Performance Evaluation, Benefits and Challenges of Performance Measurement and Evaluation, Controlling the Projects

Unit-6: Computer Applications in Project Management **No. of lectures-**06

Introduction to MS Projects – Understanding the MS Project screen & different views, Defining the project, Working with calendar, Outline the project, Create dependencies between tasks, Creating WBS, Format task list and Gantt chart, Resource planning, leveling and preparing resource graph, Working with baseline, tracking the project.

Use of excel and MS project for feasibility studies, risk management, project cost estimating, project planning and scheduling etc.

Internal Continuous Assessment (ICA):

Total Eight Assignments**.**

1. (Six Assignment) One assignments on each unit: Including numericals
2. Two case studies: project cost estimation and project scheduling

Text Books:

1. S. Choudary, Project Management, Tata McGraw Hill
2. Narendra Singh; Project Management & Control; Himalaya Publishing House, Mumbai

Reference Books

1. Maylor, Project Management, Pearson Education,
2. Project Management Institute; "A Guide to the Project Management Body of Knowledge (PMBOK Guide)"; 5th Revised edition (1 January 2013)
3. Harold Kerzner; "Project Management: A Systems Approach to Planning, Scheduling and Controlling Paperback"; Wiley; tenth edition (20 November 2012)

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Third Year B.Tech. (Mechanical Engineering)

Semester-VI

Professional Elective -IV

ME 325 (B) : Industrial Product Design

*Teaching Scheme	*Examination Scheme
Lectures : 03 Hours/week, 03 Credits	ESE : 70 Marks
Practical : 02Hours/week, 01 Credit	ISE : 30 Marks
	ICA : 25 Marks

Course Introduction:

Industrial design is a creative discipline focused on solving a real world problems with a blend of art and design, Technology, and science. This drives innovation through a combination of practical ideas and scientific processes. Industrial design is concerned with bringing artistic form and usability, usually associated with craft design and ergonomics, together in order to mass produce goods. The knowledge of industrial product design helps to understand and satisfy the need of customer by considering cost quality and flexibility

Course Objectives:

The course aims to:

1. Impart knowledge and skill sets required for industrial design profession which includes ergonomic and aesthetic in design.
2. Enable students to understand industrial design practices includes new product design.
3. Enable students to understand rule of design engineer which impact at National and international level.

Course Outcomes:

At the end of this course, student will be able to:

1. Apply product design process to industrial and consumer products
2. Use aesthetic and ergonomic concepts in product design
3. Implement critical and creative thinking in design of products.
4. Apply Design Thinking for Problem Solving
5. Create Models/Prototypes using 3D Design Tools
6. Analyse Ergonomics, Aesthetic & Economical viewpoints of Product.

Section I

Unit-1: An approach to Industrial Ddesign **No. of lectures-08**

Technical requirements, Ergonomic requirements, Aesthetic requirements. Economic Requrements, industrial and Anthropometric data, ergonomical design aspect of machine tools; testing machines; instruments; automobiles; process equipments.

Unit-2: visual effects and line and form **No. of lectures-06**

Mechanics of seeing, psychology of scene, general inferences of line and form colour and light, colour terms, colour combinations, Colour of Engineering equipment, colour of machines and their forms.

Unit-3: aesthetic concepts **No. of lectures-06**

Concept of unity, Concept of order with variety concept of purpose style and environment aspiration, symmetry, balance, User Experience Case Studies in Industrial Design

Section II

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Unit-4: Industrial Design in Practice **No. of lectures-06**

General Design situation, specifying design requirement, Benchmarking with Competitors, Quality Function Deployment QFD, Introduction to Business Model Canvas, TAM or Total Available Market,SAM or Serviceable Available Market SOM or Serviceable Obtainable Market. Types of Market Survey influencing industrial design, production

Unit-5: New product development **No. of lectures-08**

Introduction to Patent search patent database for example IP India patentability Search, patentscope,ESPACENET, Design Thinking (DT), Steps in Design Thinking process, EMPATHISE,DEFINE,IDEATE,PROTOTYPE,TEST, CASE Studies of Products Developed by DT, Design for Manufacturing and Design for Assembly (DFM & DFA)

Unit-6: Decision Making and Computer Aided Product Design **No. of lectures-06**

Decision Making optimization, probability, reliability with computer aided product design, Additive Manufacturing

Internal Continuous Assessment (ICA):

List of Experiments/Assignments/Case Studies, etc.

1. Assignment on Product Specification (Two Case Studies)
2. Assignment on Aesthetic & Ergonomical Considerations for Assignment 01 (Two Case Studies)
3. Assignment on Developing Paper Prototype of Selected Two Case Studies
4. Assignment on Nature Inspired Form & Colours
5. Assignment on Applications of Design Thinking
6. Case study design of new product – Devices, utility products, concept generation and evaluation using different methods
7. Product Modelling Using 3D Modelling Design Software
8. Prepare Business Model Canvas for Product

Text Books:

1. Product Design & Development by Karl T Ulrich,Stevan Eppinger
2. Industrial Designs for Engineers – W.H.Yali
3. Product Design – Otto- Pearson Publication
4. Creative Confidence by Tom Kelly & David Kelly IDEO

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Reference Books

1. Grassroot Innovations by Anil Gupta

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Third Year B.TECH. (Mechanical Engineering)

Semester-VI

Professional Elective – IV

ME 325 (C) : Plastic Engineering

Teaching Scheme	**Examination Scheme**
Lectures : 03 Hours/week, 03 Credits	**ESE : 70 Marks**
Practical : 02Hours/week, 01 Credit	**ISE : 30 Marks**
	ICA : 25 Marks

Course Introduction:

During this course, student is exposed to following knowledge-

1. Study of extraction, manufacturing of plastic material and classification.
2. Study of various properties of plastic materials, comparative study of the plastics on the basis of parameters like structure, cost and processing time etc.
3. Study and Comparison of the different processes on the basis of parameters like design of plastic part, cost and processing time etc.
4. Design of plastic part, die/molds, correct selection & design leads to compact & less cost of systems.

Course Objectives:

The course aims to:

1. To understand the mechanism of polymerization, techniques of polymerization
2. To provide the depth knowledge about different kinds of plastic materials based on their structure and properties.
3. To make the students familiar about properties and processing of plastics and use it for different applications.
4. To provide the depth knowledge about plastic product design and different kinds of die/mould design.

Course Outcomes:

At the end of this course, student will be able to:

1. Predict the structure and properties of different kind of plastic material and select the plastic materials for particular end user application.
2. Know the processing of different plastic material based on the end user requirement.
3. Design the plastic products
4. Design compression and transfer molds
5. Design Injection Moulds
6. Design plastic injection mould for cooling

Section I

Unit-1: Study of *Plastic Materials* **No. of lectures - 06**

Definition and Classification of Plastic Materials, Properties of plastics, applications, Testing methods for plastics, additives in plastics, Monomers & Polymers, Polymerization - Types of Polymerization.

Introduction to composite plastics, Introduction of polymer degradation and biodegradable plastics, advanced application like Agriculture, Packaging, Building, Transport, Electrical, Electronics, Medical and Furniture.

Unit-2: Processing of Plastics and Welding of Plastics **No. of lectures - 07**

Processing of Plastics:

Injection molding, Extrusion molding, sheet forming processes, calendaring, Blow molding, Processing of thermosetting plastics, compression molding, Transfer molding, rotational molding.

Welding of Plastics:

Hot gas welding, hot tool welding, High frequency induction welding, laser welding, Infrared welding, ultrasonic welding, friction welding.

Unit-3: Design of Plastic Parts **No. of lectures - 07**

Basic design features, Tolerances of molded plastics parts, allowances in plastics, Design corners, undercuts, curing time, ribs, minimum wall thickness, design of inserts, cores mold materials.

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Section II

Unit-4: Design of compression and transfer molds **No. of lectures – 08**

a) Design and main parts of compression mould, standard insert mould body, design of loading chamber, design of punch, ejectors, stripper guided pin.

b) Technology of transfer mould, types, main parts, automation in transfer mould.

Unit-5: Injection Mould Design **No. of lectures – 06**

Injection mould design, Single, multi cavity, semi-automatic and automatic moulds. Types of injection mould, detailed structure and working. Feed system, Temperature control system, Ejection System, application.

Unit-6: Cooling of plastic injection mould **No. of lectures – 06**

Determining the heat quantity dissipated with cooling, heat dissipation with natural cooling, mean temperature, thermal resistance of mold body, summery of dimension and construction of correct cooling system.

Internal Continuous Assessment (ICA):
List of Experiments/Assignments/Case Studies, etc.

1. Study of plastic material- Polymerization, properties and specific applications in wide areas.
2. Design of Plastic product.
3. Injection mould design for simple component.
4. Design of Compression mould.
5. Design of Blow Mould.
6. Two Case studies for mould manufacturing-At least one case study with any CAD/CAM software.
7. Study and applications of advanced Plastics.
8. Industry Visit to Plastic part manufacturing Units (Min. Two Units).

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Text Books:

1. Prof.(Dr.) Sanjay K Nayak, Fundamentals of Plastics Mould Design, Tata McGraw Hill Education Private Limited, New Delhi.

Reference Books

1. J. A. Brydson, “Plastics Materials”, Butter worth Heinemann Oxford,1999
2. Schwartz & good man “Plastics materials and processing”
3. Irwin Rubin “Hand book of Plastic Materials and Technology”
4. Fred W. Billmeyer, JR., “Text Book of Polymer Science”, John Wiley & Sons, Singapore, 1994
5. Charles A. Harper, “Handbook of Plastic Processes”, WILEY India Pvt.Ltd.,2014
6. R.C.Batra, “Comprehensive Injection Moulding”, CBS Publishers and Distributors Pvt. Ltd., 2011

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Third Year B.Tech. (Mechanical Engineering)

Semester-VI

Professional Elective – IV

ME 325 (D) : Railway Transportation

Teaching Scheme	**Examination Scheme**
Lectures : 03 Hours/week, 03 Credits	**ESE : 70 Marks**
Practical : 02Hours/week, 01 Credit	**ISE : 30 Marks**
	ICA : 25 Marks

Course Introduction:

This course presents a comprehensive overview of passenger and freight railway transport systems, from design through to construction and operation. Moreover, it thoroughly covers freight railway systems transporting conventional loads, heavy loads and dangerous goods. For each system it provides a definition, a brief overview of its evolution and examples of good practice, the main design, construction and operational characteristics, the preconditions for its selection and the steps required to verify the feasibility of its implementation. This subject includes all means of transport whose rolling systems involve at least one iron component.

Course Objectives:

The course aims to:

1. To make a student understand concepts of various types of railway transport systems.
2. To make a student understand the different aspects of railway engineering, their uses, capabilities and limitations.
3. To introduce track engineering and fundamental calculations for railway tracks.
4. To give students an introduction to rolling stock and their dynamics.
5. To introduce a student to concept of derailment railway systems.
6. To make a student aware about concepts of Wheel Rail behavior.

Course Outcomes:

At the end of this course, student will be able to:

1. Summaries different components of a railway transportation system
2. Interpreting various stresses & deflections generated in track under various loads.
3. Analysis of forces on track due to various loads.
4. Design track under various loads.
5. Interpretation of behavior of railway track with rolling stock.
6. Evaluating derailment of railway vehicles.

Section I

Unit-1: Introduction to Railway Transportation Systems **No. of lectures- 08**

Introduction to railway systems, Components of railway systems: Railway infrastructure, Rolling stock and Railway operation, Fundamental functional principles: Running on a straight path, running in curves, Distinctive features of railway systems, Classification of railway systems. The capabilities of the railway transportation system: Advantages and disadvantages of the railway, Comparison of the characteristics of railway systems, Comparison of the capabilities of different transportation systems.

Unit-2: Behavior of rolling stock on track **No. of lectures- 08**

Behavior of a single railway wheel set: Movement on straight path, Movement in curves, Behavior of a whole vehicle: Operational and technical characteristics of bogies- Object and purposes of bogies, Conventional bogies, Bogies with self-steering wheel sets, Bogies with independently rotating wheels, Bogies with creep-controlled wheel sets, Bogies with wheels with mixed behavior. Wheel rolling conditions and bogies inscription behavior in curves. Lateral behavior of a whole vehicle- Vehicles with conventional bogies, Vehicles with bogies with self-steering wheel sets, Vehicles with independently rotating wheels, Comparative assessment.

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Unit-3: Derailment of railway vehicles **No. of lectures- 04**

Derailment of railway vehicles: Definition, Derailment through displacement of track, Derailment as a result of vehicle overturning, Derailment with wheel climb- Description of the phenomenon, Derailment criteria, Factors affecting derailment.

Section II

Unit-4: Vertical loads on track **No. of lectures- 08**

Classification of loads, Vertical loads on track: Static vertical loads- Axle load, Wheel weight, Daily traffic load. Quasi-static vertical loads: Vertical wheel load due to crosswinds, Vertical wheel load due to residual centrifugal force. Dynamic vertical loads- Dynamic vertical wheel load, Total vertical wheel load, Design vertical wheel load, Design loads of bridges.

Unit-5: Transverse loads on track **No. of lectures- 08**

Transverse loads on track: Gravitational forces, Creep forces- Running on straight path, running in curves, Crosswind forces, Residual centrifugal force, Guidance forces, Forces due to vehicle oscillations, Total transversal force.

Unit-6: Longitudinal force Analysis **No. of lectures- 04**

Longitudinal forces: Temperature forces, Rail creep forces, Braking forces: Acceleration forces, Traction forces: Adhesion forces, Fishplate forces.

Internal Continuous Assessment (ICA):
List of Experiments/Assignments/Case Studies, etc.

Minimum Four case studies on:

1. Rail transportation systems
2. Failure of railway tracks
3. FEA analysis of loading conditions of various types of coaches and bogies
4. Advanced electric systems in railways
5. Derailment of railway vehicles

Minimum Four assignments on:

1. Assignment on Railway Transportation System
2. Assignment on Behavior of rolling stock on track
3. Assignment on Derailment of railway vehicles
4. Assignment on Vertical loads on track
5. Assignment on Transverse loads on track
6. Assignment on Longitudinal force Analysis

Text Books:

1. Railway Transportation Systems — Design, Construction and Operation, Christos N. Pyrgidis, 2019, CRC Press
2. A Text Book of Railway Engineering, S.C. Saxena, S.P.Arora, Dhanpat Rai Publications (p) Ltd.-new, Delhi, 2010.
3. Electric Traction for Railway Trains: A Book for Students, Electrical & Mechanical Engineers, Superintendents of Motive Power & Others, E. P. Burch, McGraw- Hill Book Company.

Reference Books

1. Handbook of Railway Vehicle Dynamics, Simon Iwnicki, Taylor & Francis Group, CRC Press, ISBN: 9780849333217, 0849333210
2. Railway Track Engineering, J.S.Mundrey, Tata McGrow Hill Publication. Principles of Railway Engineering, S.C. Rangawala, Charotar Publication, 2015.
3. Traction Rolling Stock- Three Phase Technology, A.K. Rawal, Indian Railway Institute of Electrical Engineering, Nasik Road.
4. Traction Distribution- Power Supply Electric Traction, A.K. Rawal, Indian Railway Institute of Electrical Engineering, Nasik Road.

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Third Year B.Tech. (Mechanical Engineering)

Semester-VI

ME 327: Advanced Programming Concepts – II (Java)

Teaching Scheme
Lectures : 01 Hour/week, 01 Credits
Practical : 02Hours/week, 01 Credit

Examination Scheme
ICA : 25 Marks

Course Introduction:

By the end of this course, students will have gained a fundamental understanding of programming in Java by creating a variety of scripts and applications for the Web and for systems development. Java is a programming language, suitable for projects ranging from small scripts to large systems. Students will be able to explore the large standard library of Java, which supports many common programming tasks.

Course Objectives:

The course aims to:

1. To learn the basic syntax and semantics of JAVA.
2. To make students familiar with the general programming concepts of JAVA such as variables branching, loops and functions.
3. To make the students learn and program JAVA scripts.
4. To develop GUI based applications in JAVA

Course Outcomes:

At the end of this course, student will be able to:

1. Install JAVA IDE & develop simple applications using JAVA.
2. Read from and write to text files and debug errors.
3. Write Java code using advanced Java feature
4. Write JAVA applet for windows based applications such as Word & Excel and JAVA scripts for CAD software such as CATIA & AutoCAD.
5. Develop a small JRE based application or Applet for a mechanical engineering subject.
6. Use the syntax and semantics of java programming language and basic concepts of OOP

Section I

Unit-1: Introduction to Java **No. of lectures-2**

Java history, Java features, Java vs. C and C++, Installing Java, Exploring the IDE, Simple Java program, JVM and command line arguments

Unit-2: General Programming **No. of lectures-2**

Constants, Variable and data types, Operators and expressions, Branching and looping, calling object methods, Creating a function. Program plan, assigning static properties & dynamic properties,

Unit-3: OOP **No. of lectures-3**

Define class, methods declaration, creating objects and constructors, Methods overloading, static members, nesting of methods, overriding methods, Final variables and methods, Interfaces and packages

Section II

Unit-4: Interface and packages **No. of lectures-2**

Using packages and interfaces, I/O classes creating files, reading/writing characters

Unit-5: Arrays, Strings and Vectors **No. of lectures-2**

1D and 2D arrays, Strings, Vectors

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Unit-6: Debugging & : Applets **No. of lectures-3**

Types of Errors exceptions, Exception handling using catch statements, finally statement

Applets, Applets vs. Applications

Internal Continuous Assessment (ICA):

List of Experiments/Assignments/Case Studies, etc.

1. Assignment on Fundamentals of Java programming
2. Programming exercises on Variables and parameters
3. Programming exercises on branching and looping
4. Programming exercises on Console I/O
5. Assignment on object objects, classes and methods
6. Programming exercises on Arrays, strings and vectors

7. Programs on packages and interfaces
8. Programs on Exception handling
9. Assignment on Java Applet

Text Books:

1. Programming with JAVA: A Primer (4th Edition) - E. Balaguruswamy TMH
2. JAVA: The Complete Reference(5th Edition) - Herbert Scheldt (TMH)
3. Essential JAVA for Scientists and Engineers - Malan and Hahn (BH)

Reference Books

1. Object Oriented Programming through JAVA - P. Radhakrishna (University Press)
2. Java Programming for Beginners -Motwani (Shroff Publication)
3. Let us JAVA -Yeshwant Kanetkar (BPB)
4. JAVA in Easy Steps -Mike McGrath (TMH)

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पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Third Year B.Tech. (Mechanical Engineering)

Semester- VI

ME 327: Mechanical Workshop – III

Teaching Scheme | **Examination Scheme**
Practical: 02Hours/week, 01 Credit | **ICA: 50 Marks**

Course Introduction:
This course is important to make the students aware of various skills involved in manufacturing & assembly, develop skills to operate different machine tools and make students aware of operation sequence, speed, feed selection for different materials & operations along with their operational set up.

Course Objectives:
The course aims to:

1. Set the manufacturing set up of different machining operations and study the corresponding set up parameters while working on actual machine tools.
2. Select appropriate and proper process parameter for obtaining desired requirement on work piece.
3. Identify the operational / processing problems and suggest remedial solution for adopted manufacturing processes.

Course Outcomes:
At the end of this course, student will be able to:

1. Understand the working of various machines
2. Operate various machine tools.
3. Perform various machining operations.
4. Selection of operational and process parameters during machining operations.
5. Manufacture a small assembly of components.
6. Understand various attachments on various machines.

Course Contents
Any one noncommercial assembly consisting of at least three components with tolerance involving use of lathe, drilling, milling, grinding and any additional machine tool or processes as per requirement. Use machining operations like boring, slotting, tapping, tapering, external taper turning, shaping, milling etc. (Any 5 Operations)

or

Development and Execution of one simple turning/milling job on CNC (Trainer) including geometric and dimensional tolerances.

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Note

1. Students shall prepare a work book involving brief write up regarding machine/machines employed for job.
2. Students should prepare a work book which involves a process sheet for each job and inspection report of the job.
3. Based on the job performed, attendance record, work book, internal viva, faculty may carry internal assessment.
4. Material specification for conventional practical job is Φ32mm MS bar and Material for CNC is as per machine requirement.
5. 5. Development and Execution of CNC job need to cover all fundamentals of CNC programming and its execution.

Text Books:

1. Workshop Technology (Volume VI) by Raghuvanshi.
2. Workshop Technology (Volume VI) by Hajra Chowdhary.
3. Workshop Technology (Volume VI) by W.A.J. Chapman
4. Production Technology by P. C. Sharma.
5. Production Technology – HMT Handbook.
6. Production Technology (Volume VI) by Gupte - Patel.
7. Introduction to CAD/CAM, Rao P.N.
8. CAD/CAM/CAE, Chougule N.K.

पुण्यश्लोक अहिल्यादेवी होळकर
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Reference Books

1. Manufacturing Processes & systems by Phillip F. Ostwald, Jairo Munoz-Wiley India.
2. Fundamentals of modern Manufacturing by Mikel P. Groover-Wiley India
3. Theory and Practice, Ibrahim Zeid – CAD/CAM - Tata McGraw Hill Publishing Co.
4. CAD/CAM - Mastering, Ibrahim Zeid –-Tata McGraw Hill Publishing Co.

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Punyashlok Ahilyadevi Holkar Solapur University

Third Year B.Tech. (Mechanical Engineering)

Semester-V

ME 328 : Mini Project

Teaching Scheme	**Examination Scheme**
Tutorial : 01 Hour/week, 01 Credit	**ICA : 50 Marks**

Course Introduction: The mini project is designed to help students develop practical ability and knowledge about practical tools/techniques in order to solve real life problems related to the industry, academic institutions and society. This course will also develop investigative, research and report writing skills and will provide an opportunity to investigate a chosen topic in considerable depth. Mini Project provides the opportunity for students to demonstrate the application of their research skills, and to apply their knowledge to complex computing problems. A mini project is an assignment that strengthens the understanding of fundamental knowledge through effective application of theoretical concepts.

Course Objectives:

The course aims to:

1. To identify potential problems in engineering.
2. To Carry out Research about the selected topic.
3. To provide a solution for the problem identified.
4. To express technical ideas, strategies and methodologies in written form.

Course Outcomes:

At the end of this course, student will be able to:

1. Identify and analyze the potential technical problems.
2. Carry out research about the selected topic
3. Seek suggestions from subject experts
4. Carry out planning and its execution with teammates
5. Develop solution for a set of requirements for the problem identified.
6. Write a report with all the contents in logical order and do Quality Presentation

6 Steps to do Successful Mini Project:

1. Selection of Topic

Selection of topic is a huge and important task in a Mini Project. One should have a clear idea about one's subject strengths and the selected topic should be relevant to it. Always select the project that has value addition.

As a graduate you should select a project which is either advantageous to a lot of people or enhance your technical and managerial skills. Your project must play its role towards a positive growth/development in that specific field.

2. Research about the selected topic online

Do some online research about the selected topic. Go through the research papers from different researchers around the world on the topics related to Mini Project. Find some websites containing the information about the materials used for Mini Project.

3. Suggestions from subject experts

Go to the subject experts in institution and interact with them about the Mini Project topic. You can also meet many subject experts from various parts of India through social media and some discussion forums. This helps you in getting suggestions in different possible ways, through which you can get a clear idea on your Mini Project topic.

4. Planning

After getting a clear idea about the topic, prepare a rough plan about procurement of resources, experimentation, analysis, simulation, survey, fabrication etc. along with your teammates. Make a rough schedule, adapt to it and distribute the work among your teammates. This will keep your Mini Project on track and individuals will come to know about their part in the Mini Project rather than any individual (leader) taking full responsibilities.

5. Execution of plans

Make sure that the materials will be ready for the experimentation/fabrication by the scheduled time. Follow the schedule during experimentation/fabrication to get accurate and efficient results.

6. Presentation

Experimentation/Fabrication does not make a Mini Project successful; one should be able to present the results in proper way. So it should be prepared in such a way that, it reflects the exact objective of your Mini Project.

The mini project shall be evaluated in two stages, Intermediate review and End Semester Review. Below points are considered for evaluation:

Sr.No.	Title
1	Quality of the presentation
2	Quality of the report
3	The quantum of the work
4	Understanding of the subject selected
5	Deal with questions

Internal Continuous Assessment (ICA)-

Guidelines for Mini-Project content & Mark Distribution

1. A group of maximum 04 students be formed for Mini-Project work.

2. Work diary and reporting to guide as per prescribed contact hours.

3. The contents of work diary shall reflect the efforts taken by project group for

पुण्यश्लोक अहिल्यादेवी होळकर
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i. Searching suitable mini-project work

ii. Brief report preferably on journals/ research or conference papers/ books or literature surveyed to select and bring out the mini-project area.

iii. Brief report of feasibility studies carried to implement the conclusion.

iv. Rough Sketches/ Design Calculations, etc.

4. The mini-project may be based on software/experimental/analysis/fabrication work.

5. It will be preferable if student will work on the area of mini project in line with their proposed final year project.

6. The group has to give a power point presentation in front of the faculty members / panel of department at the end of semester along with the spiral bound report (Limited to 20 Pages).

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015'B' Grade (CGPA 2.62)

Name of the Faculty: Science and Technology

CHOICE BASED CREDIT SYSTEM

Syllabus : Computer Science and Engineering

Name of the Course: Final Year B.Tech (CSE)

(Syllabus to be implemented from w.e.f. June 2023)

Programme Educational Objectives and Outcomes

A. Program Educational Objectives

1. Graduate will exhibit strong fundamental knowledge and technical skills in the field of ComputerScience & Engineering to pursue successful professional career, higher studies and research.
2. Graduate will exhibit capabilities to understand and resolve various societal issues through theirproblem solving skills.
3. Graduate will be sensitive to ethical, societal and environmental issues as a software engineeringprofessional and be committed to life-long learning.

B. Program Outcomes

Engineering Graduate will be able to –

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and researchmethods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities withan understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

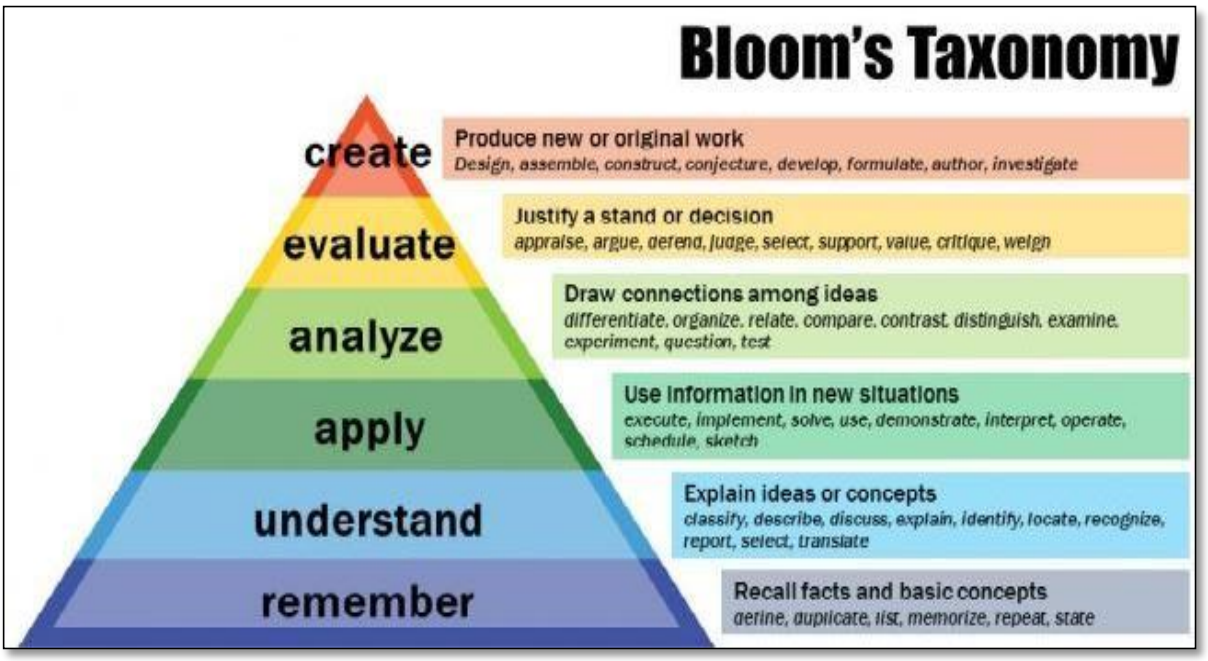
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

C. Program Specific Outcomes (PSOs)

1. Apply the principles of computational mathematics, computer systems and programming paradigms to solve computational problems.

2. Design and develop application software with functionalities applicable for desktop, web and mobile applications with due consideration of system software constraints.

3. Apply software engineering methods, cutting edge technologie and ICT, using appropriate tools and FOSS alternatives for designing ,developing & testing application software


Bloom's Taxonomy
create
Produce new or original work
Design, assemble, construct, conjecture, develop, formulate, author, investigate
evaluate
Justify a stand or decision
appraise, argue, defend, judge, select, support, value, critique, weigh
analyze
Draw connections among ideas
differentiate, organize, relate, compare, contrast, distinguish, examine, experiment, question, test
apply
Use information in new situations
execute, implement, solve, use, demonstrate, interpret, operate, schedule, sketch
understand
Explain ideas or concepts
classify, describe, discuss, explain, identify, locate, recognize, report, select, translate
remember
Recall facts and basic concepts
define, duplicate, list, memorize, repeat, state

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF SCIENCE AND TECHNOLOGY
Structure of Final Year B.Tech.(CSE) wef. 2023-2024
Semester-I

Course Code	Theory Course Name	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
CS411	Software Testing and Quality Assurance	3	--	--	3	70	30		100
CS412	Compiler Construction	3	--	--	3	70	30		100
CS413	Professional Elective-II	3	--	--	3	70	30		100
CS414	Professional Elective-III	3	--	--	3	70	30		100
CS415	DevOps	2	--	--	2		25		25
SL41	Self Learning (Technical)				1	50			50
	Sub Total	**14**	**0**	**0**	**15**	**330**	**145**		**475**
	Laboratory/Workshop					**ESE**			
						POE			
CS411	Software Testing and Quality Assurance	--	--	2	1			25	25
CS412	Compiler Construction	--	--	2	1			25	25
CS413	Professional Elective-II	--	--	2	1			25	25
CS414	Professional Elective-III	--	--	2	1			25	25
CS415	DevOps	--	--	2	1	50		25	75
CS416	Project Phase-I	--	--	2	1	25		25	50
CS417	Vocational Training	--	--	--	1			25	25
	Sub Total			**12**	**7**	**75**		**175**	**225**
	Grand Total	**14**	**0**	**12**	**23**	**405**	**145**	**175**	**700**

Professional Elective-II		**Professional Elective-III**	
CS413A	Business Intelligence	CS414A	Human Computer Interaction
CS413B	Data Mining	CS414B	Big Data Analytics
CS413C	Distributed Systems	CS414C	Information Retrieval
CS413D	Management Information System		

Self Learning (Technical)	
SL41A	UI or UX Technology
SL41B	Software Licenses and Practices

Note :

1. Batch size for the practical /tutorial shall be of 15 students. On forming the batches, if the strength of remaining students exceeds 7, then a new batch shall be formed.
2. Vocational Training (evaluated at Final Year B.Tech Semester VII) of minimum 15 days shall be completed in any vacation after S.Y. B.Tech Semester IV but before Final Year B.Tech Semester VII& the report shall be submitted and evaluated in Final Year B.Tech. Semester VII.
3. Appropriate Professional Elective II & III Subjects may be added when required.
4. Project group for Final Year B.Tech. (Information Technology) Semester VII and Semester VIII shall not be of more than **five** students.
5. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF SCIENCE AND TECHNOLOGY
Structure of Final Year B.Tech.(CSE) wef. 2023-2024
Semester-II

Course Code	Theory Course Name	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
SL42-A	Self-Learning Technical (MOOC/Swayam / NPTEL)				4	100*			100*
SL42-B	Self Learning Technical Course offered by institute				4	100*			100*
SL42-C	Apprenticeship/Internship				4	100*			100*
	Sub Total				**4**	**100**			**100**
	Laboratory/Workshop					**ESE** / **POE**			
CS421	Project Phase-II			20	10	100		100	200
	Sub Total			**20**	**10**	**100**			**200**
	Grand Total			**20**	**14**	**200**		**100**	**300**

* Students shall opt for any one of the three courses (i.e. out of CS 421-A, CS 421-B and CS 421-C, students can select any one course for obtaining 4 credits of 100 marks).

Note:

1. Batch size for the practical /tutorial shall be of 15 students. On forming the batches, if the strength of remaining students exceeds 7, then a new batch shall be formed.
2. Appropriate Professional Elective IV Subjects may be added when required.
3. Project group for Final Year B.Tech. (Information Technology) Semester VIII shall not be of more than **five** students.
4. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable
5.

- SL42A - Self Learning Technical Course (MOOC/Swayam/NPTEL):
  ESE 100 Marks, Credits: 4, transferrable from Online Examinations conducted by approved MOOC platform.

- SL42B Self Learning Technical Course offered by institute:
  ESE 100 Marks, Credits: 4, Course shall be designed by the Institute
  Institute level examination to be conducted by institute offering the course.

- SL42C Apprenticeship/Internship (Self Learning):
  - Students shall opt for semester long internship/apprenticeship (minimum 60 days).
  - ESE 100 Marks, Credits: 4 (Oral Examination based on the report of Apprenticeship/Internship)
  - Apprenticeship/Internship may be of the following type:
    1. Offered by industry at their premises.
    2. Offered by industry at the institute campus.
    3. Offered by institute jointly with the industry.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
CS411 : SOFTWARE TESTING & QUALITY ASSURANCE

Teaching Scheme	**Examination Scheme**
Lectures : 3 Hours /Week, 3 Credits	ESE – 70 Marks
Practical : 2 Hours/Week, 1 Credit	ISE – 30 Marks
	ICA – 25 Marks

COURSE OUTCOMES:

At the end of this course, students will be able to

1. Compare the different software testing methods and select the suitable one for a given scenario.
2. Design test strategy & test plan for software testing.
3. Apply different approaches of management, quality assurance and standards for software engineering processes.
4. Demonstrate automated testing tools to test software.

SECTION– I

Unit 1: Fundamentals of Software Testing **(08)**

Introduction, Basics of Software Testing, Approaches to Testing, Testing During Development Life Cycle, Essential of Software Testing, Features of Testing, Misconceptions About Testing, Principles of Software Testing, Test Policy, Strategy, Planning, Process, Challenges in Testing, Test Team Approach, Methods, Defect Classification, Defect, Error, Mistake in Software, Defect Life Cycle, Defect Management Process, Developing Test Strategy, Developing Testing Methodologies, Testing Process, Attitude Towards Testing, Test Methodologies, Skills Required by Tester.

Unit 2: Methods of Testing **(06)**

Software Verification and Validation, Black-Box and White-Box Testing, Static and Dynamic Testing, Black-Box Testing Techniques-Equivalence Partitioning, Data Testing, State Testing, Other Black Box Test Techniques. White-Box Testing Techniques-Data Coverage, Code Coverage, Other White Box Test Techniques.

Unit 3: Levels of Testing **(08)**

Verification and Validation Model, Levels of Testing, Proposal Testing, Requirement Testing, Design Testing, Code Review, Unit Testing, Module Testing, Integration Testing, Big-Bang Testing, Sandwich Testing, System Testing- GUI Testing, Compatibility Testing, Security Testing, Performance Testing, Volume Testing, Stress Testing, Load Testing, Installation Testing, Regression Testing, Smoke Testing, Sanity Testing, Ad hoc Testing, Usability Testing, Acceptance Testing-Alpha Testing, Beta Testing, Gamma Testing.

SECTION II

Unit 4: Test Planning & Documentation **(08)**

Test Planning-The goal of Test Planning, Test Planning Topics, Writing and Tracking Test Cases-The Goal of Test Case Planning, Test Case Planning Overview, Test Case Organization and Tracking, Reporting Bugs- Getting Your Bugs Fixed, Isolating and Reproducing Bugs, Not All Bugs Are Created Equal, Bug-Tracking Systems.

Unit 5: Quality Concepts & Software Quality Assurance **(06)**

Quality Concepts-What is Quality?, Software Quality, The Software Quality Dilemma, Achieving Software Quality, Software Quality Assurance-Background Issues, Elements of Software Quality Assurance, SQA Processes and Product Characteristics, SQA Tasks, Goals and Metrics, Formal Approaches to SQA, Statistical SQA, Software Reliability, The ISO 9000 Quality Standards, CMM, The SQA Plan.

Unit 6: Automated Testing and Testing Tools **(08)**

Introduction, The Benefits of Automation and Tools, Test Tools, Software Test Automation, Random Testing, Realities of Using Test Tools and Automation, Open Source Testing Tools, Case Studies on Testing Tools-Selenium.

Internal Continuous Assessment (ICA):

Assignments:

- Minimum 6 - 8 assignments based on each topic of above syllabus.
- Two assignments on use of Selenium for software testing.

Text books:

1. Software Testing Principles, Techniques and Tools By M G Limaye, Published by Tata McGraw-Hill Education Private Limited, Published 2009, ISBN (13): 978-0-07-013990-9, ISBN (10): 0-07-013990-3 (Chapter 1 & 3)
2. Software Testing, Second Edition By: Ron Patton, Published by SAMS, ISBN-13: 978-0672327988 ISBN-10: 0672327988 (Chapter 2, 4 & 6)
3. Software Engineering: A Practitioner's Approach by Roger S Pressman, 8th Edition,
4. Publisher McGraw Hill (Chapter 5)

Reference books:

1. Software Testing Principle and Practices By Ramesh Desikan, Gopalaswamy Ramesh, Pearson Education, ISBN 978-81-7758-121-8
2. Software Testing Principles and Practices By Naresh Chauhan, Publisher OXFORD UNIVERSITY PRESS-NEW DELHI, ISBN 0-19-806184-6
3. Beautiful Testing: Leading Professionals Reveal How They Improve Software By Adam Goucher, Tim Riley, Publisher O'reilly
4. Foundations of Software Testing By Rex Black, Dorothy Graham, Erik Van Veenendaal, Isabel Evans, Published by Cengage Learning India Pvt Ltd.
5. Lessons Learned in Software Testing by Cem Kaner , James Bach , Bret Pettichord, Publisher Wiley
6. Testing Computer Software Cem Kaner, Jack Falk, Hung Q. Nguyen, Publisher Wiley
7. Selenium Testing Tools Cookbook By Unmesh Gundecha Published by Packt, ISBN: 978-1-84951-574-0
8. Dr. K.V.K.K. Prasad, "Software Testing Tools: Covering WinRunner, Silk Test, LoadRunner, JMeter and TestDirector With Case Studies", Dreamtech Publications ISBN: 10:81-7722-532-4

Reference tutorials:

1. Spoken Tutorials on Selenium Software Testing Framework at http://spokentutorial.org/tutorial-search/?search_foss=Selenium&search_language=English

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
CS412 : COMPILER CONSTRUCTION

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hrs/week, 3 Credits	ESE: 70 Marks
Practical : 2 Hrs/week, 1 Credit	ISE: 30 Marks
	ICA : 25 Marks

Introduction:

A compiler translates a program written in a high-level programming language that is suitable for human programmers into the low-level machine language that is required by computers.

Since writing a compiler is a nontrivial task, it is a good idea to split the compilation into several phases with well-defined interfaces. Conceptually, these phases operate in sequence, each phase except first phase taking the output from the previous phase as its input. Each phase is handled by a separate module.

This course provides an in-depth view of translation and optimization process. All phases required for translating a high-level language to machine language is covered in this course including scanning, parsing, intermediate-code generation, machine-code generation, register allocation and code optimization.

Course Prerequisite:

1. Theory of Computation
2. System Programming
3. Programming Language knowledge

Course Outcomes:

At the end of the course, students will be able to

1. Describe language translation and compiler design constructs.
2. Design and develop lexical analyzer and parser.
3. Apply optimization principles for generating code
4. Describe storage allocation strategies for memory allocation

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SECTION-I

Unit 1 - Introduction to Compiling (03)

Introduction, Compilers, Phases of a compiler, Compiler construction tools

Unit 2 - Lexical Analysis (07)

Role of a Lexical analyzer, Input buffering, Specification and recognition of tokens, Finite automata implications, Designing a lexical analyzer generator

Unit 3 - Syntax Analysis (10)

Role of Parser, Writing grammars for context free environments, Top-down parsing, Recursive descent and predictive parsers (LL), Bottom-Up parsing, Operator precedence parsing, LR parsers, SLR parsers, LALR parsers.

Unit 4 - Syntax Directed Translation (08)

Syntax directed definitions, construction of syntax tree, Bottom-up evaluation of S-attributed definitions, L-attributed definitions, Top-down translation of inherited attributes, Bottom-up evaluation of inherited attributes, Analysis of syntax directed definitions.

SECTION-II

Unit 5 - Run Time Environments (05)

Source language issues, storage organization and allocation strategies, Parameter passing, Symbol table organizations and generations, Dynamic storage allocations

Unit 6 - Intermediate Code Generation (07)

Intermediate languages, declarations, Assignment statements, Boolean expressions, case statements Back patching, procedure calls, Back patching, procedure calls

Unit 7 - Code Generation (08)

Issues in design of a code generator and target machine, Run time storage management, Basic blocks and flow graphs, Next use information and simple code generator, Issues of register allocation, Assignment and basic blocks, Code generation from DAG and the dynamic code generation algorithm

Unit 8 - Code Optimization (08)

Sources of optimization, Peephole optimization and basic blocks, loops in flow graphs, Data flow analysis and equations, code improving transformation and aliases, Data flow analysis and algorithms, symbolic debugging of optimized code

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Internal Continuous Assessment (ICA) :

ICA shall consist of minimum 10 practical assignment problems.

1. Generate the grammar for 'C' language.
2. Implement the lexical analyzer for simple 'C' language.
3. Implement the recognizer for given transition diagram.
4. Implement the top-down parsing using recursive decent parsing technique.
5. Implement the shift- reduce parser.
6. Implement the operator precedence parser.
7. Implement the LL(1) parser for the language.
8. Generate the symbol table for language.
9. Generation of 3- address code for language.
10. Implement the code optimization technique on the code produced in 10.
11. Generation of target code for given 3-address code.
12. Use of free open source software to practice the parsing example.

Text Books:

1. Compilers - Principles, Techniques and Tools, A.V. Aho, R. Shethi and J.D. Ullman (Pearson Education)
2. Compiler Construction, Dhamdhere (Mc-Millan)
3. Principles of Complier Design- V.Raghavan (Mc Grawhill Education) (2nd edition)

Reference books:

1. Compiler Construction, Principles & Practice – Ken Louden (Cengage Learning)
2. Compiler Design in C,– Allen I. Holub (PHI / Pearson Education)
3. Compiler Construction: An advance course- Manish Kumar Jha (Dhanpat Rai) (3rd Edition)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
CS413A: PROFESSIONAL ELECTIVE – II : BUSINESS INTELLIGENCE

Teaching Scheme	**Examination Scheme**
Lectures : 3 Hours /week, 3 credits	ESE : 70 Marks
Practical: 2 Hours/Week, 1 Credit	ISE – 30 Marks
	ICA – 25 Marks

COURSE OUTCOME:

At the end of the course, student will be able to

1. Describe the basic components of BI environment.
2. Apply data mining techniques for data analysis.
3. Use ETL and BI tools for the decision support system.
4. Describe various applications of Business Intelligence.

SECTION – I

Unit 1 : Introduction to Business Intelligence (08)

Effective and timely decisions, role of mathematical models, BI architectures, ethics on BI. Introduction to data warehouse, architecture, OLAP

Unit 2 : Decision Support System (07)

Representation of decision making system, evolution of information system, definition and development of decision support system, mathematical models for decision making

Unit 3 : Analysis of Data Mining (08)

Definition and applications of data mining, data mining process, analysis methodologies, data preparation, data validation, data transformation, data reduction, data exploration, Univariate analysis, Bivariate analysis, Multivariate analysis.

SECTION – II

Unit 4 : Machine learning and Data analysis (06)

Regression, simple and multiple regression, validation of regression models, time series, evaluating and analysis of time series, exponential smoothing models, autoregressive models

Unit 5 : Data mining Techniques for BI (08)

Classification and its problems, evaluating classification models, classification trees, Bayesian methods, neural networks, structure of association rules, Apriori algorithm, general association rules, clustering methods, partition methods and hierarchical methods

Unit 6 : Business Intelligence Applications (08)

Marketing models: Relational marketing, Salesforce management, Business case studies, supply chain optimization, optimization models for logistics planning, revenue management system, Logistics business case studies

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Internal Continuous Assessment (ICA) :

ICA Shall be continuous process based on Student's performance in - class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction during theory.

Text Book:

1. Business Intelligence Data mining and optimization for Decision making by Carlo Vercellis, ISBN:978-81-265-4188-1, Wiley Publication
2. Data Mining and Business Intelligence by S.K. Shinde and Uddagiri Chandrashekhar

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Reference Books:

1. Data Warehousing in the Real World - Anahory & Murray, Pearson Edt.
2. Data Warehousing Fundamentals - Ponniah [Wiley Publication]

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
CS413B : PROFESSIONAL ELECTIVE II : DATA MINING

Teaching Scheme	**Examination Scheme**
Lectures : 3 Hours /Week, 3 Credits	ESE – 70 Marks
Practical : 2 Hours/Week, 1 Credit	ISE – 30 Marks
	ICA – 25 Marks

COURSE OUTCOMES:

At the end of this course, students will be able to

1. Examine the types of the data to be mined for a particular application.
2. Apply preprocessing statistical methods for any given raw data.
3. Select and apply proper data mining algorithms to build analytical applications
4. Comprehend the roles that data mining plays in various fields and manipulate different data mining techniques.
5. Demonstrate and apply a wide range of Clustering, Classification and association rule mining algorithms.

SECTION- I

UNIT 1: Introduction (3)

Why data Mining, What is Data Mining?, Basic data mining tasks, What kind of Data can be mined, What kinds of Patterns can be mined?, technological support for data mining, target applications of data mining, major issues in data mining, KDD process ,Data mining Vs Knowledge Discovery in Databases.

UNIT 2: Data Preprocessing (3)

Need to Preprocess the data, major tasks in Data Preprocessing, Data Cleaning, Data integration, Data Reduction, Data Transformation and Data Dicretization.

UNIT 3: Mining Frequent Patterns, Associations, and Correlations: Basic and advanced Concepts (6)

Basic Concepts, Frequent Itemset Mining Methods, Which Patterns Are Interesting? – Pattern Evaluation Methods, Pattern Mining: A Road Map, Pattern Mining in Multilevel, Multidimensional Space , Constraint-Based Frequent Pattern Mining, Pattern Exploration and Application.

UNIT 4: Classification (8)

Issues in Classification, Statistical-Based Algorithms: Regression, Bayesian Classifiers. Distance Based Algorithms: K -Nearest Neighbors Classifiers, Decision Tree Based Algorithms.

SECTION II

UNIT 5: Cluster Analysis- Basic Concept and Methods (6)

Cluster Analysis : What is Cluster Analysis?, Requirements for Cluster Analysis, Overview of Basic Clustering Methods, **Partitioning Methods**: k-Means, k-Medoids.

Hierarchical Methods : Agglomerative Algorithms and Divisive Clustering, BIRCH: Multiphase Herarchical Clustering Using Clustering Feature Trees, Evaluation of Clustering.

UNIT 6: Association Rules (6)

Introduction, Large Item sets, Basic Algorithms: Apriori Algorithm, Sampling Algorithm, Partitioning Algorithm, Parallel and Distributed Algorithms, Comparing Approaches, Incremental Rules, Advanced association rule-Techniques, Measuring the quality of rules.

UNIT 7: Web Mining **(4)**

Introduction, Web mining: Introduction, web content mining, web usage mining, web structure mining, web crawlers.

UNIT 8: Outlier Detection **(4)**

Outliers and Outlier Analysis, Outlier Detection Methods, Statistical Approaches, Clustering-Based Approaches, Classification-Based Approaches.

Internal Continuous Assessment (ICA) :

Minimum 10 to 12 assignment based on above topics.

Text Books:

1. Margaret H. Dunham, "DATA MINING Introductory and Advanced Topics", PEARSON (Units 4,6)
2. Han, Kamber, Pei, "DATA MINING Concept and Techniques", 3rd Edition,ELSEVIER (Units 1,2,3,5,8)
3. Tan, Vipin Kumar, Steinbach , "Introduction to Data Mining" , PEARSON (Unit 3)
4. G. K. Gupta , \Introduction to Data mining with case studies", PHI, second edition (Unit 7)

Reference Books:

1. Galit Shmueli, Nitin Patel, Peter Bruce, "Data mining For Business intelligence" Wiley Student Edition.
2. M.Berry and G. Linoff, "Mastering Data Mining", Wiley Student Edition

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
CS413C : PROFESSIONAL ELECTIVE-II : DISTRIBUTED SYSTEMS

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours/Week, 3 Credits	ESE: 70 Marks
Practical : 2 Hours/Week, 1 Credit	ISE: 30 Marks
	ICA : 25 Marks

COURSE OUTCOME:

At the end of the course, student will be able to

1. Describe the basics of distributed systems and middleware.
2. Design and simulate distributed system software modules using various methods, strategies, and techniques presented in the course that fulfils requirements for desired properties.
3. Apply principles of distributed systems in a real world setting across multidisciplinary areas.
4. Apply knowledge of Hadoop Distributed File system, its architecture and working for active research at the forefront of these areas.

SECTION – I

Unit 1: Fundamentals (4)

Fundamentals of OS, What is Distributed System? Evolution of Distributed Computing System, Distributed Computing System Models, Distributed Computing Gaining Popularity, Issues in Designing Distributed System, Introduction to Distributed Computing Environment, Protocols for Distributed Systems – FLIP and VMTP

Unit 2: Message Passing (6)

Introduction, Desirable features of Good Message-Passing System, Issues in IPC by Message Passing, Synchronization, Buffering, Message Passing Interface, Multidatagram Messages, Process Addressing, Failure Handling, Group communication, Case Study: RMI, CORBA

Unit 3: Remote Procedure Calls (6)

Introduction, The RPC Model, Transparency of RPC, Implementing RPC mechanism, Stub Generation, RPC Messages, Marshalling Arguments and Results, Server Management, Parameter-Passing Semantics, Call Semantics, Communication Protocols for RPCs, Client-Server Binding, Exception Handling, Security

Unit 4: Synchronization in Distributed Systems (6)

Introduction, Process Migration, Threads, Clock Synchronization, Event Ordering, Election algorithms, Distributed Consensus algorithms

SECTION – II

Unit 5: Distributed Mutual Exclusion (5)

Introduction, Classification of Mutual Exclusion Algorithms, Preliminaries, A simple solution toDistributed Mutual Exclusion, Non-Token-Based Algorithms, Lamport's Algorithm, The Ricart-Agrawala Algorithm, Token-Based Algorithms, Suzuki-Kasami's Broadcast Algorithms

Unit 6: Distributed Deadlock Detection (5)

Introduction, Preliminaries, Deadlock handling strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control organizations for distributed deadlock detection, Centralized deadlock detection algorithms, Distributed deadlock detection algorithms, Avoidance andPrevention algorithms, Hierarchical deadlock detection algorithms

Unit 7: Distributed File Systems **(6)**

Introduction, Architecture, Mechanisms for building Distributed File System, Design issues, Log-Structured file systems, Case studies- Google FS

Unit 8: Distributed Shared Memory **(6)**

Introduction, Architecture and Motivation, Algorithms for implementing DSM, Memory Coherence, Coherence Protocols, Design issues, Case studies-Linda

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Text Books:

1. Distributed O.S. Concepts and Design, P.K.Sinha, PHI (Unit 1, 2, 3, 4)
2. Advanced Concepts in Operating Systems, Mukesh Singhal & N.G.Shivaratri, TMH (Unit 5, 6, 7, 8)
3. Distributed Computing, Sunita Mahajan, Seema Shah, OXFORD University Press (Unit 1, Case studies 7, 8)

Reference Books:

1. Distributed System Principles and Paradigms, Andrew S. Tanenbaum, 2nd edition, PHI
2. Distributed Systems, Colouris, 3rd Edition

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - II

CS413D : PROFESSIONAL ELECTIVE-II : MANAGEMENT INFORMATION SYSTEM

Teaching Scheme	**Examination Scheme**
Lectures : 3 Hours /Week, 3 Credits	ESE – 70 Marks
Practical : 2 Hours/Week, 1 Credit	ISE – 30 Marks
	ICA – 25 Marks

COURSE OUTCOME:

1) Student can elaborate basic infrastructure and strategies used in information systems.
2) Student can apply professional ethical codes of conduct as appropriate to industry and organizational environments
3) Students can design information systems using principles of Communication Technologies.
4) Students will be able to develop secure information systems.

SECTION-I

Unit 1 - Information Systems in Global Business Today (09)

The Role of Information Systems in Business Today,
How information systems are transforming business, What is new in information system.
Business Processes and Information systems, Systems for collaboration and social business, Tools and technologies for collaboration and social business

Unit 2 - Information Systems, Organizations, and Strategy (08)

Organizations and it's features, How Information Systems Impact on Organizations, Competitive strategies using information systems, Challenges posed by strategic information systems

Unit 3 - Ethical and Social Issues in Information Systems (08)

Understanding Ethical, Social, political issues raised by information systems, principles for conductin ethical decisions, Contemporary information systems technology. Challenges to the protection individual privacy and intellectual property.

SECTION-II

Unit 4 - IT Infrastructure and Emerging Technologies (08)

IT Infrastructure, Infrastructure Components, Contemporary Hardware Platform Trends, Contemporary Software Platform Trends, Management Issues

Unit 5 - Foundations of Business Intelligence: Databases and Information Management (10)

Organizing Data in a Traditional File Environment, Major Capabilities of Database Management Systems, Using Databases to Improve Business Performance and Decision Making, Managing Data Resources, Telecommunications, the internet, and Wireless Technology: Principles Components of Telecommunications Network & Ket Networking Technologies, Different types of networks, principle technologies and standards for wireless networking, communication, internet access.

Unit 6 - Security Management of Information Technology (09)

Introduction, Tools of Security Management, Internetworked Security Defenses, Encryption, Firewalls, Denial of Service Attacks,, E-mail Monitoring, Other Security Measures, security codes, Security Monitors, Fault Tolerant Systems, and Disaster Recovery, System Control & Audits, Information Systems Controls, Auditing IT Security.

Unit 7 - E-commerce: Digital Markets, Digital Goods (08)

Features of e-commerce. Digital Markets, Digital Goods**,** principles ecommerce business and revenue models, e-commerce transformed marketing, e-commerce business-to-business transaction, Role of M-commerce in business & its applications, issues related building e-commerce.

Text Book:

1. Management Information Systems : Managing the Digital Firm, 15th Edition by Kenneth C. Laudon and Jane Laudon, Pearson Education
2. Management Information Systems: James A O'Brien, George M Marakas, Ramesh Behi. (Tenth Edition), McGraw Hill Publication.

Reference Books:

1. Information Technology for Management: Transforming Organizations in the Digital Economy, Efraim Turban,6th Edition, Wiley Edition
2. Management Information Systems: Shubhalakshmi Joshi, Smita Vaze, Biztantra

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I

CS414A : PROFESSIONAL ELECTIVE-III : HUMAN COMPUTER INTERACTION

Teaching Scheme	**Examination Scheme**
Lectures : 3 Hours /Week, 3 Credits	ESE – 70 Marks
Practical : 2 Hours/Week, 1 Credit	ISE – 30 Marks
	ICA – 25 Marks

COURSE OBJECTIVES:

1. Know how to analyze and consider user's need in the interaction system
2. Understand various interaction design techniques and models
3. Understand the theory and framework of HCI
4. Understand and analyze the cognitive aspects of human – machine interaction

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COURSE OUTCOME :

At the end of this course, students will be able to

1. To develop good design for human machine interaction system
2. Analyze the user's need in interaction system
3. To design new interaction model to satisfy all types of customers
4. Evaluate the usability and effectiveness of various products
5. To know how to apply interaction techniques for systems

SECTION-I

Unit 1 **(5)**

Introduction, The human, The computer, The interaction, Paradigms, Usability of Interactive Systems, Guidelines, Principles, and Theories.

Unit 2 **(5)**

Design Process - Interaction design basics, HCI in the software process, Design rules, Implementation support, Evaluation techniques, Universal design, User support

Unit 3 **(5)**

Models and Theories0 Cognitive models, Socio-organizational issues and stakeholder requirements, Communication and collaboration models, Task analysis, Dialogue notations and design, Models of the system, Modelling rich interaction

Unit 4 **(6)**

Interaction Styles- Direct Manipulation and Virtual Environments, Menu Selection, Form Filling and Dialog Boxes, Command and Natural Languages, Interaction Devices, Collaboration and Social Media Participation

SECTION-II

Unit 5 **(5)**

Design Issues- Quality of Service, Balancing Function and Fashion, User Documentation and Online Help, Information Search, Information Visualization

Unit 6 **(5)**

Outside the Box- Group ware, Ubiquitous computing and augmented realities, Hypertext, multimedia, and the world wide web Text

Unit 7 **(6)**

Information Search and visualization - Introduction, Search in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Search Interfaces, Information Visualization, OAI Model for Website Design.

Unit 8 **(5)**

Hypertext, Multimedia and the world wide web, Introduction, Understanding hypertext, Web technology and issues, Static web content, dynamic web content

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Internal Continuous Assessment (ICA) :

Minimum 10 to 12 assignments based on above topics.

Text Books :

1. Human Computer Interaction, Alan Dix, Janet Finlay, Gregory Abowd and Russel Beale, Prentice Hall Publication
2. Designing the User Interface, Ben Shneiderman, 4th Edition, Pearson Education, 2008, ISBN 81- 7808-262-4

Reference Book :

1. Human Computer Interaction, Dan R. Olsen, Cengage Learning, India Edition, ISBN No.978-81-315-1137-4
2. The Essential Guide to User Interface Design, Second Edition, An Introduction to GUI Design Principles and Techniques, Wilbert O. Galitz, Wiley India (P) Ltd., ISBN : 81- 265-0280-0
3. The Essential of Interaction Design, Alan Copper, Robert Reimann, David Cronin, Wiley India (P) Ltd., ISBN : 978-81-265-1305-5

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
CS414B : PROFESSIONAL ELECTIVE – III : BIG DATA ANALYTICS

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours /Week, 3 credits	ESE - 70 Marks
Practical: 2 Hour/Week, 1 credit	ISE - 30 marks
	ICA - 25 marks

COURSE OUTCOMES:

At the end of this course, students will be able to

1. Comprehend limitations of conventional DBMS and recognize need for Big Data Analytics.
2. Compare Big data processing technologies and choose appropriate one for a given scenario.
3. Use Various Big data technologies for Big data analytics
4. Write Map Reduce program to process Big Data.

SECTION – I

Unit 1: Introduction to Types of Digital Data (4)

Classification of Digital Data, Structured Data, Sources of structured data, Ease with Structured data, Semi-Structured data, sources of semi-structured data, Unstructured data, sources of unstructured data, Issues with terminology, Dealing with unstructured data, Place me in the basket.

Unit 2: Introduction to Big Data (4)

Big data, What is big data? Why big data?, Other characteristics of data which are not definitional traits of big data, Challenges with big data, Big data stack, Exercises - Puzzle, Fill in the blanks.

Unit 3: Big Data Analytics (6)

Big Data Analytics, Analytics 1.0, Analytics 2.0, Analytics 3.0, Traditional BI vs. Big Data Environment, Terminologies used in Big Data Environment, Big Data Technology Landscape, NoSQL Databases, NoSQL Vs. RDBMS, NewSQL, Hadoop, Hadoop 1.0 vs. Hadoop 2.0, Exercises, Data Science is multidisciplinary, Data Scientist - Your new best friend.

Unit 4: Introduction to Hadoop (10)

Introducing Hadoop, Why not RDBMS, Distributed Computing Challenges, A Brief History of Hadoop, Hadoop Overview, Hadoop Components, High Level Architecture of Hadoop, Hadoop Distributed File System, HDFS Architecture, Daemons Related to HDFS, Working with HDFS Command, Special Features of Hadoop, Processing Data With Hadoop, Introduction How Map Reduce Works, Map Reduce Example, Word Count Example using Java Managing Resources and Applications with YARN Introduction, Limitation of Hadoop 1.0, Hadoop 2: HDFS, Hadoop 2: YARN, Interacting with Hadoop EcoSystem Hive, Pig, HBase, Sqoop.

SECTION – II

Unit 5: Introduction to MongoDB (4)

Recap of NoSQL databases, MongoDB – CRUD, MongoDB- Arrays, Java Scripts, Cursors, Map Reduce Programming, Aggregations.

Unit 6: Introduction to Cassandra (4)

Features of Cassandra, CQLSH - CRUD, Collections, Counter, List, Set, Map, Tracing.

Unit 7: Introduction to Hive (8)

What is Hive? History of Hive and Recent Releases of Hive, Hive Features, Hive Integration and Work Flow, Hive Data Units, Hive Architecture, Hive Primitive and Collection Data Types, Hive File Format, Hive Query Language(HQL)–Statements – DDL,DML. Hive Partitions – Bucketing, Views, Sub Query, Joins, Hive User Defined Function, Aggregations in Hive, Group by andHaving, Serialization and Deserialization, Hive Analytic Functions.

Unit 8: Introduction to Pig **(4)**

Introducing Pig, History and Anatomy of Pig, Pig on Hadoop, Pig Philosophy, ETL Processing, Pig Latin Overview, Word count example using Pig.

Internal Continuous Assessment (ICA) :

- Objective of assignments should be to test students understanding and assess their ability to putinto practice the concepts and terminologies learned.
- Assignments must be of nature, which require students to identify the use case scenarios forusing technologies mentioned in syllabus.
- It should consist of the 08-10 practical based on following guidelines
  1. Basic big data operations using NumPy, SciPy & Pandas.
  2. Implementation of Plotting, Filtering and Cleaning a CSV File Data Using NumPy & Pandas.
  3. Linear Regression using WEKA.
  4. Implement multidimensional visualization by adding variables such as color, size, shape, andlabel by using Tableau.
  5. Apply Filters on Dimensions and Measures for any dataset using tableau.
  6. Apply K-means Clustering on iris dataset in tableau.
  7. Integrate R with tableau for data visualization.
  8. Simple MongoDB and its CRUD Operations
  9. Performing import, export and aggregation in MongoDB.
  10. Performing CRUD operations using Cassandra.
  11. Store the login details of the user such as UserID and Password. The information stored shouldexpire in a day's time using time to live (TTL).
  12. Map-Reduce Programming examples
  13. Partitioning and processing using Hive.
  14. Perform group by, order by, sort by, cluster by, distribute by queries using Hive.
  15. Find out frequency of each word (word count) using pig.

Text Book :

1. Big Data and Analytics, Seema Acharya, Subhashini Chellappan, - Wiley India Pvt. Ltd.
2. Hadoop: The Definitive Guide, 3rd Edition, Tom White , - O'reilly Media.
3. Programming Hive, Edward Rutherglen, Dean Wampler, Jason Rutherglen, Edward Capriolo. - O'reilly Media.
4. The Definitive Guide to MongoDB: A Complete Guide to Dealing with Big Data Using MongoDB (Definitive Guide Apress) 2e by David Hows, Eelco Plugge, Peter Membrey, Tim Hawkins.
5. Programming Pig, by Alan Gates - O'reilly Media.
6. Cassandra: The Definitive Guide, Eben Hewitt - O'reilly Media.

Reference Book :

1. Big Data For Dummies, Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, Wiley Brand.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses (Wiley CIO), Michael Minelli, Michele Chambers, Ambiga Dhiraj : John Wiley & Sons.
3. Mining of Massive Datasets, Anand Rajaraman, Jure Leskovec, Jeff rey D. Ullman, Cambridge University Press.
4. Hadoop in Action, Chuck Lam, Dreamtech Press, ISBN : 978-81-7722-813-7.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)

SEMESTER - I

CS414C : PROFESSIONAL ELECTIVE – III : INFORMATION RETRIEVAL

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours /Week, 3 credits	ESE - 70 Marks
Practical: 2 Hour/Week, 1 credit	ISE - 30 marks
	ICA - 25 marks

Course Objectives:

1. To acquaint students to information retrieval process and information models.
2. To evaluate the performance of information retrieval systems.
3. To search text using sequential searching &pattern matching algorithms and using various indexing structures.
4. To learn difference in data retrieval, information retrieval and multimedia retrieval systems.
5. To learn different components of search engine and ranking algorithms.

Course Outcomes:

Students will be able to

1. Perform text operations, build classic information retrieval models, and evaluate the performance of information retrieval algorithms.
2. Formulate various types of queries and perform query operations.
3. Speed up retrieval result of text retrieval using indexing, searching techniques.
4. Model, index and search documents containing multimedia objects.
5. Search web using web search engines & web directories and use ranking algorithms to rank web pages.

SECTION – I

Unit 1 : Introduction **(07)**

Information retrieval vs. data retrieval, User Task, Logical View of the documents,Information retrieval process, Text Operations: Introduction, document pre-processing, Document Clustering, Text Compression, Comparing text compression techniques

Unit 2 : Information Retrieval Models& Performance Evaluation **(08)**

A Formal Characterization of IR Models, Classic Information Retrieval, Models for Browsing, Recall and Precision, Alternative measures

Unit 3 : Query Languages and Query Operations **(07)**

Keyword based querying, Pattern Matching, Query operations: User relevance feedback, Automatic local analysis, Automatic global analysis

Section – II

Unit 4: Indexing and Searching **(10)**

Inverted Files and Indices for text search, Boolean Queries, Sequential searching, Pattern Matching

Unit 5: Multimedia IR - Models and Languages **(8)**

Data Modelling & Query Languages, Indexing and searching

Unit 6: Searching the Web **(5)**

Search Engine architecture, User interfaces, Ranking,Web Crawling, Browsing, Metasearchers, Searching using Hyperlinks

Text Book -

1. Modern Information Retrieval - Ricardo Baeza-Yates and Berthier Ribeiro-Neto - Pearson Education (Low Price Edition)

Reference:

1. Introduction to Information Retrieval, Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, Cambridge University Press. 2008.(http://nlp.stanford.edu/IR-book/information-retrieval-book.html)
2. Information Storage and Retrieval- Robert R Korthage, WILEY-INDIA

Internal Continuous Assessment (ICA):

- It should consist of the 08-10 practical based on following guidelines

1. Study of different search engines
2. Perform text operation and create logical Views of documents
3. Implementation of IR system using Boolean model.
4. Implementation of IR system using Vector model
5. Implementation of IR system using various types of queries.
6. Searching using inverted index (construction & Searching)
7. Sequential searching using Brute Force Algorithm
8. Sequential searching using Knuth-Morris-Pratt Algorithm
9. Sequential searching using Boyer- Moore Algorithm
10. Sequential searching using BDM (Backward DAWG Matching) Algorithm.
11. Sequential searching using Shift-OR Algorithm
12. Approximate matching using dynamic Programming
13. Implementation of Multimedia Information Retrieval System

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Text Book -

1. Modern Information Retrieval - Ricardo Baeza-Yates and Berthier Ribeiro-Neto - Pearson Education (Low Price Edition)

Reference:

1. Introduction to Information Retrieval, Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, Cambridge University Press. 2008.(http://nlp.stanford.edu/IR-book/information-retrieval-book.html)
2. Information Storage and Retrieval- Robert R Korthage, WILEY-INDIA

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
CS415 : DevOps

Teaching Scheme	**Examination Scheme**
Lectures: 2 Hours /Week, 2 credits	ISE - 25 Marks
Practical: 2 Hour/Week, 1 credit	POE – 50 marks
	ICA - 25 marks

Course Objectives:

1. To introduce DevOps terminology, definition & concepts
2. To understand the different Version control tools.
3. To understand the concepts of Continuous Integration / Continuous Deployment)
4. To get acquainted with concept of docker and kubernets
5. To Illustrate the benefits and drive the adoption of cloud-based Devops tools to solve real world problems

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Course Outcomes:

At the end of the course, students will be able to

1. Apply DevOps principles to meet software development requirements.
2. Apply CI/CD using tools such as Jenkins, Git and Maven
3. Analyze the Containerization ofimages and deployment of applications over Docker
4. Collaborate and adopt Devops in real-time projects.

SECTION - I

Chapter1:Introductionto Devops **05**

Devops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and Github, Introduction to GitLab, Introduction to BitBucket

Chapter 2 : Compile and Build Using Maven **05**

Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build Phases (compile build,test, package) Maven Profiles, Maven Repositories (local, central, global), Maven plugins, Maven Create and Build Artifacts, Dependency Management

Chapter 3 : Continuous Integration Using Jenkins **06**

Introduction to CI/CD, Install & Configure Jenkins,Jenkins Architecture Overview, Build Jobs and Configurations, Jenkins Plugins, Jenkins Integration with other Tools

SECTION – II

Chapter 4 :Containerization with Docker **05**

Introduction to Containerization, Introduction to Docker, Understanding Images and Containers, Working with Containers.

Chapter 5 : Kubernetes **05**

Introduction to Kubernetes, Need of Kubernetes, Kubernetes Architecture, Setup Kubernetes, Kubernetes Concepts

Chapter 6 : Building Devops Pipelines Using any Cloud Platform **05**

Create Github Account, Create Repository, Create Organization, Create a New Pipeline, Build a Sample Code

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Text Books :

1. DevOps Tools from Practitioner's Viewpoint. Deepak Gaikwad, Viral Thakkar,. Wiley publications.
2. Jenkins, The Definitive Guide, John Ferguson Smart,O'Reilly Publication.

Reference Books:

1. The DevOps2.1 ToolKit : Docker Swarm, Building, Testing, Deploying, and Monitoring services inside Docker Swarm clusters by Viktor FarcicPackt Birmingham, Mumbai.
2. MariotTsitoara, "Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer", Second Edition, 2019.
3. https://maven.apache.org/guides/getting-started/

Internal Continuous Assessment (ICA):

ICA shall include Minimum 8 to 10 practical assignments based on the syllabus topics.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)

SEMESTER - I

CS417 : PROJECT PHASE I

Teaching Scheme	**Examination Scheme**
2 Practicals/Week, 1 Credit	**ICA : 25 Marks**
	ESE : 25 Marks

Introduction :

Project based learning is a paradigm which is becoming time-honored now a days. To keep abreast with this, Project course is included in the curriculum which is spread over both semesters of final year. For this course, students carry out a project as a team that allows them to demonstrate their abilities and to develop skills within their chosen area of interest. Hardware realization as well software projects with focus on design and research aspects are accepted. Also communicating effectively, both in oral and written form are an important skill for engineering graduates in many different contexts. This course also aims to foster these skills.

Course Prerequisite:

Student shall have technical competency as well as behavioral facet to carry project as a part of a team. Student shall have an adept knowledge of hardware and software architecture and associated programming skills. Student shall also possess necessary technical report writing skills, presentation skills.

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course objectives :

1. Explore project identification process and carryout literature survey for real world problem.
2. Evaluate alternative approaches, and justify the use of selected tools and methods.
3. Consider relevant social, ethical and legal issues.
4. Give an exposure to planning and designing a project.
5. Enhance team working and leadership skills.
6. Enhance presentation and technical documentation skills.

Course outcomes :

1. Study and select problem of societal relevance.
2. Select an appropriate solution design with due consideration for society.
3. Carry out impact analysis for environment and sustainability consideration(s).
4. Design a system using software engineering techniques and modern tools.
5. Engage in teamwork and communicate effectively, while observing professional ethics.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)

SEMESTER - I

SL41A : SELF LEARNING : UI / UX Technology

Examination Scheme

1 Credit **ESE : 50 Marks**

Introduction:

Web Technology alludes to the different tools and techniques that are used during the process of communication between various sorts of gadgets over the web or the internet. This course includes different technologies which help to build the front end and backend for websites and web applications.

Course outcomes:

At the end of course, students will be able to

1. Design web pages using HTML, CSS and JavaScript
2. Analyze client/server-sidescripting technologies to meet requirements of web application and choose an appropriate one.
3. Develop a web application using client / server-side scripting technologies for a given problem.

SECTION-I

Unit 1: UI Design

HTML5: Features of HTML5, designing frontend using HTML5, Designing Graphics using Canvas API, Web storage (Session and local storage).

CSS3: Features of CSS3,Styling front end usingCSS3

JavaScript: Syntax and Semantics of JavaScript, Document Object Model, Event Handling, Browser Object Model, Form handling, and validations. Object-Oriented Techniques in JavaScript.XML.

JSON: Introduction to AJAX. Introduction to JQuery and D3JS, JavaScript in Browser.

Unit 2 : REACTJS

Introduction, Fundamentals of ReactJS, Working with Lists and Conditionals, Styling React Components and Elements, Debugging React apps, Understanding HTTP Requests in React in the context of AJAX

Unit 3 : ElectronJS

Introduction, Fundamentals of Electron JS, Creating cross-platform applications, Deployment of ElectronJS application

SECTION-II

Unit 4 : RESTful WebServices

REST and the Rebirth of HTTP, RESTful Architectural Principles, The Object Model,Model the URIs, Defining the Data Format, Assigning HTTP Methods, JAX-RS

Unit 5 : Introduction to Server-side JS Framework–Node.js

Introduction-What isNode JS, Architecture, Feature of Node JS, Installation and setup, creating web servers with HTTP (Request & Response), Event Handling, GET & POST implementation - Connectto NoSQL Database using NodeJS, Implementation of CRUD operations.

Unit 6 :PHP and MySQL

Introduction to PHP5 and PHP6, variables and constants, program flow, functions, arrays and files and directories, Forms and Databases, integration with MySQL applications on PHP

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)

SEMESTER - I

SL41B : SELF LEARNING : Software Licensing and Practices

Examination Scheme

1 Credit **ESE : 50 Marks**

Course Outcomes:

1. Students will develop basic understanding of software licensing models and practices adopted in software development and distribution.
2. Students will be able to analyze and choose appropriate software licensing model and strategy for their own softwares developed.

Unit 1 - Introduction

Basic Principles of Copyright Law, Contract and Copyright, Open Source Software Licensing, Issues, with Copyrights and Patents, The Open Source Definition, Warranties.

Unit 2 - Software Licenses

The MIT License, The BSD License , The Apache License, v1.1 and v2.0, The Academic Free License, Application and Philosophy of MIT and BSD Licenses, GNU General Public License, GNU Lesser General Public License, The Mozilla Public License, Application and Philosophy of GNU GPL and GNU LGPL.

Unit 3 - Creative Commons Licenses and Non Open Source Software Licenses

Creative Commons Licenses, Classic Proprietary License, Sun CommUnity Source License, Microsoft Shared Source Initiative.

Unit 4 - Legal Impacts of Open Source and Free Software Licensing

Entering Contracts, Statutory Developments Related to Software Contracts, The Self Enforcing Nature of Open Source and Free Software Licenses, The Global Scope of Open Source and Free Software Licensing, The "Negative Effects" of Open Source and Free Software Licensing, Community Enforcement of Open Source and Free Software Licenses, Compatible and Incompatible Licensing: Multiple and Cross Licensing.

Text Books:

1. Intellectual Property and Open Source: A Practical Guide to Protecting Code - By Van Lindberg, Oreily Media.
2. Understanding Open Source and Free Software Licensing - By Andrew M. St. Laurent, Oreily Media. (e-Resource available at : http://oreilly.com/openbook/osfreesoft/book/index.html)

Reference Books:

1. Essentials of Licensing Intellectual Property - By Alexander I. Poltorak and Paul J. Lerner, John Wiley Publication.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)

SEMESTER - I

CS417 : VOCATIONAL TRAINING

Teaching Scheme	**Examination Scheme**
1 credit	ICA - 25 marks

The student should attend vocational training arranged at Industry or Institute and should complete a mini project on the technology on which training was given. A report regarding satisfactory completion of the training should be submitted to the college by competent authority from Industry / Institute. The evaluation of Term Work will be carried out by a panel of Examiners decided by the institute.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)

SEMESTER - II

CS421 : PROJECT PHASE II

Teaching Scheme
Practical: 20 Hours/Week, 10 Credit

Examination Scheme
POE – 100 Marks
ICA – 100 Marks

Introduction:

Project based learning is a paradigm which is becoming time-honored now a days. To keep abreast with this, Project course is included in the curriculum which is spread over both semesters of final year. For this course, students carry out a project as a team that allows them to demonstrate their abilities and to develop skills within their chosen area of interest. Hardware realization as well software projects with focus on design, development and research aspects are accepted. Also communicating effectively, both in oral and written form are an important skill for engineering graduates in many different contexts. This course also aims to foster these skills.

Course objectives:

1. Apply programming skills to bring out solutions to global, economic, environmental and societal problems.
2. Apply engineering and management principles to achieve project goal.
3. Implement project using latest tools and technologies
4. Expose students to test and analyze the modules of planned project.
5. Enhance team working and leadership skills
6. Enhance presentation and technical documentation skills

Course outcomes:

1. Analyze technological alternatives for developing IT solution with relevance to environment and sustainability.
2. Explore state-of-art tools and FOSS alternatives to develop solutions meeting societal and professional needs.
3. Develop a system through Software Development Life Cycle.
4. Demonstrate ability to engage in teamwork while observing professional ethics.
5. Write and present a well organized project report
6. Inculcate habit of self study and lifelong learning.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited – 2015 B-Grade CGPA- 2.62

Name of the Faculty: Science & Technology

CHOICE-BASED CREDIT SYSTEM SYLLABUS:

ELECTRICAL ENGINEERING

Name of the Course: Final Year B. Tech

(Syllabus to be implemented w.e.f. June 2023-24)

पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ।। विद्यया संपन्नता ।।	**Punyashlok Ahilyadevi Holkar Solapur University, Solapur** **Faculty of Engineering & Technology** **B. Tech (Electrical Engineering)** **PROGRAMME: BACHELOR OF ELECTRICAL ENGINEERING**

PROGRAMME OBJECTIVES

A. PROGRAM EDUCATIONAL OBJECTIVES

1.	Deliver fundamental as well as advanced knowledge with research initiatives in the field of electrical engineering with emphasis on state-of-the-art technology.
2.	Graduates will demonstrate measurable progress in the fields they choose to pursue.
3.	Design and develop technically feasible solutions for real world applications which are economically viable leading to societal benefits.
4.	To nurture graduates to be sensitive for ethical, societal and environmental issues while conducting their professional work.

B. PROGRAMME OUTCOMES

Students attain the following outcomes: -

1.	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2.	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3.	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4.	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5.	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6.	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequentresponsibilities relevant to the professional engineering practice.
7.	**Environment and sustainability:** Understand the impact of the professionalengineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8.	**Ethics:** Apply ethical principles and commit to professional ethics, responsibilities,and norms of the engineering practice.
9.	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10.	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11.	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12.	**Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technologicalchange.

C. PROGRAMME SPECIFIC OUTCOMES

1.	An ability to specify, design and analyze Power System, Electrical Machinery, Electronic Circuits, Drive Systems, Lightning Systems and deliver technological solution by adapting advances in allied disciplines.
2.	Apply knowledge of electrical engineering to meet the desired needs within realistic constraints viz. economical, ethical, and environmental and safety.
3.	Apply modern software tools for design, simulation and analysis of electrical systems to successfully adapt in multi-disciplinary environments.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Engineering & Technology
B. Tech (Electrical Engineering)

Choice-Based Credit System Syllabus Structure of B. Tech Electrical Engineering W.E.F. 2023-2024 ***Semester I***

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
EL 411	Power Quality and FACTS	3	-	-	3	30	70	-	100
EL 412	Signals and System	2	1	-	3	30	70	25	125
EL 413	Switchgear and Protection	3	-	-	3	30	70	-	100
EL 414	Professional Elective-I	3	-	-	4	30	70	-	100
EL 415	Professional Elective-II	3	1	-	4	30	70	25	125
Sub Total		**15**	**2**	**-**	**17**	**150**	**350**	**50**	**550**
Laboratory Course Name									
							ESE		
							POE	**OE**	
EL 411	Power Quality and FACTS	-	-	2	1	-	-	25	25	50
EL 413	Switchgear and Protection	-	-	2	1	-	50	-	25	75
EL 414	Professional Elective-I	-	-	2	1	-	-	-	25	25
EL 416	Seminar on Industrial Training	-	-	-	-	-	-	-	25	25
EL 417	Project Phase-I	-	-	4	2	-	-	50	25	75
Sub Total		**--**	**-**	**10**	**5**	**-**	**125**		**125**	**250**
Grand Total		**15**	**2**	**10**	**22**	**150**	**475**		**175**	**800**

Abbreviations*: L - Lectures, P –Practical, T - Tutorial, ISE - In semester Exam, ESE - End Semester Exam, ICA- Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)*

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Engineering & Technology
B. Tech (Electrical Engineering)

Choice-Based Credit System Syllabus Structure of B. Tech Electrical Engineering W.E.F. 2023-2024 ***Semester II***

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	ICA	***Total***
# EL 421	**Self-Learning Module - III**	-	-	-	2	-	50	-	50
# EL 422	**Self-Learning Module – IV**	-	-	-	2	-	50	-	50
Sub Total		**-**	**-**	**-**	**4**	**-**	**100**	**-**	**100**
Laboratory Course Name									
							ESE		
							POE	**OE**		
EL 423	Project Phase-II (Capstone Project)	-	-	20	10	-	-	100	100	200
*EL 424	Internship				4	-		100	-	100
Sub Total		**-**	**-**	**20**	**10**	**-**	**200**		**100**	**300**
Grand Total		**-**	**-**	**20**	**14**	**-**	**200**		**100**	**300**

Abbreviations: L - Lectures, P –Practical, T - Tutorial, ISE - In Semester Exam, ESE - End Semester Exam, ICA - Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)

Students shall select Self-Learning Modules - III and IV from the course list. Students must appear and pass university examinations.

OR

Students can take NPTEL/SWAYAM/MOOC courses which shall be of minimum eight weeks duration from the approved platform and appear for examination or equivalent certification.

OR

* Students should undergo a three-month internship. Students undergoing internship and completing a project sponsored by the same Industry/Organization have to submit an internship and project report separately to obtain four credits for EL 424.

Note –

1. Batch size for the practical /tutorial shall be of 15 students. On forming the batches, if the strength of the remaining students exceeds 8, then a new batch shall be formed.
2. Vocational Training (evaluated at Final Year Part-I) of a minimum of 15 days shall be completed in any vacation after S.Y. Part-I, but before Final Year Part-I & the report shall be submitted and evaluated in Final Year Part-I.
3. Project group for Final Year (Electrical Engineering) Part I and Part II shall not be of more than **four** students.
4. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, open book test, laboratory test and their interaction, and attendance for theory and lab sessions as applicable.
5. **Students should undergo three months internship (For the Entire 8th Semester) or shall select Self Learning Module-III & IV from the course list and must have to appear and pass for university examination or can take NPTEL/SWAYAM/MOOC courses which shall be of minimum eight weeks duration from the approved platform and submit certificate of completion along with the assessment marks in lieu of University and Institute Examination.**
6. In Project phase-I students shall select Sponsored / Industry oriented / In –House projects which should cover Literature survey, Problem statement finalization, and Synopsis submission of proposed work. Students shall submit a hard copy of synopsis and progress report only after delivering the seminar.
7. Project phase II can be a Capstone project/Industry sponsored project which shall be the implementation of the problem statement decided as in phase-I. A hard copy of the final report shall be submitted to the department after successful completion of the project. Student can carry out project phase II as sponsored/In House project
8. Students can avail semester long internship/ apprentice/ industrial training and the report submitted by student will be accepted as the project work only if, project guide accepts this work and examination panel approves the same. (Student should continuously report their work to the project guide and should be periodically evaluated by the internal examiners at college level).
9. Minimum one Industrial Visit for Professional Elective-I based on given syllabus.

Professional Elective Courses: Student shall choose any one course of the following

Elective No	Semester	Course Code	Electrical Power System	Course Code	Control System & Drives	Course Code	Recent trends
Professional Elective I	**VII**	EL 414.1	High Voltage Engineering	EL 414.3	Programmable Logic Control and SCADA	EL 414.5	Neural Networks & Fuzzy Logic Control
		EL 414.2	Power System and Operation Control	EL 414.4	Instrumentation Process Control & Robotics	EL 414.6	Smart Grid Technology
Professional Elective II	**VII**	EL 415.1	Power System Planning	EL 415.3	Special Purpose Machines and its control	EL 415.5	Applications in Solar Energy Technology
		EL 415.2	Extra High Voltage AC Transmission	EL 415.4	Advanced Electrical Drives	EL 415.6	Electric and Hybrid Vehicle
Self-Learning Module-III	**VIII**	EL 421.1	Electrical Estimation, Installation and Testing	EL 421.2	Mechatronics	EL 421.3	Alternate Energy Systems
		EL 421.4	Students can select & enroll for an approved minimum eight-week technical course from various NPTEL/SWAYAM technical courses, or any other approved MOOC platform, complete its assignments and appear for a certification examination conducted by NPTEL, SWAYAM or respective MOOC platform. BOS Chairman / Coordinator will announce the list of approved NPTEL/MOOC online courses/areas of minimum eight weeks duration for 'Self Learning Module-III' from the available NPTEL/SWAYAM/MOOC courses and will make them available to students through the University website.				
Self-Learning Module-IV	**VIII**	EL 422.1	Electrical Energy Audit and Management	EL 422.2	High Voltage DC Transmission	EL 422.3	Illumination Engineering
		EL 422.4	Students can select & enroll for an approved minimum eight-week technical course from various NPTEL/SWAYAM technical courses, or any other approved MOOC platform, complete its assignments and appear for certificate examination conducted by NPTEL, SWAYAM or respective MOOC platforms. BOS Chairman / Coordinator will announce the list of approved NPTEL/MOOC online courses/areas of minimum eight weeks duration for 'Self Learning Module-III' from the available NPTEL/SWAYAM/MOOC courses and will make them available to students through the University website.				

SEMESTER-I

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Tech. Electrical Engineering
Semester-I
POWER QUALITY AND FACTS (EL411)

Teaching Scheme
Theory: - 3 Hrs/Week, 3 Credits
Practical: - 2 Hrs/Week, 1 Credit

Examination Scheme
ESE – 70 Marks
ISE- 30Marks
ICA-25Marks
OE- 25Marks

- **Course Prerequisite:**
  Student shall have knowledge of Electrical Power system concepts, basic electrical and power Electronics.
- **Course Objectives**
  1 To study the various issues affecting power quality, their production, monitoring and suppression.
  2 To study various methods of power quality monitoring & To study to apply appropriate solution techniques for power quality Problem
  3 To study the importance of Reactive power compensation
- **Course Outcome**

After Completion of this Course
1 Student will be able to get the in-depth understanding of power quality issues & standards.
2 Students will be able to understand working of power quality improving Equipment's.
3 Student will able to understand series compensator devices
4 Student will able to understand various method of improving real and reactive power

SECTION-I

Unit 1 Introduction to Power Quality (08 Hrs.)

- **Prerequisite:**
  Basic of power System concepts
- **Objectives:**
  1 To introduce students about power quality
  2 To understand the Power Quality standard
- **Outcome**

After completing this unit, students -
1 Can define Power Quality Issues
2 Can understand the Power Quality Standard

- **Unit Content:**
  Terms and definitions: Overloading - under voltage - over voltage. Concepts of transients – short duration variations such as interruption - long duration variation such as sustained

interruption. Sags and swells - voltage sag - voltage swell - voltage imbalance - voltage fluctuation – power frequency variations. International standards of power quality, Computer Business Equipment, Manufacturers Associations (CBEMA) curve

- **Content Delivery Methods:**

  Chalk and talk, Power point presentations

Unit 2 Harmonics (07 Hrs.)

- **Prerequisite:**

  Harmonics and transients, Mathematics

- **Objectives:**

  1 To introduce students about Harmonics and Transient.
  2 To understand the IEEE and IEC Standard

- **Outcome**

After completing this unit, students -

  1 Will be able to understand Harmonics and mitigation method.
  2 Will be able to calculate Harmonics

- **Unit Content:**

  Harmonic sources from commercial and industrial loads, locating harmonic sources, Power system response characteristics - Harmonics Vs transients, Effect of harmonics – harmonic distortion -voltage and current distortion - harmonic indices - inter harmonics - resonance. Harmonic distortion evaluation - devices for controlling harmonic distortion - passive and active filters. IEEE and IEC standards

- **Content Delivery Methods:**

  Chalk and talk, Power point presentations

Unit 3 Power Quality Monitoring (05 Hrs.)

- **Prerequisite:**

  Knowledge of Equipment’s

- **Objectives:**

  1 To introduce students about Process of Monitoring and measurements.

- **Outcome**

After completing this unit, students -

  1 Will be able to understand Power Quality monitoring
  2 Will be able to get knowledge of instruments.

- **Unit Content:**

  Monitoring considerations - monitoring and diagnostic techniques for various power quality problems, Power quality Measurement Equipment

- **Content Delivery Methods:**

  Chalk and talk, Power point presentations

SECTION-II

Unit 4 FACTS Concepts and Static Shunt Compensator (08 Hrs.)

- **Prerequisite:**
  Power system network, Reactive power compensation
- **Objectives:**
  1 To Study the importance of Reactive power compensation
  2 To study the variation of power, their production, monitoring and suppression
- **Outcome**

After completing this unit, students -

1 Student will able to understand various method of improving real and reactive power

- **Unit Content:**
  Introduction of the FACTS devices, its importance in transmission Network, Basic types of FACTS controller, Objectives of the shunt compensation, method of controller VAR generation, static VAR compensators: SVC and STATCOM, Comparison between *V-I* and *V- Q* Characteristics of STATCOM and SVC
- **Content Delivery Methods:**
  Chalk and talk, Power point presentations

Unit 5 Static Series Compensator **(07 Hrs.)**

- **Prerequisite:**
  Reactive power compensation
- **Objectives:**
  1 To study the variation of power, their production, monitoring and suppression
- **Outcome**

After completing this unit, students -

1 Student will able to understand series compensator devices

- **Unit Content:**
  Objectives of the series compensation, variable Impedance type series compensation (GCSC, TSSC TCSC & SSSC) switching converter type series compensators, characteristics of series compensator.
- **Content Delivery Methods:**
  Chalk and talk, Power point presentations

Unit 6 TCVR, TCPAR and Combined Compensators (UPFC and IPFC) (05 Hrs.)

- **Prerequisite:**
  Reactive power compensation
- **Objectives:**
  1 To study the variation of power, their production, monitoring and suppression
- **Outcome**

After completing this unit, students -

1 Student will able to understand TCVR & TCPAR devices, Student will able

to understand.UPFC & IPFC devices

- **Unit Content:**

  Objective of voltage and phase angle regulators, approaches to TCVR and TCPAR, switching converter-based Voltage and Phase angle Regulators, Basic operating principles of UPFC, control structure of UPFC, Basic operating principles and characteristics of IPFC, Control structure and applications of IPFC.

- **Content Delivery Methods:**

  Chalk and talk, Power point presentations

- **Text Books:**

  1 Understanding FACTS-Concepts and Technology of FACTS by Narain G Hingorani, Laszlo Gyugyi, Standard Publishers

  2 FACTS Controller in Power Transmission and Distribution by K R Padiyar Static Reactive power compensation By T.J.E. Miller, Jhon Wiley & Sons Network

  ICA: -Minimum Eight experiments based on above syllabus.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Tech. Electrical Engineering
Semester-I
SIGNALS AND SYSTEMS (EL412)

Teaching Scheme
Theory: - 2 Hrs/Week, 2 Credits
Tutorial: - 1 Hr/Week, 1 Credit

Examination Scheme
ESE – 70 Marks
ICA – 25 Marks
ISE- 30 Marks

- **Course Prerequisite:**
  Students shall have a mathematical background of differential equations, differentiation and integration.He/She shall also have basic knowledge of Z transform.
- **Course Objectives**
  1. To make students understand mathematical description, graphical representation, transformationand classification of signals
  2. To make students understand the concept of systems, their classification and properties.
  3. To make students understand LTI system analysis in time domain using convolution and investigation of LTI system properties by Impulse response.
  4. To make students understand use of frequency domain analysis tools like Fourier Transform andZ Transform for LTI systems.
  5. To make students understand the concept of Discrete Fourier Transform, need of Fast FourierTransform and its computation.
- **Course Outcome**

After Completion of this Course

1. Identify basic signals, mathematically and graphically represent, transform and classify CT andDT signals
2. Classify different systems and state their properties.
3. Analyze LTI systems in the time domain using convolution and investigate their properties usingImpulse response.
4. Use Fourier and Z Transform for analyzing systems in frequency domain and use their properties.
   Compute DFT and FFT of DT sequences.

SECTION-I

Unit 1 Introduction to Signals (07 Hrs.)

- **Prerequisite:**
  Basic Mathematics
- **Objectives:**
  1. To introduce to student different types of signals and their representations.
  2. To make student perform signal transformations and arithmetic operations on continuous time &discrete time signals
- **Outcome**

After completing this unit, students -

1. Is able to describe mathematically, sketch and label different basic signals.
2. Is able to classify the given continuous time or discrete time signal into different types such as even/odd, energy / power signals, periodic / non-periodic signals etc.
3. Is able to perform different time transformations such as shifting, scaling & reversal on a given signal.
4. Is able to perform different arithmetic operations on given signals.

- **Unit Content:**

  Definition of signals, Classification of signals, Continuous time, discrete time & digital signal, Differenttypes of elementary Continuous and Discrete time signals (Unit step, Unit Impulse, Exponential, Sinusoidal, Unit ramp), rectangular signal, sinc signal, Properties of Unit Impulse, Operations on signals: time shifting, time reversal, Amplitude scaling, time scaling, signal addition & subtraction, signal multiplication, multiple signal transformations, precedence rule, Properties of CT & DT signals (Periodic, non-periodic, Even and Odd signals, Causal-Non causal, Deterministic & Non-deterministic), energy and power of Continuous time signal and discrete time signal,

- **Content Delivery Methods:**

  Chalk and talk, PowerPoint presentations

- **Assessment Methods:**

  Different types of signals, signal transformations, and classification of signals (numerical approach)

Unit 2 Introduction to Systems (07 Hrs.)

- **Prerequisite:**

  Basic Mathematics

- **Objectives:**

1. To introduce to students' different types of systems.
2. To introduce to students' different system properties

- **Outcome**

After completing this unit, students -

1. Describe different systems represented by input / output relations.
2. Classify the given systems into different types such as static/dynamic, linear/nonlinear, causal/noncausal, stable/unstable, time invariant/ time variant, invertible/non-invertible.

- **Unit Content:**

  Definition of system, Classification of Continuous time signal and discrete time systems, lumped anddistributed parameter systems, static and dynamic systems, causal and non-causal systems, linear and nonlinear systems, time variant and invariant systems, stable and unstable systems, invertible & noninvertible systems

- **Content Delivery Methods:**

  Chalk and talk, Power point presentations

- **Assessment Methods:**

  Numerical related to System properties

Unit 3 Linear Time-Invariant Systems (06 Hrs.)

- **Prerequisite:**
  Basic signals, properties of signals & systems
- **Objectives:**
  1 To make student understand representation of continuous time signals & discrete time signals in terms of unit impulse signal.
  2 To make student understand the convolution operation.
  3 To compute the convolution sum / integral of given signals.
- **Outcome**

After completing this unit, students -

1 Compute the convolution sum/ Integral of given signals.
2 Identify the system properties using given impulse response of the system.

- **Unit Content:**
  Introduction to system analysis, Representation of discrete time signals in terms of impulse, Impulse response, Response of DT-LTI system: Convolution sum (Graphical & Analytical method), Response of CT-LTI systems: Convolution Integral, Properties of convolution, Properties of DT-LTI system and CT-LTI system (Dynamicity, invertibility, Causality, stability, unit step response)
- **Content Delivery Methods:**
  Chalk and talk, Power point presentations
- **Assessment Methods:**
  Convolution sum / integral computation, properties of convolution, Properties of DT-LTI system, Properties of CT-LTI system

SECTION-II

Unit 4 Z Transform (07 Hrs.)

- **Prerequisite:**
  Understanding of basic signals, Geometric Progression & basic mathematics
- **Objectives:**
  1 To make student understand need of Z Transform & Z domain representation of time domain DTsignals with ROC.
  2 To make student understand different properties of Z transform and compute Inverse Z Transform
  3 To make students compute the response of DT LTI system using Z transform.
- **Outcome**

After completing this unit, students -

1 Is able to use Z transform for analysis of DT systems.
2 Is able to identify the Region of Convergence of Z transform.
3 Is able to compute Inverse Z Transform.
4 Is able to compute the response of DT LTI system using Z transform.

- **Unit Content:**

  Z -transform: Z transform & region of convergence of finite and infinite duration DT signals. Properties of region of convergence. Properties of Z transform (Statement, Proof and Numerical): Linearity, Time scaling, Time Shifting, Convolution, differentiation (Multiplication by 'n'), Initial value theorem, Final value theorem.

  Inverse Z transform: Power series method, Partial fraction expansion method, Residue method

- **Content Delivery Methods:**

  Chalk and talk, Power point presentations

- **Assessment Methods:**

  Proofs of Z transform properties, Numerical on Z and inverse Z transform.

Unit 5 Fourier Transform (07 Hrs.)

- **Prerequisite:**

  Understanding of basic signals & basic mathematics

- **Objectives:**

  1 Analysis of signals in frequency domain using Fourier transform
  2 Different properties of Fourier transform.

- **Outcome**

After completing this unit, students -

  1 Compute Fourier transform.
  2 Use different Fourier transform properties.

- **Unit Content:**

  Continuous time Fourier transform:

  Introduction to Fourier series & Fourier transform, Convergence of Fourier transform, phase and magnitude spectrum, Properties (Statement, Proof & Numerical): Linearity, Time shifting, Frequency shifting, time scaling, frequency differentiation, time differentiation, convolution.

  Discrete time Fourier transforms:

  Introduction, Relation between Z transform and DT Fourier transform, existence of DT Fourier transform, Properties (Statement, Proof & Numerical): Linearity, Periodicity, Time shifting, Frequency shifting, time reversal, differentiation, convolution in time domain, convolution in frequency domain and Parsevals theorem.

- **Content Delivery Methods:**

  Chalk and talk, PowerPoint presentations

- **Assessment Methods:**

  Proofs of Fourier transform properties, Numerical on CT and DT Fourier transform.

Unit 6 Discrete Fourier Transform (06 Hrs.)

- **Prerequisite:**

  Understanding of basic signals, Geometric Progression & basic mathematics

- **Objectives:**
  1. DFT and IDFT and their properties
  2. Need of FFT, DIT-FFT and DIF-FFT algorithms.
- **Outcome**

After completing this unit, students -

1. Compute 4 point and 8-point DFT.
2. Use DFT properties
3. Compute FFT using DIT-FFT and DIF-FFT algorithms.

- **Unit Content:**

  Discrete Fourier Transform:

  Introduction, 4- & 8-point DFT & IDFT, Properties: Linearity, Time shifting, Shift in K domain,Conjugate symmetry, Time reversal, linear convolution

  Fast Fourier Transform:

  Need of FFT, 8-point DITFFT algorithm and 8-point DIFFFT algorithm
- **Content Delivery Methods:**

  Chalk and talk, PowerPoint presentations
- **Assessment Methods:**

Proofs of DFT properties, Numerical on DFT, IDFT and FFT algorithms.

- **Text Books:**
  1. Signals and Systems, A.V. Oppenheim, A. S. Wilsky, PHI Publication.
  2. Signals and Systems, Simon Haykin, Barry Van Veen, John Wiley & Sons
  3. Introduction to Analog and Digital Communications, Simon Haykins, Wiley India
  4. "Signals and Systems", Dr. D.D. Shah & Prof. A.C. Bhagali, Mahalaxmi Publication Kolhapur
- **Reference Books:**
  1. M. J. Roberts and Govind Sharma, "Fundamentals of Signals and Systems",2nd edition GrawHill,2010
  2. Lathi B. P., "Signal & Systems", Oxford University press, 2nd Ed. 1998
  3. Salivahan S., "Digital Signal Processing", TMH Publication, 2001.
  4. A. Nagoor Kani, "Signals and Systems", McGraw Hill
  5. P. Ramesh Babu & R. Ananda Natarajan, "Signals and Systems", 4/e- SciTech
  6. "Signals and Systems" Ghosh, Pearson Education.
  7. "Signals, Systems and Transforms" Charles Phillips, Pearson Education, Third Edition,

ICA: -Minimum Eight Tutorials based on above syllabus.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Tech. Electrical Engineering
Semester-I
SWITCHGEAR AND PROTECTION (EL413)

Teaching Scheme
Theory: - 3 Hrs/Week, 3 Credits
Practical: - 2 Hrs/Week, 1 Credit

Examination Scheme
ESE – 70 Marks
ISE- 30Marks
ICA-25Marks
POE- 50Marks

- **Course Objectives:**

To impart the basic knowledge regarding:

1. Need of protection
2. Basic power system protection concepts
3. Different protection schemes
4. Protection of different power system equipment's

- **Course Outcomes:**

1. Students will be able to know operating principles of different relays used forprotection.
2. Student will be able to get the in-depth understanding of how the major equipment'sused in the power system are being protected against faults and abnormal conditions

SECTION-I

Unit-1 Protective Relays **(07 Hrs.)**

- **Prerequisite:**

Basic power system protection concepts &basic of relay

- **Objectives:**

1. Study of operating principles of different relays
2. Study needs of relay in protection system
3. Study of theory & construction of different relay

- **Outcomes:**

1. Can identify faults in system with protective relay
2. Is able to apply concepts of operating principles for protection
3. Can compare between various relay for protection

- **Unit Content:**

Need of protective relaying, Desirable qualities, zone of protection, primary & back up protection, attracted armature, balanced beam, moving coil relays, theory and construction of induction disc and induction cup type electromagnetic relays, theory of torque production in induction relays, static relay, microprocessor-based relaying (Block diagram and flow chart), Instrument transformers: CT burden, saturation and knee point voltage and type of PTs

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Theory questions related to construction & operation if different relay and derivationsrelated to relay operation.

Unit-2: Over Current Protection and Differential Protection (07 Hrs.)

- **Prerequisite:**

Different protection schemes

- **Objectives:**

1. Study of operating principle of fuse & differential protection
2. Study of theory & construction of differential schemes
3. Study of theory & construction of different fuses.

- **Outcomes:**

1. Can identify different protection scheme
2. Is able to apply protection with different schemes.

- **Unit Content:**

Fuse: Re-wirable and HRC fuse, fuse characteristics, application and selection of fuse. Plug Setting, time setting (Simple numerical on PSM & TSM), radial feeder and ring mains protection, relay coordination, earth fault and phase fault relays, directional relay, static relay (block diagram for over current relays), microprocessor-based o/c relay, numerical on over current relays Simple differential relay, percentage differential relay, line protection

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Simple numerical on calculation of PSM & TSM & Theory questions related todifferential Schemes.

Unit-3 Distance Protection (07 Hrs.)

- **Prerequisite:**

Distance protection schemes & microprocessor

- **Objectives:**

1. Study of operating principle distance protection.
2. Study of theory & construction of distance schemes
3. Study of different zones of protection.

- **Outcomes:**

1. Can identify fault in different zones of protection
2. Is able to apply protection distance protection.

- **Unit Content:**

Impedance, reactance and admittance characteristics relay settings for 3-zone protection,carrier aided protection scheme, out of step blocking scheme, electromagnetic and static relays for transmission line protection, and microprocessor-based impedance, reactance and mho relays

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Theory questions related to different distance protection schemes

SECTION-II

Unit-4 Equipment Protection (06 Hrs.)

- **Prerequisite:**

Working of Generator, Transformer, Bus-bar

- **Objectives:**

1. Study of operating principle of equipment protection.
2. Study of protection of different power system equipment's

- **Outcomes:**

1. Can identify fault in different zones of protection
2. Is able to apply protection to different equipment.

- **Unit Content:**

Transformer protection: Different types of faults in transformer, overcurrent protectionof transformer, percentage differential protection of transformer, harmonic restraint scheme, Buchholz relay for incipient faults, protection against over-fluxing

Generator protection: stator earth fault, phase fault, stator current unbalance (NPS)protection, rotor overheating, earth fault protection, excitation failure and protection against motoring, generator-transformer unit protection.

Induction motor protection - Protection of induction motors against different faults and abnormal conditions

Bus-bar protection – Introduction, Differential protection of bus-bars, backup protectionof bus-bars

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Theory questions related to different equipment protection schemes

Unit-5 Circuit Breakers: (06 Hrs.)

- **Prerequisite:**

Concept of resistivity

- **Objectives:**

1. To introduce student basic phenomenon in operation of circuit breaker.
2. Study of arc interruption methods in circuit breakers.

- **Outcomes:**

1. Can analyse different arc interruption methods.
2. To make student understand concepts of RV, RRRV& TRV

- **Unit Content:**

Voltage-current characteristics of arc, principles of DC and AC arc interruption, high resistance and

current zero interruption, arc voltage, expression for transient re-striking voltage (TRV), recovery voltage, RRRV and resistance switching, current chopping, capacitive current interruption, Simple numerical on the calculation of TRV, RRRV etc.

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Simple numerical on calculation of RV, RRRV & Theory questions related to aboveContents

Unit-6 Types of Circuit Breakers: (06 Hrs.)

- **Prerequisite:**

Arc formation process

- **Objectives:**

1. Study of different types of circuit breaker.
2. Study of arc interruption methods in circuit breakers.

- **Outcomes:**

1. Can understand the construction & operation of circuit breakers.
2. Can compare different types of circuit breaker

- **Unit Content:**

Classification of circuit breakers, brief study of construction and working of bulk oil andminimum oil CB, Air break and Air Blast CB, SF6 and Vacuum CB, MCB and MCCB, HVDC breakers, Ratings of CB and testing of CB, Isolator, earthing switch

- **Content Delivery Methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Simple numerical on Breaking & making capacity & Theory questions related to above Contents

Unit-7 Over Voltage Protection: (03 Hrs.)

- **Prerequisite:**

Meaning of overvoltage

- **Objectives:**

1. Study of different equipment's for power system protection
2. Study of causes of overvoltage in power system

- **Outcomes:**

1. Can understand the construction & operation overvoltage protecting equipment.
2. Can compare different types of overvoltage protecting equipment

- **Unit Content:**

Causes of over voltages, surge arrestors and absorbers, metal oxide (ZnO) arrestors , insulation co-ordination in a power system

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Theory related questions

Text books:

1. Power System Protection and Switchgear: B.Ram and B.N. Vishwakarma
2. Fundamentals of Power system Protection: Paithankar Y G and Bhide S R, PHIpublication, EEE 2003
3. Switchgear and Protection: Sunil.S. Rao, Khanna Publications
4. Switchgear and protection: J B Gupta, S K Kataria and Sons

References:

1. Power Systems Protection and Switch Gear: Ravindranath B., and Chander, N., WileyEastern Ltd.
2. Protective Relaying: Principles and Applications: J. Lewis Blackburn, Thomas J. DominCRC Press
3. Computer Relaying for Power System: A. G. Phadke, J. S. Thorp: Research Studies PressLTD, England (John Willy & Sons Inc. New York)
4. Handbook of switchgears: Bharat Heavy Electricals Limited, McGraw Hill Pubication
5. Electrical Power Systems - Dr. S.L. Uppal & Prof. S. Rao, Khanna publishers
6. A Web course on "Digital Protection of Power System" by Prof. Dr S. A. Soman, IITMumbai
7. For MCCB:- http://electrical-engineering-portal.com/download-center/books-and-guides/electrical-engineering/basics-of-molded-case-circuit-breakers-mccbs

ICA:

Minimum six experiments from the given list and two drawing sheets based on above syllabus.

List of experiments: -

1. Experimental realization of Electromechanical over current relay
2. Experimental realization of static over current/earth fault relay
3. Experimental realization of numerical over current/earth fault relay
4. Experimental realization of three phase transformer protection with % differential relay
5. Experimental realization setup of circuit breaker
6. Experimental realization of distance protection of transmission line
7. Experimental realization of three phase induction motor protection
8. Experimental realization of merz-price protection of alternator

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Tech. Electrical Engineering
Semester-I
PROFESSIONAL ELECTIVE-I
High Voltage Engineering (EL 414.1)

Teaching Scheme
Theory: - 3 Hrs/Week, 3 Credits
Practical: - 2 Hr/Week, 1 Credit

Examination Scheme
ESE – 70 Marks
ICA - 25Marks
ISE- 30Marks

- **Course Objectives**

To impart basic knowledge of high voltage equipment and their applications.

- **Course Outcomes**

Student will able to handle the equipment in power system as well as high voltage laboratories

SECTION-I

Unit 1: Electrostatic fields **(06 Hrs.)**

- **Prerequisite:**

Electric Fields, Classification of Insulators.

- **Objectives:**

1. Revision of concepts of Electric Fields.
2. Revision of concepts of classification of Insulators.
3. To introduce Insulators breakdown.

- **Outcomes:**

After completing this unit, student -

1. Can apply Electric fields fundamentals to power system.
2. Can calculate breakdown strengths of Insulators.
3. Analyze the surge voltage distribution.

- **Unit Content:**

Electrostatic stresses, Gas/vacuum as insulators, liquid breakdown, solid breakdown, estimation and control of electric stresses, surge voltages, their distribution and control

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Derivations related to above system and its representations

Unit 2– Conduction and break-down in gases **(09 Hrs.)**

- **Prerequisite:**

Concepts of Breakdown Phenomenon.

- **Objectives:**

1. To make student understand behavior of breakdown in gases.
2. To make student aware of breakdown techniques.
3. To understand corona discharges.

- **Outcomes:**

After completing this unit, student –

1. Able to understand behavior of breakdown in gases.
2. Can derive various breakdown phenomena.
3. Can evaluate practical considerations in gases.

- **Unit Content:**

Gases as insulating media, ionization processes, Townsends growth equation, primary andsecondary process, Townsends criterion for break-down, Paschens law, break-down in nouniform fields and corona discharges, post break-down phenomena and applications, practical considerations in using gases for insulation purposes

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Derivation related to above contents.

Unit 3– Conduction and break-down in liquid dielectric & Solid dielectric (06 Hrs.)

- **Prerequisite:**

Concepts of Insulators breakdown techniques.

- **Objectives:**

1. To make student aware the breakdown in liquid dielectrics.
2. To make student aware the breakdown in solid dielectrics.

- **Outcomes:**

After completing this unit, student –

1. Able to derive conduction & breakdown in liquids.
2. Can compare between liquids & Solids breakdown.

- **Unit Content:**

Liquids as insulators, conduction and break-down in pure liquids, conduction and breakdown in commercial liquids, Intrinsic break-down, electromechanical break-down, thermal break-down, break-downs of solid dielectrics in practice, break-down of compositeinsulation, solid dielectric used in practice

- **Content Delivery Methods:**

Chalk and talk, power point presentation, videos

- **Assessment Methods:**

Derivation related to above Content.

SECTION-II

Unit 4– Generation & Measurement of high voltages and currents (06 Hrs)

- **Prerequisite:**

HVAC & HVDC transmission techniques.

- **Objectives:**

1. To make student understand HVAC & HVDC generation techniques.
2. To make student understand concept of Tripping.

To make student understand the measurement techniques of high voltages

- **Outcomes:**

After completing this unit, student –

1. Can analyze measurement techniques of high voltage & currents.
2. Can analyze the impulse generator.
3. Can prepare suitable method for generation of high voltage.

- **Unit Content:**

Generation of HVDC/HVAC and impulse voltages, generation of impulse currents, trippingand Control of impulse generators, Measurement of high direct current voltages, measurement of high ac and impulse voltages, measurement of high dc, ac and impulse currents, CRO for impulse voltage and current

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Theoretical questions on above content.

Unit 5- High voltage testing of electrical apparatus (09 Hrs.)

- **Prerequisite:**

Name of the insulating materials, importance of insulating material in electrical equipment's.

- **Objectives:**

1. To make student understand different testing methods of Electrical apparatus.
2. To make student understand various tests on the insulating materials.
3. To make student understand the testing of Surge diverters.

- **Outcomes:**

After completing this unit, student –

1. Can solve the theoretical questions based on given syllabus
2. Can write the procedure for various test of insulation
3. Can write the procedure testing methods on circuit breakers, cables, Transformers.

- **Unit Content:**

Testing of insulators and bushings, testing of circuit breakers, testing of cables, testing ofTransformers, testing of surge diverters, radio interference measurements.

- **Content Delivery Methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical questions related to above Content.

Unit 6- Design, planning and layout of high voltage laboratories (06 Hrs.)

- **Prerequisite:**

Basics of foundation of technical labs.

- **Objectives:**

1. To introduce to student various factors for Electrical Power system foundation
2. To make student understand classification of high voltage laboratories.

To understand sizing & rating of high voltage laboratories

- **Outcomes:**

After completing this unit, student –

1. Can understand various factors for high voltage laboratories foundation
2. Can understand procedure for sizing & rating of high voltage laboratory.
3. Can understand the use of various tools and devices for high voltage laboratory.

- **Unit Content:**

Test facilities provided in high voltage laboratories, activity and studies in high voltageLaboratories, classification of high voltage laboratories, size and ratings of high voltageLaboratories, grounding of impulse testing laboratories.

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Theoretical questions related to above Content.

Text books:

1. M S Naidu, V Kamraju, "High Voltage Engineering",Tata McGraw Hill publications
2. Ravindra Aror a, Wolf Gang Mosch, "High voltage insulation engineering", New ageInternational publishers ltd Wiley estern Ltd
3. C L Wadhwa , "High Voltage Engineering" , New age international publishers ltd

References:

1. Kuffel E and Abdullah M "Introduction to High Voltage Engineering", Pearson publication
2. E Kuffel, W S Zaengi, J Kuffel, "High Voltage Engineering fundamentals", Newnesspublications
3. Prof. D V Razevig, Translated from Russian by Dr. M P Chourasia, "High VoltageEngineering", Khanna publishers

ICA: It will consist of at least eight experiments from the following based on the prescribed syllabus but not restricted below:

1. Simulation study of voltage double circuits using PSpice.
2. Simulation study of impulse voltage generation circuits using PSpice.
3. Experimental study of HVAC generation.

4. Verification of Paschen’s law.
5. Experimental study of Greinacher voltage doubler.
6. Experimental study of impulse voltage generation.
7. Breakdown test of insulating oil using Oil Test Kit.
8. Break down test of hardboard insulation plate
9. PD measurement for needle-plane electrode system.
10. To observe the corona using horn gap apparatus.
11. Plane to plane test for breakdown of air.
12. Hemisphere to plane test for breakdown of air.
13. Point to plane test for breakdown of air.
14. Study of tesla coil.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Tech. Electrical Engineering
Semester-I
PROFESSIONAL ELECTIVE-I
Power System and Operation Control (EL 414.2)

Teaching Scheme
Theory: - 3 Hrs/Week, 3 Credits
Practical: - 2 Hr/Week, 1 Credit

Examination Scheme
ESE – 70 Marks
ICA - 25Marks
ISE- 30Marks

- **Course Objectives**

To study Economic operation of Power Systems, Hydrothermal scheduling

- **Course Outcome**

Student will able to familiar with real and reactive power control

SECTION-I

Unit-1 Economic Operation of Power System **(07 Hrs.)**

- **Prerequisite:**

Different terminology used in power system, different generating power station

- **Objectives:**

1. A prime objective here is to perform the service at the lowest possible cos
2. The objective in minimal emission dispatch is to minimize certain contaminants forthe system

- **Outcomes:**

1. Can understand the optimum allocation of active power generation can be calculatedfor minimum generation cost.
2. Can understand analytical methods of arriving at the optimal strategies in powersystems which must meet the minimum standards of reliability.

- **Unit Content:**

Optimal operation of Generators in Thermal Power Stations, heat rate Curve, Cost Curve,Incremental fuel and Production costs, input-output characteristics, Optimum generation allocation with line losses and with line losses neglected, Loss coefficient, Penalty factor,Hydrothermal scheduling.

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Numerical problems and derivations related to economic Operation of Power system

Unit-2: Unit Commitment **(07 Hrs.)**

- **Prerequisite:**

Spinning reserve, Thermal power Plant

- **Objectives:**

1. Study of minimization of the total operation cost while satisfying all unit and systemconstraints

- **Outcomes:**

1. Can understand different unit commitment solution method.
2. Can understand different thermal unit constraints

- **Unit Content:**

Spinning reserve, thermal unit constraints, Unit commitment solution methods-Priority list, Dynamic programming, Lagrange multiplier

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Numerical problems and derivations related to unit Commitment

Unit-3 Load Frequency Control (07 Hrs.)

Prerequisite:

Generator, Control area

- **Objectives:**

1. The objective of this unit is to acquire the knowledge on importance of frequencycontrol.
2. The objective of this unit is to acquire the knowledge on PI control for the single areasystem to yield zero steady state error.

- **Outcomes:**

1. Can understand concept of control area in power system.
2. Can understand speed governing system

- **Unit Content:**

Necessity of keeping frequency constant, Definitions of Control area – Single areacontrol, Load frequency control of 2-area system, speed governing system

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Theory questions and derivations related to load frequency control

SECTION-II

Unit-4 Reactive Power control (07 Hrs.)

- **Prerequisite:**

Active & Reactive power

- **Objectives:**

1. Study the compensation of the reactive power in power systems
2. Some of the characteristics of power systems and their loads which deteriote thequality of supply.

- **Outcomes:**

1. Can understand different compensation techniques i.e. by generation or absorption of asuitable

Quantity of reactive power.

- **Unit Content:**

Overview of Reactive Power control – Reactive Power compensation in transmission systems, advantages and disadvantages of different types of compensating equipment fortransmission systems, load compensation – Specifications of load compensator, Uncompensated and compensated transmission lines: shunt and Series Compensation

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Theory questions related to reactive power control

Unit-5 Power System Security (07 Hrs)

- **Prerequisite:**

Power System control

- **Objectives:**

1. The objective of a security is to keep the power system stable by isolating only thecomponents that are under fault
2. To study different contingencies in power system.

- **Outcomes:**

1. Can understand security assessment is crucial for the reliable and secure operation ofpower systems.
2. Can understand effect of contingency & take necessary actions to keep the powersystem secure and reliable.

- **Unit Content:**

Introduction, system state classification, security analysis, contingency analysis,Sensitivity factors, power system voltage stability.

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Theory questions related to Power System Security

Unit 6: Voltage Stability (07 Hrs)

- **Prerequisite:**

Reactive power, Voltage stability

- **Objectives:**

1. To study of voltage stability problem in power system
2. To study future trends & challenges in voltage stability

- **Outcomes:**

1. Can understand different methods of improving voltage stability
2. Can understand terms related to voltage stability

- **Unit Content:**

Introduction, comparison of voltage angle & voltage stability, reactive power flow&Voltage, collapse, mathematical formulation of voltage stability problem, voltage stability analysis, prevention voltage collapse, state of art, future trends & challenges

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Theory questions related to voltage Stability

Text books:

1. C. L. Wadhwa, "Electrical Power Systems", Newage International.
2. I. J. Nagrath & D. P. Kothari "Modern Power System Analysis "Tata M Graw Hill
3. Allen. J. Wood and Bruce F. Wollenberg, "Power Generation, Operation and Control", John Wiley& Sons, Inc., 2003
4. Chakrabarti & Halder, "Power System Analysis: Operation and Control", Prentice Hall ofIndia

Reference Books:

1. J Duncan Glover and M. S. Sarma, "Power System Analysis and Design", THOMPSON.
2. O. I. Elgerd, "Electric Energy systems Theory", Tata McGraw-hill Publishing Company Ltd.
3. Grainger and Stevenson, "Power System Analysis", Tata McGraw Hill.
4. HadiSaadat, "Power System Analysis", TMH Edition.

ICA: Minimum Eight simulations experiments based on the above syllabus.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Tech. Electrical Engineering
Semester-I
PROFESSIONAL ELECTIVE-I
Programmable Logic Control and SCADA (EL 414.3)

Teaching Scheme
Theory: - 3 Hrs/Week, 3 Credits
Practical: - 2 Hr/Week, 1 Credit

Examination Scheme
ESE – 70 Marks
ICA - 25Marks
ISE- 30Marks

- **Course Objectives**

To impart the basic knowledge regarding:

1. PLC programming
2. SCADA architecture
3. Evolution of SCADA protocols

- **Course Outcomes**

Student will be able to get the in-depth understanding of programming of PLC, basicSCADA system architecture and the evolution of SCADA protocols.

SECTION-I

Unit 1: Introduction to PLC **(07Hrs.)**

- **Prerequisite:**

Control system, Programming logic, Digital logic.

- **Objectives:**

1. Revision of concepts of control system.
2. Revision of concepts of digital logic.
3. To make the students understand the fundamentals of automation and various automationsystems used in industry such as PLC.
4. To provide knowledge levels needed for PLC programming and operating.

- **Outcomes:**

After completing this unit, student -

1. Can gain knowledge on Programmable Logic Controllers
2. Can understand different types of Devices to which PLC input and outputModules are connected.
3. Understand working of PLC.

- **Unit Content:**

Definition & History of PLC, Overall PLC system, PLC Input & Output modules, central processing unit, CPUs & Programmer/monitors, Solid state memory, the processor, Input modules (Interfaces), Power supplies, PLC advantages & disadvantages, Selection criteria forPLC

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Theoretical questions related to above Content.

Unit 2– Programming of PLC (06Hrs.)

- **Prerequisite:**

Concepts of programming, Gate logic, Relay logic

- **Objectives:**

1. Students should understand the working of control systems and should be able todetermine hardware and software requirements of PLC
2. To make the students how devices to which PLC input and output modules areconnected.
3. To train the students to create ladder diagrams from process control descriptions.

- **Outcomes:**

After completing this unit, student –

1. Able to create ladder diagrams from process control descriptions.
2. Ability to apply PLC timers and counters for the control of industrial processes.
3. Apply Programming languages and instructions of PLC.
4. Design PLC based application by proper selection and sizing criteria, developing GUIand ladder program.

- **Unit Content:**

Programming equipment, proper construction of PLC ladder diagram, Basic components & their symbols in ladder diagram, Fundamentals of ladder diagram, Boolean logic & relay logic and analysis of rungs, Input ON/OFF switching devices, Input analog devices, Output ON/OFF devices, Output analog devices, programming ON/OFF Inputs to produce ON/OFF outputs.

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Ladder logic on above contents.

Unit 3– Advanced PLC Function (08Hrs.)

- **Prerequisite:**

Concepts of automation Industry, discrete control system.

- **Objectives:**

1. To make the students understand PLC functions, Data Handling Function.
2. To train the students to develop a coil and contact control system to operate a basic robotand analog PLC operations.
3. To make the students understand PID & Industrial process control.

- **Outcomes:**

After completing this unit, student –

1. Able to use different types PLC functions, Data Handling Function.
2. Is able to apply concepts of coil contact methods.

Can compare between analog & automated plc operations

- **Unit Content:**

Analog PLC operation, PID control of continuous processes, simple closed loop systems, problems with simple closed loop systems, closed loop system using Proportional, Integral &Derivative (PID), PLC interface, and Industrial process example, Motors Controls: AC Motor starter, AC motor overload protection, DC motor controller, Variable speed (Variable Frequency) AC motor Drive

- **Content Delivery Methods:**

Chalk and talk, power point presentation, videos

- **Assessment Methods:**

Theoretical questions related to above Content.

SECTION-II

Unit 4- SCADA Systems (08Hrs.)

- **Prerequisite:**

Control schemes for Data Collection.

- **Objectives:**

1. To make student understand the control levels.
2. To understand the requirements of safety and design safety instrumented systems.
3. To understand SCADA system.

- **Outcomes:**

After completing this unit, student –

1. Can analyze the parts of SCADA system.
2. Can analyze the SCADA communication systems.
3. Able to understand desirable properties of SCADA Systems.

- **Unit Content:**

Introduction and definitions of SCADA, Basic SCADA system Architecture Human MachineInterface, Master Terminal Unit, Remote Terminal Unit. SCADA data transfer through PLCC. Communication Technologies, Communication system components, SCADA Communication in an electrical power system, SCADA system desirable Properties, Real Time System, SCADA server, SCADA functions

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Theoretical questions related to above Content.

Unit 5- SCADA Architecture (06Hr.)

- **Prerequisite:**

Name of the parts of SCADA Systems.

- **Objectives:**

1. To make student understand different architectures of SCADA systems.
2. To make student understand various configurations of systems.

To make student understand the working of critical Infrastructure by Automation

- **Outcomes:**

After completing this unit, student –

1. Able to understand the architectures.
2. Able to analyze the power system operations.
3. Can understand critical Infrastructure by SCADA.

- **Unit Content:**

First generation-Monolithic, Second Generation-Distributed, Third generation Networked Architecture, Intelligent Electronic Devices, Operation and control of interconnected power system, Automatic substation control, SCADA configuration, Energy management system, system operating states, system security, State Estimation, SCADA system security issues Overview. SCADA systems in the critical Infrastructure: Petroleum Refining Process, Conventional Electric Power Generation, water Purification System, Chemical Plant

- **Content Delivery Methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical questions related to above Content.

Unit 6- Evolution of SCADA Protocols (07Hrs.)

- **Prerequisite:**

Basics of foundation of protocols.

- **Objectives:**

1. To introduce to student various protocols for computer systems.
2. To make student understand procedure for understanding of Protocols.
3. To introduce to student the use of various protocols for Automations.

- **Outcomes:**

After completing this unit, student –

1. Can understand various factors for Protocols levels security.
2. Can understand procedure for protocols.
3. Can understand the use of various protocols for Automations.

- **Unit Content:**

Overview of Open systems interconnection (OSI) Model, Functions of OSI Model Layers, OSI Protocols, Functions of Transmission control protocol / Internet protocol (TCP/IP) Layers,TCP/IP protocol, DNP3 protocol, IEC61850 layered architecture, Control and Information Protocol (CIP), Device Net, Control Net, Ether Net/IP, Flexible Function Blockprocess (FFB), Process Field bus (Profibus), The Security Implications of the SCADA protocols

- **Content Delivery Methods:**

Chalk and talk, power point presentations, Videos.

- **Assessment Methods:**

Theoretical questions related to above Content.

Text books:

1. Gary Dunning, “Introduction to Programmable Logic Controllers”, Thomson, 2nd Edition
2. John R. Hackworth, Frederick D., Hackworth Jr., “Programmable Logic ControllersProgramming Methods and Applications”
3. John W. Webb, Ronald A. Reis, “Programmable Logic Controllers: Principles andApplication”, 5th Edition
4. Ronald L. Krutz, “Securing SCADA System”, Wiley Publishing 5.Stuart A Boyer, “SCADA supervisory control and data acquisition

Reference Books:

1. Batten G. L., “Programmable Controllers”, McGraw Hill Inc., Second Edition
2. Bennett Stuart, “Real Time Computer Control”, Prentice Hall, 1988
3. Doebelin E. O., “Measurement Systems”, McGraw-Hill International Editions, FourthEdition, 1990
4. Gordan Clark, Deem Reynders, “Practical Modem SCADA Protocols”

ICA: Minimum Eight experiments from the given list.

List of Experiments:

1.Interfacing of lamp & button with PLC for ON & OFF operation. b) Performed delayed
2.Operation of lamp by using push button.
3.Multiple push button operation with delayed lamp for ON/OFF operation. b) Combination of
4.Counter & timer for lamp ON/OFF operation.
5.Set / Reset operation: one push button for ON & other push button for OFF operation.
6.DOL starter & star delta starter operation by using PLC.
7.PLC based temperature sensing using RTD.
8.PLC based thermal ON/OFF control.
9.Interfacing of Encoder with PLC (Incremental/Detrimental)
10. PLC based speed, position measurement system.
11. Development of Dynamos & relating with parameters of PLC.
12. PLC interfaced with SCADA & status read/command transfer operation.
13. Parameter reading of PLC in SCADA.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Tech. Electrical Engineering
Semester-I
PROFESSIONAL ELECTIVE-I
Instrumentation Process Control & Robotics (EL 414.4)

Teaching Scheme
Theory: - 3 Hrs/Week, 3 Credits
Practical: - 2 Hr/Week, 1 Credit

Examination Scheme
ESE – 70 Marks
ICA - 25Marks
ISE- 30Marks

- **Course Objectives**

1. To differentiate between manipulating variable and disturbance
2. To explain the effect of P-D controller
3. To explain the terms: Auto Tuning, Bump less Transfer and Integration Wind Up
4. To explain a scheme for implementation of P-I-D controller using electronic circuit
5. To justify the use of feed forward controller in addition to conventional feedback controller

- **Course Outcome**

At the end of this lesson, the student should be able to

1. Develop linearized mathematical models of simple systems
2. Write the input-output relationship of a P-I-D controller
3. Explain the importance of tuning of controller for a particular process
4. Distinguish between position algorithm and velocity algorithm for implementation of digital P-I-D controller
5. Find the transfer function of the feed forward controller for complete disturbance rejection

SECTION-I

Unit 1: Introduction to Process Control **(06 Hrs.)**

- **Prerequisite:**

Basics of Controllers

- **Objective:**

To introduce student to different types of controllers

- **Outcomes:**

After completing this unit, students –

Can apply different types of controllers

- **Unit Content:**

Introduction to Process Control, P-- I -- D Control, Controller Tuning, Implementation of PID Controllers

Unit 2: Special Control Structures **(07 Hrs.)**

- **Prerequisite:**

Basics of Controllers

- **Objective:**

To introduce student to different types of control systems

- **Outcomes:**

After completing this unit, students –

Can analyze types of control systems

- **Unit Content:**

Feed forward and Ratio Control, Predictive Control, Control of Systems with InverseResponse

Unit 3: Industrial Controllers (07 Hrs.)

- **Prerequisite:**

Basics of State Space

- **Objective:**

To introduce student to different types of Industrial Controllers

- **Outcomes:**
- **After completing this unit, students –**

Can analyze types of industrial controllers

- **Unit Content:**

Cascade Control, Overriding Control, Selective Control, Split Range Control, MultiloopControl

SECTION-II

Unit 4: Robotics (06 Hrs.)

- **Prerequisite:**

Basics of Instrument Characteristics

- **Objective:**

To introduce student to robotics & Characteristics of Instrument Characteristics

- **Outcomes:**

After completing this unit, students –

Can understand basics of robotics

- **Unit Content:**

Robot anatomy-Definition, law of robotics, History and Terminology of Robotics, Accuracyand repeatability of Robotics

Unit 5: Elements of robots – links, joints, actuators, and sensors (08 Hrs.)

- **Prerequisite:**

Basics of Electric Motors

- **Objective:**

To introduce student to robotics & Use of special electric motors

- **Outcomes:**

After completing this unit, students –

1. Can analyze basics of robotics**.**
2. Can relate different sensors

- **Unit Content:**

Position and orientation of a rigid body, Homogeneous transformations, Representation ofjoints, link representation using D-H parameters, Examples of D-H parameters and link transforms, different kinds of actuators – stepper, DC servo and brushless motors, model of a DC servo motor, Types of transmissions, Purpose of sensors, internal and external sensors,common sensors –encoders, tachometers, strain gauge-based force-torque sensors, proximityand distance measuring sensors, and vision

Unit 6: Kinematics of serial robots (07 Hrs.)

- **Prerequisite:**

Basics of kinematic

- **Objective:**

To introduce student to kinematics

- **Outcomes:**

After completing this unit, students –

Can apply approach of kinematics

- **Unit Content:**

Introduction, Direct and inverse kinematics problems, Examples of kinematics of common Serial manipulators, workspace of a serial robot, Inverse kinematics of constrained and Redundant robots, Tractrix based approach for fixed and free robots and multi-body Systems

- **Text Books:**

1. Stephanopoulos, "Chemical Process Control, 2nd edition, Prentice Hall, New Delhi,2003.
2. Coughanowr, "Process Systems Analysis and Control", 2nd Edition, McGraw Hill, Singapore,1991.
3. Peter Harriott, "Process Control", Tata McGraw Hill, New Delhi, 1985.
4. Ghosal, A., Robotics: Fundamental Concepts and Analysis, Oxford University Press 2nd reprint,2008.
5. Fu, K., Gonzalez, R. and Lee, C. S. G., Robotics: Control, Sensing, Vision and Intelligence¸McGraw- Hill, 1987.

ICA: Minimum Eight experiments based on above syllabus.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Tech. Electrical Engineering
Semester-I
PROFESSIONAL ELECTIVE-I
Neural Network and Fuzzy Logic Control (EL 414.5)

Teaching Scheme
Theory: - 3 Hrs/Week, 3 Credits
Practical: - 2 Hr/Week, 1 Credit

Examination Scheme
ESE – 70 Marks
ICA - 25Marks
ISE- 30Marks

- **Course Objective:**

1. To cater the knowledge of Neural Networks and Fuzzy Logic Control and use these forcontrolling real time systems.
2. To Expose the students to the concepts of feed forward neural networks
3. To provide adequate knowledge about feedback networks.
4. To provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic andto design the fuzzy control using genetic algorithm.

- **Course Outcomes: After completing this course, students can**

1. Control the real time signal using Neural Networks and Fuzzy Logic.
2. Explain concepts of feed forward neural networks
3. Describe application of feedback networks.
4. Design the fuzzy control using genetic algorithm

SECTION I

Unit-I Fundamentals of Fuzzy Logic **(08 Hrs)**

- **Prerequisite:** Basics of control system.
- **Objectives:**

1. To expose the students to the concepts of fuzzy set.
2. To provide adequate knowledge about fuzzy operations.

- **Outcomes:**

After completing this unit, student can

1. Explain the concepts of fuzzy set.
2. Perform fuzzy operations

- **Unit Content:**

Basic concepts: fuzzy set theory- basic concept of crisp sets and fuzzy sets- complements- union intersection-combination of operation- general aggregation operations- fuzzy Relations-compatibility relations-orderings- morphisms- fuzzy relational equations-fuzzy setand systems

Unit-II Architecture of Neural Networks: **(08 Hrs)**

- **Prerequisite:** concepts of fuzzy sets and operations.

- **Objectives:**

1. To give information about Architecture of Neural Networks.
2. To provide knowledge of algorithms of various neural structures.

- **Outcomes:**

After completing this unit, student can

1. Draw and Explain Architecture of Neural Networks.
2. Write algorithms of various neural structures

- **Unit Content:**

Architectures: motivation for the development of natural networks-artificial neural networks-biological neural networks-area of applications-typical Architecture-setting weights-commonactivations functions-Basic learning rules- Mcculloch-Pitts neuron- Architecture, algorithm, Applications-single layer net for pattern classification- Biases and thresholds, linear separability - Hebb'srule- algorithm -perceptron - Convergence theorem-Delta rule

Unit-III Basic Neural Network Techniques: (08 Hrs)

- **Prerequisite:** Basics of Fuzzy and neural networks.
- **Objectives:**

1. To give information about neural net.
2. To provide knowledge of algorithms of neural net

- **Outcomes:**

After completing this unit, student can

1. Explain neural net..
2. Write algorithms of neural nets..

- **Unit Content:**

Back propagation neural net: standard back propagation-architecture algorithm- derivation of learning rules number of hidden layers--associative and other neural networks- hetro associative memory neural net, auto associative net- Bidirectional associative memory- Applications-Hopfield nets-Boltzman machine

SECTION II

Unit-IV Competitive Neural Networks: (08 Hrs)

- **Prerequisite:** Basics of Fuzzy and neural networks
- **Objectives:**

1. To give information about Competitive Neural Networks

- **Outcomes:**

After completing this unit, student can

1. Explain about Competitive Neural Networks

- **Unit Content:**

Neural network based on competition: fixed weight competitive nets- Kohonenself organizing maps and applications-learning vector quantization-counter propagation nets and applications adaptive resonance

theory: basic architecture and operation-architecture, algorithm, application and analysis of ART1 & ART2

Unit-V Special Neural Networks: **(08 Hrs)**

- **Prerequisite:** Basics of Fuzzy and neural networks
- **Objectives:**

1. To give information about Special Neural Networks

- **Outcomes:**

After completing this unit, student can

1. Explain Special Neural Networks

- **Unit Content:**

Cognitron and Neocognitron - Architecture, training algorithm and application-fuzzy associate memories, fuzzy system architecture- comparison of fuzzy and neural systems.

Text book(s) and/or required material

1. T1. Kliryvan- Fuzzy System & Fuzzy logic Prentice Hall of India, First Edition.
2. Lawrence Fussett- fundamental of Neural network Prentice Hall , First Edition.

Reference Books:

1. Bart Kosko, ―Neural network and Fuzzy System‖ - Prentice Hall-1994.
2. J.Klin and T.A.Folger, ―Fuzzy sets‖ University and information- Prentice Hall -1996.
3. J.M.Zurada, ―Introduction to artificial neural systems‖-Jaico Publication house,Delhi 1994.
4. VallusuRao and HayagvnaRao , ―C++ Neural network and fuzzy logic‖-BPB and Publication, NewDelhi,1996.

Intelligent Systems and Control-http://nptel.ac.in/courses/108104049/

ICA: Minimum Eight experiments based on above syllabus.

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **B.Tech. Electrical Engineering** **Semester-I** **PROFESSIONAL ELECTIVE-I** **Extra High Voltage AC Transmission (EL 414.6)**

Teaching Scheme	**Examination Scheme**
Theory: - 3 Hrs/Week, 3 Credits	**ESE –** 70 Marks
Practical: - 2 Hr/Week, 1 Credit	**ICA** - 25Marks
	ISE- 30Marks

- **Course Objectives**

1. To provide the students the fundamental concepts of EHVAC system
2. To analyze the accessing techniques for lighting system.
3. To comprehend the different issues related to Power frequency voltage control.

- **Course Outcomes**

1. Student will able to analyze the EHVAC system.
2. Student will able to maintain/ Trouble shoot lightning arrester issues.
3. Student will able to design EHVAC Lines

SECTION-I

Unit 1 Introduction and Calculation of line and ground parameters (08Hrs.)

- **Prerequisite:**

Transmission line constants and their impacts

- **Objectives:**

1. To introduce to student Engineering Aspects and Growth of EHVAC Transmissionsystem.
2. To make student understand constants of EHVAC Transmission line with their impact analysis.

- **Outcomes:**

After completing this unit, student -

1. Can able to understand fundamentals of EHVAC transmission system.
2. Can calculate Resistance, inductance and capacitance of EHVAC transmission line.

- **Unit Content:**

Engineering aspects and growth of EHVAC, transmission line trends and preliminaries, Resistance of conductor, temperature rise properties of bundled conductors, inductance and capacitance calculation, sequence inductance and capacitance, line parameters for modes of propagation, resistance and inductance of ground return

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Numerical problems and derivations related Resistance, inductance and capacitance ofEHVAC transmission line.

Unit 2– Voltage gradient of conductors and Losses (06Hrs.)

- **Prerequisite:**

Concepts of electrostatics, potential, potential gradients.

- **Objectives:**

1. To make student understand charge potential relations for transmission lines.
2. To make student analyze impact of potential and voltage gradients.
3. To make student derive I^2R and corona loss.

- **Outcomes:**

After completing this unit, student –

1. Can understand charge potential relations for multi-conductor lines
2. Is able to calculate potential and voltage gradients on conductor lines and sub-conductors.
3. Can evaluate I^2R and corona loss

- **Unit Content:**

Electrostatics, field of sphere gap, charge potential relations for multi-conductor lines, surface voltage gradients on the conductor lines, surface voltage gradients on sub-conductors of bundle conductors, distribution of voltage gradients on sub-conductors of bundle, I2R and corona loss, corona loss formula, charge voltage diagram with corona, attenuation of travelling waves due to corona loss, audible noise, corona pulses, their generation and properties, limits for radio interference fields

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Numerical problems and derivation related to charge potential relations, voltage gradients,I^2R and corona loss.

Unit 3– Theory of travelling waves and standing waves (07Hrs.)

- **Prerequisite:**

Concepts of Time varying electromagnetic fields.

- **Objectives:**

1. To make student understand impact of frequency on the performance of EHVACtransmission line.
2. To make student apply concepts of electromagnetic theory and wave propagation.

- **Outcomes:**

After completing this unit, student –

1. Can identify the impact of power frequency and natural frequency on line performance.
2. Is able to apply concepts of electromagnetic theory and wave propagation

- **Unit Content:**

The wave at the power frequencies, differential and solution for general case, standing waves and natural frequencies, open ended line double exponential response, response to sinusoidal, excitation, line energization with trapped charge voltage, reflection and refraction of travelling waves

- **Content Delivery Methods:**

Chalk and talk, power point presentation, videos

- **Assessment Methods:**

Theory and derivation related to above Content.

SECTION -II

Unit 4 - Over voltage in EHV system covered by switching operations (08 Hrs.)

- **Prerequisite:**

Concept of line switching, voltage surge, switching surge.

- **Objectives:**

1. To make student understand concept of over voltage with its significance.
2. To make student capable to calculate switching surges.

- **Outcomes:**

After completing this unit, student –

1. Can understand over voltage with their types and impacts.
2. Can analyze the switching surges and its remedies.

- **Unit Content:**

Over voltage, their types, recovery voltage and circuit breaker, Ferro-resonance over voltages and calculation of switching surges- single phase equivalents, reduction of switching surges on EHV systems

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Numerical problems and derivation related to above Content.

Unit 5- Power frequency voltage control and over voltages (07 Hrs.)

- **Prerequisite:**

Power circle diagram, synchronous condenser

- **Objectives:**

1. To make student understand application of power circle diagram.
2. To make student understand need of voltage control and their ways.
3. To make student understand the requirement of reactive power compensation.

- **Outcomes:**

After completing this unit, student –

1. Can analyze the performance parameters through circle diagram.
2. Can give the solution for voltage control under the various power situations.

- **Unit Content:**

Generalized constants, charging currents, power circle diagram and its use, voltage control using synchronous condenser, sub-synchronous resonance in series capacitors compensated lines and static reactive compensating systems

- **Content Delivery Methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical questions and numerical related to above Content

Unit 6- Design of EHV-AC lines (06Hrs.)

- **Prerequisite:** basics of line construction
- **Objectives:**

4. To make student understand design procedure and design factors for EHVAC Lines.

- **Outcomes:**

After completing this unit, student –

1. Student will able to design EHVAC Lines

- **Unit Content:**

Introduction, design factors under steady state, design examples: steady state limits, line insulation design based upon transient over voltages

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Theoretical questions and numerical related to above Content

Text Books

1. Rakosh Das Begamudre," Extra high voltage AC transmission engineering", New Age Publication

ICA: -

There should be minimum 6 experiments on the above syllabus but nor restricted the following

1. Simulation of real and reactive power flow analysis in HVAC transmission line.
2. Simulation of VAR compensation for improvement of voltage in EHVAC line
3. Simulation for power system stability improvement of AC transmission line.
4. Simulation for comparison between Dc & AC transmission line over various performance parameters
5. Simulation for design of EHVAC transmission line.
6. Simulation for determination transmission line parameters
7. Simulation & analysis of power factor controllers for EHVAC line
8. Simulation for the study of performance of HVAC line.

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **B.Tech. Electrical Engineering** **Semester-I** **PROFESSIONAL ELECTIVE-II** **Power System Planning (EL 415.1)**

Teaching Scheme	**Examination Scheme**
Theory: - 3 Hrs/Week, 3 Credits	**ESE –** 70 Marks
Tutorial: - 1 Hr/Week, 1 Credit	**ICA -** 25Marks
	ISE- 30Marks

- **Course Objectives:**

1. This course makes the students conversant with different power system planning methods.
2. This course is intended to provide basic knowledge of different power system forecasting techniques.
3. It also aimed to provide different power system reliability evaluation.

- **Course Outcome:**

After completing this course, students can –

1. Explain the need of power system expansion.
2. Analyze the given power system for determining optimal values of decision variables.
3. Apply mathematical tools to solve multi-objective optimization problems in expansionplanning and reliability studies
4. Power System Planning and Reliability

SECTION-I

Unit 1 Load Forecasting Techniques **(06 Hrs.)**

- **Prerequisite:**

Terminologies and definition, Linear Algebra

- **Objectives:**

1. To make student understand load growth
2. To introduce to student the importance of planning.
3. To make student understand design concepts of expansion.

- **Outcomes:**

After completing this unit, student -

1. Can apply terminology used in planning.
2. Can apply practically design methods in expansion and planning.

- **Unit Content:**

Introduction, factors affecting Load Forecasting, Classification of Load and Its Characteristics, 6 Load Forecasting Methods, Weather sensitive load Forecasting, AnnualForecasting, Monthly Forecasting, and Total Forecasting

- **Content Delivery Methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical questions related to above Content.

Unit 2 System Planning and Distribution Automation (07 Hrs.)

- **Prerequisite:**

Different power generation system

- **Objectives:**

To make student understand different planning methods.

- **Outcomes:**

After completing this unit, student –

Can compare different methods of system planning.

- **Unit Content:**

Introduction, objectives and factors affecting to System Planning , Short Term Planning, Medium Term Planning, Long Term Planning

- **Content Delivery Methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical questions related to above Content.

Unit 3 Generation Planning and Cost Analysis (07 Hrs.)

- **Prerequisite:**

Different power generation system, Interconnected Network

- **Objectives:**

1. To make student understand different generation methods.
2. To make student understand different generation planning and cost analysis

- **Outcomes:**

After completing this unit, student

1. Can explain different methods of Generation Planning.
2. Can compare cost analysis of different generation methods.

- **Unit Content:**

Objectives and factors affecting Generation Planning, Generation Sources, Integrated Resource Planning, Generation System Model and Cost Analysis

- **Content Delivery Methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical questions related to above Content.

SECTION-II

Unit 4 Transmission Planning, Reliability and Quality (06 Hrs.)

- **Prerequisite:**

Different transmission system and Interconnected Network

- **Objectives:**

1. To make student understand different transmission planning.

To make student understand reliability and quality

- **Outcomes:**

After completing this unit, student –

1. Can explain different methods of transmission Planning.
2. Can understand reliability and quality of transmission system.

- **Unit Content:**

Introduction, Objectives of Transmission Planning, Network Reconfiguration, System and Load Point Indices, Data required for Composite System Reliability and quality

- **Content Delivery Methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical questions related to above Content.

Unit 5 Demand Side Management, Energy Conservation and Auditing (07 Hrs.)

- **Prerequisite:**

Different methods of Load Model

- **Objectives:**

1. To make student understand different load model
2. To make student understand energy audit and management.

- **Outcomes:**

After completing this unit, student –

1. Can explain different methods of load models.
2. Can apply energy audit and management techniques.

- **Unit Content:**

Introduction of DSM, use of DSM, Energy conservation and its importance, listing of energy conservation opportunities (ECOs), Definition, need of energy audit, types of energy audit, procedure of energy auditing

- **Content Delivery Methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical questions related to above Content.

Unit 6 Additional Topics Relating to New Developments (07Hrs.)

- **Prerequisite:**

Different methods of Load Model and power system planning

- **Objectives:**

To make student understand different load model and planning.

- **Outcomes:**

After completing this unit, student –

1. Can study new developments in Power System Planning and Reliability.

- **Unit Content:**

New algorithms and methods relating to power system planning, Load Forecasting, DSM and energy auditing

- **Content Delivery Methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical questions related to above Content.

Textbooks:

1. Robert L. Sullivan, Power System Planning, TMH, 1st Edition, 1977.
2. A.S. Pabla, Power System Planning, Macmillan India Ltd., 1st Edition, 1998.

References:

1. A.K. Mahalanabis, D.P. Kothari, S.I. Abson, Computer Aided Power System Analysis andControl, TMH, 1st edition, 1988
2. A.S. Pabla, Electric Power Distribution, McGraw Hill publication, 4th Edition, 1997.Research Papers.

ICA: Minimum six simulations/tutorials on above syllabus

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Tech. Electrical Engineering
Semester-I
PROFESSIONAL ELECTIVE-II
Smart Grid Technology (EL 415.2)

Teaching Scheme
Theory: - 3 Hrs/Week, 3 Credits
Practical: - 2 Hr/Week, 1 Credit

Examination Scheme
ESE – 70 Marks
ICA - 25Marks
ISE- 30Marks

- **Course Prerequisite:**

Student shall have knowledge of Power generation, transmission and distribution system.

- **Course Objectives:**

1. To provide an understanding of why Smart Grids are critical to the Sustainability andgrowth of India's electricity network.
2. To enable a shift from today's situation to the intelligent, profitable, efficient, Reliabl
3. To enable consumer orientated grid required to meet the challenges of the future withminimum impact to the environment.

- **Course Outcomes:**

Upon successful completion of this course, the students will be able to:

1. Understand the concept of Smart Grid
2. Understand working of main components involved in Smart Electric Grid
3. Analyze how electricity problem can be solved by Smart Electric Grid technology
4. Observe and find solution on power quality issues on Smart Electric Grid
5.

SECTION-I

Unit 1: The Smart Grid: **(06 Hrs.)**

- **Prerequisite:**

Concepts of electrical power transmission and distribution, Grid.

- **Objectives:**

1. To make students understand concept of smart grid
2. To provide an understanding of why Smart Grids are critical to theSustainability and growth of India's electricity network.

- **Outcomes:**

After completing this unit, student –

1. Can able to understand concept of smart grid
2. Can able to Understand working of main components involved in Smart Electric Grid.

- **Unit Content:**

Introduction, Why implement the Smart Grid now? , What is the Smart Grid? Overview of how Indian

power market is organized, operated and challenges being faced, Overview of thetechnologies required for the Smart Grid.

- **Content Delivery Methods:**

Chalk and talk, Video lectures

- **Assessment Methods:**

Theoretical questions related to above content.

Unit 2: Smart Grid Technologies: (08 Hrs.)

- **Prerequisite:**

Basic operation of electric meter, Tariff, Communication technologies

- **Objectives:**

1. To make students understand operation of automatic meter reading.
2. To make students understand applications of electronic devices in the smart electric grid.

- **Outcomes:**

After completing this unit, student –

1. Can able to understand operation of automatic meter reading.
2. Can able to find different applications of electronic devices in the smart electric grid.

- **Unit Content:**

Smart meters: An overview of the hardware used, Evolution of electricity metering, Key components of smart metering, Automatic Meter Reading(AMR), Demand-side integration, Substation automation equipment, Switching techniques, Communication channels, The ISO/OSI model, Communication technologies, Geographic Information System(GIS), Intelligent Electronic Devices(IED) & their application for monitoring &protection, Smart storage like Battery, Phase Measurement Unit(PMU).

- **Content Delivery Methods:**

Chalk and talk, Video lectures, Animations

- **Assessment Methods:**

Numerical and Theoretical questions related to above content

Unit 3: Electrifying rural India through Smart grid (07 Hrs.)

- **Prerequisite:** electric power generation and utilization.
- **Objectives:**

1. To make student understand Architecture for smart grids.

- **Outcomes:**

After completing this unit, student –

1. Can able to understand Architecture for smart grids

- **Unit Content:**

Electrifying India's rural community and the challenges being faced.(Developing technology and systems that will enable smarter rural electrification, Financing programmes, Virtual power plants, Solar power, Geothermic power), Smart Utilities (case studies), Presentation on the Smart Grid Maturity Model (SGMM), Architecture for smart grids.

- **Content Delivery Methods:**

Chalk and talk.

- **Assessment Methods:**

Numerical problems and Theoretical questions related to above content.

SECTION II

Unit 4: Power Quality Issues in Smart Grid (06 Hrs.)

- **Prerequisite:** basics of power quality problems.
- **Objectives:**

1. To make students understand power quality issues and their effects on the functioning ofsmart electric grid.
2. To make students understand importance of power quality monitoring and power qualityaudit.

- **Outcomes:**

After completing this unit, student –

1. Can able to understand power quality issues and its effects.
2. Can able to conduct power quality audit.

- **Unit Content:**

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

- **Content Delivery Methods:**

Chalk and talk, Video lectures, animations

- **Assessment Methods:**

Numerical problems and Theoretical questions related to above content.

Unit 5: Power electronics in the Smart Grid: (08 Hrs.)

- **Prerequisite:** operation of current source inverter, voltage source inverter and shunt compensation.
- **Objectives:**

1. To make students understand use of power electronic devices.
2. To make students analyze fault current limiting and shunt compensation using powerelectronics.

- **Outcomes:**

After completing this unit, student –

1. Can able to understand use of power electronic devices.
2. Can able to find fault current limiting parameters.

- **Unit Content:**

Introduction, Current source converters, Voltage source converters, Renewable energy generation, Fault current limiting, Shunt compensation, D-STATCOM, FACTS.

- **Content Delivery Methods:**

Chalk and talk, Video lectures, Animations

- **Assessment Methods:**

Numerical problems and Theoretical questions related to above content

Unit 6: Distribution management systems: (07 Hrs.)

- **Prerequisite:** basics of distribution system.
- **Objectives:**

1. To make students understand concept of distribution management system.
2. To make students analyze operating parameters of Energy management systems.

- **Outcomes:**

After completing this unit, student –

1. Can able to understand concept of distribution management system
2. Can able to conduct Energy management systems

- **Unit Content:**

Introduction, Data sources and associated external systems, Modelling and analysis tools, Energy management systems, Visualization techniques.

- **Content Delivery Methods:**

Chalk and talk, Video lectures, Animations

- **Assessment Methods:**

Numerical problems and Theoretical questions related to above content

Text Books:

1. Ali Keyhani, Mohammad N. Marwali, Min Dai "Integration of Green and Renewable Energyin Electric Power Systems", Wiley
2. Janaka Ekanayake, Kithsiri Liyanage, JianzhongWu, Akihiko Yokoyama, Nick Jenkins"SMART GRID TECHNOLOGY AND APPLICATIONS", Wiley
3. A. B. M. Shawkat Ali, "Smart Grids Opportunities, Developments, and Trends", Springer

Reference Books:

1. Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response",CRC Press
2. Peter S. Fox Penner, "Smart Power: Climate Changes, the Smart Grid, and the Future ofElectric Utilities", Island Press; 1 edition 8 Jun 2010
3. S. Chowdhury, S. P. Chowdhury, P. Crossley, "Microgrids and Active DistributionNetworks." Institution of Engineering and Technology, 30 Jun 2009
4. Gil Masters, Renewable and Efficient Electric Power System, Wiley-IEEE Press, 2004.
5. A.G. Phadke and J.S. Thorp, Synchronized Phasor Measurements and their Applications,Springer Edition, 2010.

ICA: Minimum Eight experiments based on above syllabus.

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **B.Tech. Electrical Engineering** **Semester-I** **PROFESSIONAL ELECTIVE-II** **Special Purpose Machines and its control (EL 415.3)**

Teaching Scheme	**Examination Scheme**
Theory: - 3 Hrs/Week, 3 Credits	**ESE –** 70 Marks
Tutorial: - 1 Hr/Week, 1 Credit	**ICA** - 25Marks
	ISE- 30Marks

- **Course Prerequisite:**

Student shall have knowledge of all conventional AC and DC machines.

- **Course Objectives:**

The course aims: -

1. To gain knowledge of operation and performance of synchronous reluctance motors.
2. To learn the operation and performance of stepping motors.
3. To understand operation and performance of switched reluctance motors.
4. To familiarize with operation and performance of permanent magnet brushless D.C. motors.
5. To illustrate operation and performance of permanent magnet synchronous motors.

Course Outcomes:

At the end of this course, students will be able to:

1. Reproduce principal of operation of PMSM, Stepper motor, SRM, Switch reluctance and linear motors.
2. Develop torque - speed and performance characteristics of above motors.
3. Enlist application of above motors.
4. Demonstrate various control strategies

Unit 1–Generalized Machine Theory (07Hours)

Energy in singly excited magnetic field systems, determination of magnetic force and torque from energy. Determination of magnetic force and torque from co-energy, Forces and torques in systems with permanent magnets. MMF of distributed winding, Magnetic fields production of EMFs in rotating machines.

Unit 2–Permanent Magnet Synchronous and brushless D.C. Motor Drives (07 Hours)

Synchronous machines with PMs, machine configurations. Types of PM synchronous machines Sinusoidal and Trapezoidal. EMF and torque equations Torque - speed characteristics, Concept of electronic commutation, Comparative analysis of sinusoidal and trapezoidal motor operations. Applications.

Unit 3–Control of PMSM Machine (07Hours)

abc-αβ and αβ-dq transformations, significance in machine modeling, Mathematical Model of PMSM (Sinusoidal), Basics of Field Oriented Control (FOC), Control Strategies: constant torque angle, unity power factor.

Unit 4–Reluctance Motor (07 Hours)

Principle of operation and construction of Switch Reluctance motor, Selection of poles and pole arcs, Static and dynamics Torque production, Power flow, effects of saturation, Performance, Torque speed characteristics, Synchronous Reluctance, Constructional features; axial and radial air gap motors; operating principle; reluctance torque; phasor diagram; motor characteristics Introduction to control of Reluctance Drive. Applications.

Unit 5– Stepper Motor **(07 Hours)**

Construction and operation of stepper motor, hybrid, Variable Reluctance and Permanent magnet, characteristics of stepper motor, Static and dynamics characteristics, theory of torque production, figures of merit; Concepts of lead angles, micro stepping, Applications selection of motor.

Unit 6–Electrical Machines **(07 Hours)**

Introduction to linear electric machines. Types of linear induction motors, Constructional details of linear induction motor, Operation of linear induction motor. Performance specifications and characteristics Applications.

ICA: Minimum Eight experiments based on above syllabus.

Text Books:

1. K. Venkatratnam, 'Special Electrical Machines', University Press
2. A.E. Fitzgerald Charles Kingsley, Stephen Umans, 'Electric Machinery', Tata McGraw Hill Publication
3. T.J.E. Miller, 'Brushless Permanent magnet and Reluctance Motor Drives' Clarendon Press, Oxford 1989
4. V. V. Athani, 'Stepper Motors: Fundamentals, Applications and Design', New age International, 1997.
5. P.S. Bhimbra, Generalized Theory of Electrical Machines

Reference Books:

1. R Krishnan, 'Permanent Magnet Synchronous and Brushless D.C. Motor Drives' CRC Press.
2. Ion Boldea, 'Linear Electric Machines, Drives and maglevs' CRC press.
3. Ion Boldea S. Nasar, 'Linear Electrical Actuators and Generators', Cambridge University Press

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Tech. Electrical Engineering
Semester-I
PROFESSIONAL ELECTIVE-II
Advance Electrical Drives (EL 415.4)

Teaching Scheme
Theory: - 3 Hrs/Week, 3 Credits
Tutorial: - 1 Hr/Week, 1 Credit

Examination Scheme
ESE – 70 Marks
ICA - 25Marks
ISE- 30Marks

- **Prerequisites:** Electrical Machines, Power electronics & Control System
- **Course Objective:**
  1. Provide the basics of DC and AC variable speed drives.
  2. Develop awareness for use of variable speed drives for various applications in Industry.
  3. Make the student aware of research avenues in the field of Electrical Drives.
- **Course Outcomes: Students' will be able to:**
  1. Technical expertise of electrical machines & drives
  2. Apply the knowledge to practical industrial systems
  3. Self-learning new technology of electrical drives
  4. Analyze and solve numerical problems on electrical drives.
  5. Describe the modern electric machines, drives, power converters, and control circuits for Specific application.

SECTION I

Unit 1 Characteristics of Electric Motors: (07 Hrs)

- **Prerequisite:**

Basic concepts from Electrical Machines, Speed control of Electric Machines.

- **Objectives:**
  1. To make students to understand dynamics of electric drives
  2. To make students to understand Steady State Stability
- **Outcomes:**

After completing this unit, student –
  1. Able to apply the concepts of Electrical Drive
  2. Able to understand dynamics of Electric Drives
  3. Able to understand Steady State Stability & Load equalization
- **Unit Content:**

Characteristics of DC motors, 3-Phase induction motors and synchronous motors, startingand braking of electric motors. Dynamics of Electric Drives, Mechanical system, Fundamental torque equations, components of load torque, Dynamic conditions of a drivesystem, Energy loss in transient operations, Steady State Stability, Load equalization

Unit 2 DC Motor Drives: **(07 Hrs)**

- **Prerequisite:**

Basic relations & characteristics of DC motor, conventional speed control methods of DC motors, basic knowledge of rectifier and chopper operation etc.

- **Objectives:**

1. To make students to understand the speed control of DC motors using power electronicconverters such rectifiers, Choppers etc
2. To make student to understand the real time application of these methods.

- **Outcomes:**

After completing this unit, student –

1. Would understand the converter fed DC motor speed control techniques.
2. Would perform the practical using different speed control methods.
3. Would be able to get the real time application of converter fed DC motor.

- **Unit Content:**

Starting, Braking and Speed Control, Transient analysis of separately excited motor with armature and field control, Energy losses during transient operation, Phase controlled converter fed DC drives, Dual-converter control of DC drive, Supply harmonics, Power factor and ripple in motor current, Chopper Control DC drives, Source current harmonic in choppers.

Unit 3 Induction Motor Drives: **(07 Hrs)**

Prerequisite:

Basic relations & characteristics, basic knowledge of inverter operation etc.

- **Objectives:**

1. To make students to understand the speed control of induction motor using powerelectronic converters such as inverters.
2. To make students to perform the various speed control methods of induction motorsusing different converters.
3. To make student to understand the real time application of these methods.

- **Outcomes:**

After completing this unit, student –

1. To make students understand the inverter fed induction motor speed control techniques.
2. To make students able to get the real time application of inverter fed induction motor.

- **Unit Content:**

Starting, Braking and transient analysis, Calculation of energy losses, Speed control, Stator voltage control, Variable frequency control from voltage and current sources, Slip power recovery-Static Scherbius and Cramer drives.

SECTION II

Unit 4 Synchronous Motor Drives: (07 Hrs)

- **Prerequisite:**

Basic relations & characteristics of synchronous motors & Brushless DC motors,

- **Objectives:**

1. To make the students to understand idea of synchronous motor Basic relations &characteristics
2. To make the students to understand VSI fed synchronous motor speed control.

To make the students to understand Brush less DC Motor drives operation

- **Outcomes:**

After completing this unit, student –

1. Would understand basic relations & characteristics of synchronous motor
2. Would understand VSI fed synchronous motor operation & performance.
3. Would understand brushless DC motor drive operation.

- **Unit Content:**

Starting, Pull in and braking of synchronous motors, Speed control– variable frequency control, cycloconverters control, Brushless DC Motor, Linear Induction Motor, Stepper Motor and Switched Reduction Motor Drives, Important features and applications.

Unit 5 Energy Conservation in Electrical Drives: (07 Hrs)

- **Prerequisite:**
- **Objectives:**

1. To make the students to understand losses in electrical drive system
2. To make the students to understand measures for energy conservation in electric drives

- **Outcomes:**

After completing this unit, student –

1. Would understand losses in electrical drive system
2. Would understand measures for energy conservation in electric drives

- **Unit Content:**

Losses in electrical drive system, Measures for energy conservation in electric drives, Use of efficient motor, Energy efficient operation of drives, Improvement of power factor and quality of supply.

Reference Books:

1. G. K. Dubey : Fundamentals of Electrical Drives, 2nd Edition, Alpha Science International,2001.
2. S. B. Dewan, Gordon R. Slemon and A. Straughen: Power Semiconductor Drives, John WileyPub.1996.
3. R. Krishnan: Electric Motor drives - Modelling, Analysis and Control, PHI India Ltd., 2002.
4. W. Shepherd, D. T. W. Liang and L.N. Hulley: Power Electronics and Motor Control, 2ndEdition, Cambridge Univ. Press, 1995.

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **B.Tech. Electrical Engineering** **Semester-I** **PROFESSIONAL ELECTIVE-II** **Advanced Applications in Solar Energy Technology (EL 415.5)**

Teaching Scheme	**Examination Scheme**
Theory: - 3 Hrs/Week, 3 Credits	**ESE –** 70 Marks
Tutorial: - 1 Hr/Week, 1 Credit	**ICA -** 25Marks
	ISE- 30Marks

- **Prerequisite:**

Knowledge of solar Energy

Unit- 1 Introduction **(08 Hrs.)**

- **Unit Content:**

Introduction to advanced solar energy applications. Thermal comfort; Sun motion. Solar water heating: Water heating systems; Freezing, boiling & scaling. Auxiliary energy; Forced-circulation systems. Natural-circulation systems; Integral collector storage systems. Water heating in space heating and cooling systems; Swimming pool heating. Hot water industrial process heat system.

- **Content Delivery Methods:**

Chalk and talk, power point presentations.

- **Assessment Methods:**

Theory questions related to above content.

Unit- 2 Solar based Building Heating & Cooling: **(08 Hrs.)**

- **Unit Content:**

Passive Heating of Buildings: Direct Gain, Thermal storage wall, Sunspaces, Thermal storage roof, Convective loop. Passive cooling of buildings: Shading, ventilation, evaporation, radiation cooling, ground coupling, dehumidification. Building heating-Hybrid methods: Solar active heating of buildings: General aspects, Components of solar heating system (solar collector, thermal storage system, Auxiliary heat supply system, and control systems). Three ways of solar space heating: solar air systems, solar liquid systems, and solar heat pump systems.

- **Content Delivery Methods:**

Chalk and talk, power point presentations.

- **Assessment Methods**

Theory questions related to above content.

Unit- 3 Solar Refrigeration and Air conditioning: **(08 Hrs.)**

- **Unit Content:**

Carnot refrigeration cycle. Solar absorption cooling: Principle of absorption cooling, Basics of absorption cooling, LiBrH2O absorption system, H2O-NH3 absorption system, Intermittent absorption

refrigeration system. Solar Vapour Compression Refrigeration. Solar Desiccant Cooling: Triethylene glycol open-cycle air conditioning system using solar air heating collectors for regeneration, LiCl-H2O open-cycle cooling system. Ventilation desiccant cycle and Recirculation desiccant cycle. Solar thermoelectric refrigeration and air-conditioning.

- **Content Delivery Methods:**

Chalk and talk, power point presentations.

- **Assessment Methods:**

Theory questions related to above content.

Unit- 4 Solar Drying of Food & Solar Desalination: (08 Hrs.)

- **Unit Content:**

Basics of solar drying. Types of solar dryers: Natural convection or Direct type solar dryers. Forced circulation type dryers: Hybrid dryer, Bin type grain dryer, solar timber drying. Hot air industrial process heat system. Solar Desalination: Simple solar still, Basics of solar still, material problems in solar still, Performance prediction of Basin-Type still. Wick type solar still. Multi-stage solar still. Active solar still. Future material advancements.

- **Content Delivery Methods:**

Chalk and talk, power point presentations.

- **Assessment Methods:**

Theory questions related to above content.

Unit -5 Solar Photovoltaic Power Applications: (08Hrs)

- **Unit Content:**

Rooftop Solar PV Systems: Introduction, system components, typical schematic diagram of rooftop solar PV systems, costing, net-metering of rooftop grid connected system, system performance analysis (Performance Ratio and Levelized Cost of Electricity). Solar PV water pumping system. Solar PV battery charging system. Solar PV street lighting system. Floating solar PV systems.

- **Content Delivery Methods:**

Chalk and talk, Videos

- **Assessment Methods:**

Theory questions related to above content.

Text books:

1. Chetan S. Solanki., “Solar Photovoltaic: Fundamentals, Technologies and Application”.
2. S. P. Sukhatme and J. K. Nayak, “Solar Energy: Principles of Thermal Collection and Storage”.
3. J. A. Duffie and W. A. Beckman, “Solar Engineering of Thermal Process”.
4. H. P. Garg and J. Prakash, “Solar Energy: Fundamentals and Applications”

References:

2. Twidell & Wier, “Renewable Energy Resources”, CRC Press (Taylor & Francis)
3. Ramesh & Kumar “Renewable Energy Technologies”, Narosa

4. G D Rai “Non-Conventional Energy Sources”, Khanna Publications
5. Tiwari and Ghosal “Renewable energy resources”, Narosa.
6. D.P.Kothari, K.C.Singhal, “Renewable energy sources and emerging technologies”, P.H.I.

ICA: Minimum six tutorials on the above syllabus

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **B.Tech. Electrical Engineering** **Semester-I** **PROFESSIONAL ELECTIVE-II** **Electric and Hybrid Vehicle (EL 415.6)**

Teaching Scheme	**Examination Scheme**
Theory: - 3 Hrs/Week, 3 Credits	**ESE –** 70 Marks
Tutorial: - 1 Hr/Week, 1 Credit	**ICA -** 25Marks
	ISE- 30Marks

Course Objectives: The students will be able to

1. To gain knowledge of Li-ion battery protection.
2. To learn HEV Subsystems and Configurations
3. To understand Mathematical Model of Li-ion battery.
4. To familiarize with Hybridization of drive trains.
5. To learn Star Labeling Schemes for Li-ion Packs

Course Outcomes: After completing the course, the students will be able to

At the end of this course, students will be able to:

1. Analyze the Life Cycle Assessment of Li-ion battery.
2. Describe the different types of Li-ion charging methods
3. Comprehend the knowledge of drive train hybridization.
4. Evaluate EV motor sizing.
5. Classify Battery Recycling methods.

SECTION I

UNIT 1: Li-ion Battery **(07 Hours)**

Materials used for Li-ion battery, Nanostructured Electrode Materials for Li-Ion Batteries, Li-ion battery protection, Wireless charging of EV, Life Cycle Assessment of Li-ion battery, Solid-state Battery, Panasonic 18650 & 2170 cell.

UNIT 2: Battery Charging and modelling **(07 Hours)**

TSCC/CV charging and CVCC/CC charging of Li-Ion battery, BMS standards, SoC Estimation methods (Kalman Filter, Neural Network, Fuzzy logic), Public EV charging stations, Solar Powered Charging Stations, Modeling of Lithium-ion batteries, Thermal Modeling of Li-ion battery.

UNIT 3: Electric Vehicle Technologies **(07 Hours)**

Battery Swapping System, EV Fleet Management, Sensors for Electric Vehicles Electric bus, Electric trucks, Fuel cell vehicles, Introduction of EV Subsystems and Configurations, Energy management

strategies and its general architecture.

SECTION II

UNIT 4: Plug-In Hybrid Electric Vehicles (07 Hours)

Hybridization of drive trains in HEVs, Hybridization of energy sources in EVs, Power Flow control in hybrid drive train topologies, Power Management Strategies in HEV, Introduction of HEV Subsystems and Configurations, Vehicle Dynamics Fundamentals and HEV Modeling (Series Hybrid), Fuel

UNIT 5: EV Components Design (07 Hours)

Criteria for battery selection, Forces on EV calculation, Power for EV calculation, Sizing the Power Converter, Sizing of Electric Machine for EVs and HEVs, Motor Torque Calculation, Induction motor control, PMSM motor control, Battery pack design, In vehicle networks- CAN

UNIT 6: Electric Vehicle Policies and Startups (07 Hours)

FAME-II Policy , Charging Infrastructure for Electric Vehicles - Revised Guidelines and Standards , Star Labeling Schemes for Li-ion Packs- BEE India, EV Tariff, EV Startup examples, Li-ion Battery Recycling Policy and Standards

ICA: Minimum six tutorials on the above syllabus

Text Books:

1. Energy Systems for Electric and Hybrid Vehicles Edited by K.T. Chau
2. Iqbal Hussain, "Electric & Hybrid Vehicles – Design Fundamentals", Second Edition, CRC Press, 2011
3. Electric and Hybrid Vehicles by Tom Denton

Reference Books:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.
2. Mehrdad Ehsani, Yimin Gao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010
3. James Larminie, "Electric Vehicle Technology Explained", John Wiley & Sons, 2003..
4. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric andFuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
5. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
6. B D McNicol, D A J Rand, "Power Sources for Electric Vehicles", Elsevier publications, 1st Edition, 1998.
7. Chris Mi, M. Abul Masrur Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives, 2nd Edition Wiley, 2017.
8. Seth Leitman, "Build Your Own Electric Vehicle" MC Graw Hill, 1st Edition, 2013.

SEMESTER-II

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **B.Tech. Electrical Engineering** **Semester-II** **SELF-LEARNING MODULE--III** **Electrical Estimation, Installation Testing and Maintenance (EL 421.1)**

Teaching Scheme	**Examination Scheme**
Theory: -2 Credits	**ESE –** 50 Marks

- **Course Objectives**

1. To understand testing and maintenance of various electrical equipment
2. To provide sufficient knowledge of installation & testing of electrical equipment's andswitch-gears.
3. To understand various provision under IE rules.
4. To make student can understand the concept of various test.

- **Course Outcomes**

1. Student able to learn the testing and maintenance of various electrical equipment's
2. Student should take due care in the installation of electrical equipment's,
3. Student should take due care while observing IE rules.
4. To make student can perform various test.

SECTION-I

Unit 1 Safety and Prevention of Accidents **(05 Hrs.)**

- **Prerequisite:**

Safety, basic idea about shock treatment

- **Objectives:**

1. To make student understand terminology used in safety
2. To introduce to student methods of providing artificial respiration
3. To make student understand operation of fire extinguishers

- **Outcomes:**

After completing this unit, student

1. Can apply terminology used in safety.
2. Can apply practically methods of providing artificial respiration.
3. Can know the operation of fire extinguishers.

- **Unit Content:**

Definition of terminology used in safety; safety, hazard, accident, major accident hazard, responsibility, authority, accountability, monitoring, I.E. Act & statutory regulations for safety of persons & equipment's working with electrical installation, Do's & don'ts for substation operators as listed in IS, Meaning & causes of electrical accidents, factors on which severity of shock depends, Procedure for rescuing the person who has received an electric shock, methods of providing artificial respiration,

Precautions to be taken to avoid fire due to electrical reasons, operation of fire extinguishers

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Theoretical questions on above content

Unit 2– Estimating and Conductor Size Calculations (05 Hrs.)

- **Prerequisite:**

Various types of conductors used in transmission line and current carrying capacity

- **Objectives:**

1. To make student understand various steps to form an estimate.
2. To make student analyze conductor size calculations for wiring and cables.

- **Outcomes:**

After completing this unit, student –

1. Is able to write the various steps to form an estimate.
2. Can evaluate conductor size for wiring and cables.

- **Unit Content:**

Estimating Meaning, Various steps to form an estimate, Price catalogue, Schedule of labour rates, Schedule of rates and estimating data, determination of conductor size, current carrying capacity, voltage drop, minimum permissible size, conductor size calculations for internal domestic wiring, simple numerical, Conductor size calculation for underground cables, Simple numerical, Conductor size calculations for overhead lines with A.C.S.R. conductors, simple numerical

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Numerical problems on Conductor size calculation, Theoretical questions on various steps to form an estimate

Unit 3- Electrical Installation (05 Hrs.)

- **Prerequisite:**

Basics of foundation

- **Objectives:**

1. To introduce to student various factors for machine foundation
2. To make student understand procedure for leveling and alignment.
3. To introduce to student the use of various tools and devices for loading and unloading

- **Outcomes:**

After completing this unit, student –

1. Can understand various factors for machine foundation
2. Can understand procedure for leveling and alignment.
3. Can understand the use of various tools and devices for loading and unloading

- **Unit Content:**

Factors involved in designing the machine foundation, Requirement of different dimension of foundation for static & rotating machines, procedure for leveling & alignment of two shafts of directly & indirectly coupled drives, effects of misalignment, Installation of rotating machines as per I.S.900-1992, Importance and purpose of earthing, types of earthing- Pipe and Plate Earthing.

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Theoretical questions related to above Content.

SECTION-II

Unit 4– Testing of Rotating Machines, Transformer and Insulation (05 Hrs.)

- **Prerequisite:**

Working of Transformer and Rotating Machine, Name of the insulating materials, importance of insulating material in electrical equipment

- **Objectives:**

1. To make student learn objectives of testing.
2. To make student learn the concepts of routine tests, type tests, special tests,supplementary test.
3. To make student capable to perform the different tests on the transformers.
4. To make student understand different properties of insulating material.
5. To make student understand various tests on the insulating materials.

- **Outcomes:**

After completing this unit, student –

1. Can understand objectives of testing.
2. Is able to understand necessity of routine tests, type tests, special tests, supplementarytest.
3. Can make the connections of different tests of transformer.
4. Can solve the theoretical questions based on given syllabus
5. Can write the procedure for various test of insulation
6. Is able to prepare routine, preventive & breakdown maintenance schedule.
7. To make student can perform Direct, Indirect and regenerative test.

- **Unit Content:**

Objectives of testing, significance of I.S.S., test on electrical machines before commissioning, concept of routine tests, type tests, special tests, supplementary test on transformer and rotating machine, induced over voltage and Impulse voltage withstand test of transformer, Classification of insulating materials as per I.S.8504 (part III) 1994, factors affecting life of insulating materials, Properties of good transformer oil, list the agents which contaminates the insulating oil, understand the procedure of following tests on oil as per I.S. 1692-1978 a) acidity test b) flash point test c) crackle test d) sludge test.

- **Content Delivery Methods:**

Chalk and talk, power point presentation, videos

- **Assessment Methods:**

Theoretical questions related to above content.

Unit 5- Maintenance of Rotating Machines, Transformer and Insulation (05 Hrs.)

- **Prerequisite:**

Working of Transformer and Rotating Machine, various types of transformers.

- **Objectives:**

1. To make student understand the concept of routine, preventive & breakdown maintenance of rotating machine
2. To make student understand the maintenance schedule of transformer
3. To make student understand the cleaning methods of insulation

- **Outcomes:**

After completing this unit, student –

1. Is able to prepare routine, preventive & breakdown maintenance schedule.
2. Can prepare the maintenance schedule of transformer
3. Can write the procedure for cleaning methods of insulation

- **Unit Content:**

Concept of routine, preventive & breakdown maintenance, comparison of Preventive and breakdown maintenance, comparison of routine and break down maintenance, procedure for developing preventive maintenance schedule, Factors affecting on preventive maintenance schedule, Introduction to total productive maintenance, Routine, Preventive maintenance of transformer, Methods of cleaning the insulation covered with loose dust, sticky dirt and oily viscous films, procedure for drying of insulation & varnishing insulation, Methods of varnishing of insulation (hot dip method & vacuum impregnation).

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Theoretical questions on above content.

- **Text books:**

1. S. Rao “Testing & Commissioning Of Electrical Equipment “,Khanna Publishers
2. B .V. S. Rao, “Testing & Commissioning Of Electrical Equipment”, Media Promoters and Publication Pvt., Ltd.

- **References:**

1. Uppal .S. L – Electrical Wiring, Estimation & Costing (Khanna Publication).
2. Raina & Bhattacharaya – Electrical Design Estimating & Costing (Willy Estern).
3. Relevant Bureau of Indian Standards
4. H. N. S. Gowda, “A Handbook on Operation and Maintenance of Transformers”,Published by H. N. S. Gowda

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **B.Tech. Electrical Engineering** **Semester-II** **SELF-LEARNING MODULE--III** **Mechatronics (EL 421.2)**

Teaching Scheme	**Examination Scheme**
Theory: -2 Credits	**ESE –** 50 Marks

SECTION-I

Unit 1–Fundamentals: **(05 Hrs.)**

- **Unit Content:**

Objective, scope and outcome of the course, Introduction to Mechatronics system- key element Mechatronics Design process- Types of design-Design Parameter-Traditional and Mechatronics designs-

Content Delivery Methods:

Chalk and talk, power point presentations

- **Assessment Methods:**

Theoretical questions on above content

Unit 2–System Modelling: **(05 Hrs.)**

- **Unit Content:**

Introduction-model categories-fields of application-model development-model verification-model validation-model simulation-design of mixed systems-electro mechanics design model transformation-domain-independent description forms simulator coupling

- **Content Delivery Methods:**

Chalk and talk, power point presentation, videos

- **Assessment Methods:**

Theoretical questions on above content

SECTION-II

Unit 3 System Interfacing: **(05 Hrs.)**

- **Unit Content:**

Introduction-selection of interface cards-DAQ card-single channelmultichannal-RS232/422/485 communication- IEEE 488 standard interface-GUI card-GPIB-Ethernet switch -Man machine interface.

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Theoretical questions on above content

Unit 4- Case Studies of Mechatronics System: (05 Hrs.)

- **Unit Content:**

Introduction-Fuzzy based washing machine-pH control system- Autofocus Camera, exposure control-Motion control using D.C. Motor & Solenoids-Engine management systems. Controlling temperature of a hot/cold reservoir using PID Control

- **Content Delivery Methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical questions related to above Content.

Unit 5- Micro Mechatronics System: (5 Hrs.)

- **Unit Content:**

Introduction- System principle - Component design – System design scaling laws- Micro actuation-Micro robot- Micro pump - Applications of micro-Mechatronics components.

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**

Theoretical questions related to above Content.

Text books:

1. Devadas Shetty, Richard A.Kolkm, "Mechatronics system design, PWS publishing company, 2009.
2. Bolton, "Mechatronics – Electronic control systems in mechanical and electrical engineering, 2 nd edition, Addison Wesley Longman Ltd., 2009.
3. Brian morriss, "Automated manufacturing Systems – Actuators Controls, sensors and Robotics", McGraw Hill International Edition, 2000.
4. Bradley, D. Dawson, N.C.Burd and A.J. Loader, "Mechatronics: Electronics in product and process", Chapman and Hall, London, 1999

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Tech. Electrical Engineering
Semester-II
SELF-LEARNING MODULE--III
Alternate Energy Systems (EL 421.3)

Teaching Scheme
Theory: -2 Credits

Examination Scheme
ESE – 50 Marks

- **Course Prerequisite:**

Awareness about energy resources, concept of conversion process

- **Course Objectives**

This course aims to:

1. Develop a fundamental understanding of solar thermal and photovoltaic systems.
2. Provide the knowledge of development and operation of wind energy system
3. Discuss bio-energy resource assessment.
4. Introduce different storage systems, Integration and Economics of Renewable Energy Systems.

- **Course Outcomes**

At the end of this course, students will be able to:

1. Analyze the performance of solar thermal and photovoltaic systems.
2. Determine wind turbine performance.
3. Explain and evaluate biomass resources in an Indian context.
4. Illustrate the importance of storage systems.
5. Analyze the economics of renewable energy sources.

SECTION-I

Unit-1 Solar Energy-I **(05 Hrs.)**

Unit contents:

Solar radiation at the earth's surface, Solar constant, Spectral distribution, Extraterrestrial Radiation, Solar Terrestrial Radiation, Solar radiation geometry, Computation of cosθ for any location having any orientation, Empirical equations for predicting the availability of solar radiation: Monthly average daily and hourly global and diffuse radiation, Beam and Diffuse radiation under cloudless skies, Solar radiation on tilted surfaces Introduction to concentrating solar power (CSP) plants using technologies like a) Parabolic troughs b) Linear Fresnel reflector, c) Parabolic Dish, etc.

- **Content delivery methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical Questions related to above contents

Unit-2 Solar Energy-II: (05Hrs.)

- **Unit contents:**

Tracking, Peak Power Point Operation, Electrical characteristics of Silicon PV Cells and Modules, PV System Components, Efficiency of PV system, MPPT of solar system, PV system design for various applications (residential, commercial and industrial)

Content delivery methods:

Chalk and talk, power point presentation

Assessment Methods:

Theoretical Questions related to above contents

Unit-3 Wind Energy (05 Hrs.)

Unit contents:

Power Contained in Wind, Conversion, the maximum energy obtained for a Thrust-operated converter (Efficiency limit), Design of Wind Turbine Rotor, Power-Speed Characteristics, Torque-Speed Characteristics, Wind Turbine Control Systems: Control Strategy, Wind Speed Statistics, Statistical Wind Speed Distributions, Site and Turbine Selection, Extraction of wind energy and wind turbine power. Introduction to Offshore Wind Energy System and its comparison with Wind Energy System,

Content delivery methods:

Chalk and talk, power point presentation

Assessment Methods:

Theoretical Questions related to above contents

SECTION-II

Unit-4 Biomass Energy: (05 Hrs.)

- **Unit contents:**

Biomass Classification, Biomass Resources and their Energy Potential, Biomass Conversion Technologies: Anaerobic Digestion, Ethanol Fermentation, Biomass Gasification: Gasifiers, Fluidized Bed Gasifier, Biogas Technologies and their factor affecting Biogas Production, Biogas Plants: Floating and Fixed Dome type, designing of biogas plant, Introduction to Biodiesel, Power Generation from Municipal Solid Waste (MSW), Landfill Gas, Liquid Waste.

- **Content delivery methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical Questions related to above contents

Unit- 5 Integration of RES (05 Hrs.)

- **Prerequisite:**

Terms related to economics

- **Objectives:**

1. To introduces Demand side management.
2. To introduces role of renewable energy sources in energy management.

- **Outcomes:**

After completing this unit

1. Students should able to write case study on industry/institute etc.
2. Can able to understand financial constraints.

- **Unit contents:**

A. Integration of RES with grid, Grid codes.

B. Economics of RES: Simple, Initial rate of return, time value, Net present value, Internal rate of return, Life cycle costing, Effect of fuel Escalation, Annualized and levelized cost of energy.

- **Content delivery methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical Questions related to above contents

Text Books:

1. Chetan Singh Solanki, "Solar Photovoltaics-Fundamentals, Technologies and Applications", PHI Second Edition
2. Godfrey Boyle, "Renewable Energy", Third edition, Oxford University Press
3. H. P. Garg, J. Prakash, "Solar Energy-Fundamentals and Applications", Tata McGraw hill Publishing Co. ltd., First Revised Edition.
4. Mukund R. Patel, "Wind and Power Solar System", CRC Press

Reference Books:

1. D.P.Kothari, K.C.Singal, Rakesh Rajan,"Renewable Energy Sources and Emerging Technologies", PHI Second Edition
2. Tapan Bhattacharya, "Terrestrial Solar Photovoltaics", Narosa Publishing House
3. Paul Gipe, "Wind Energy Comes of Age", John Wiley & Sons Inc.
4. Donald L.Klass, "Biomass for Renewable Energy, Fuels, and Chemicals, Elsevier, Academic Press
5. Thomas Ackermann, "Wind Power in Power Systems", Wiley Publications.

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **B.Tech. Electrical Engineering** **Semester-II** **SELF-LEARNING MODULE--III** **(EL 421.4)**

Teaching Scheme	**Examination Scheme**
Theory: -2 Credits	**ESE –** 50 Marks

Students can select & enroll for an approved minimum eight-week technical course from various NPTEL/SWAYAM technical courses, Or any other approved MOOC platform, complete its assignments and appear for a certification examination conducted by NPTEL, SWAYAM Or respective MOOC platform.

BOS Chairman / Coordinator will announce the list of approved NPTEL/MOOC online courses/areas of minimum eight weeks duration for 'Self Learning Module-III' from the available NPTEL/SWAYAM/MOOC courses and will make them available to students through the University website.

List of approved NPTEL/MOOC online courses/areas of minimum **eight weeks** duration based on following areas

- Electric Vehicles
- Renewable energy
- Automation and Robotics
- Artificial intelligence
- Machine Learning and Deep Learning
- Sustainable Power System
- Advance Power Electronic and Control
- Design of Photovoltaic system
- Advance Electrical Drives
- Research Methodology

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Tech. Electrical Engineering
Semester-II
SELF-LEARNING MODULE--IV
Electrical Energy Audit and Management (EL 422.1)

Teaching Scheme
Theory: -2 Credits

Examination Scheme
ESE – 50 Marks

- **Course Prerequisite:**

Awareness about energy sources, Awareness about energy management. Concept of Demand Management, Concept of Tariff

- **Course Objectives**
  1. Understanding importance of Energy and Energy security
  2. Understand impact of use energy resources on environment and emission standards,different operating framework
  3. Follow format of energy management, energy policy
  4. Learn various tools of demand Control
  5. Calculate economic viability of energy saving option
- **Course Outcomes**
  1. Analyze and understand energy consumption patterns and environmental impacts and mitigation method.
  2. Listing various energy conservation measures for various processes.
  3. Students can carry out preliminary audits.

SECTION-I

Unit-1 Energy Scenario **(06 Hrs.)**

- **Prerequisite:**

Awareness about energy sources

- **Objectives:**
  1. To introduces the type of energy(s) with relation to energy scenario.
  2. To introduces energy conservation clause(s)
- **Outcomes:**

After completing this unit
  1. Students should able to explain the given type of energy(s) with relation to energy scenario.
  2. Students can Interpret the given energy conservation clause(s)
  3. Students should understand the given IE rules
  4. Can Explain Energy Conservation Act and Electricity act.

Unit contents:

Classification of Energy resources, Conventional and non-conventional, primary and secondary

sources, commercial energy production, final energy consumption, Energy needs of growing economy, short terms and long terms policies, energy sector reforms, distributionsystem reforms and up-gradation, energy security, importance of energy conservation, energy and environmental impacts, emission check standard, United nations frame work convention on climate change, Global Climate Change Treaty, Kyoto Protocol, Clean Development Mechanism, salient features of Energy Conservation Act 2001 and ElectricityAct 2003.Indian and Global energy scenario, Introduction to IE Rules, Study of Energy Conservation Building Code (ECBC), Concept of Green Building

- **Content delivery methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical Questions related to above contents

Unit-2 Energy Management: (05 Hrs.)

- **Prerequisite:**

Awareness about energy management

- **Objectives:**

1. To introduces management strategy
2. To introduces energy manager skills and duties

- **Outcomes:**

After completing this unit

1. Students should able to management strategy.
2. Can able to explain energy manager skills and duties
3. Students should able to understand the elements of an effective energy managementprogram.

- **Unit contents:**

Definition and Objective of Energy Management, Principles of Energy management, Energy Management Strategy, Energy Manager Skills, key elements in energy management, force field analysis, energy policy, format and statement of energy policy, Organization setup and energy management. Responsibilities and duties of energy manager under act 2001. Energy Efficiency Programs, Energy monitoring systems,

Content delivery methods:

Chalk and talk, power point presentation

Assessment Methods:

Theoretical Questions related to above contents

Unit-3 Demand Management (05 Hrs.)

Prerequisite:

Concept of Demand Management, Concept of Tariff

Objectives:

1. To introduces Demand side management.
2. To introduces role of renewable energy sources in energy management.

Outcomes:

After completing this unit

1. Students should able to understand the concept of Demand side management
2. Students should able to understand importance of power factor

Unit contents:

Supply side management (SSM), various measures involved such as use of FACTS, Generation system up gradation, constraints on SSM. Demand side management (DSM), advantages and Barriers, implementation of DSM, areas of development of demand side management in agricultural, domestic and commercial consumers. Demand management through tariffs (TOD), Power factor penalties and incentives in tariff for demand control, Apparent energy tariffs, Role of renewable energy sources in energy management.

Content delivery methods:

Chalk and talk, power point presentation

Assessment Methods:

Theoretical Questions related to above contents

SECTION-II

Unit-4 Energy Audit: **(05 Hrs.)**

Prerequisite:

Concept of General Audit, Terms of Audit

Objectives:

1. To introduces energy management program.
2. To know contents for audit report writing.

- **Outcomes:**

After completing this unit

1. Students should able to understand the concept of energy flow
2. Can able to understand the need of audit.

- **Unit contents:**

Definition, need of energy audit, types of audit, procedures to follow, data and information analysis, energy audit instrumentation, energy consumption – production relationship, pie charts. Sankey diagram, Cusum technique, least square method and numerical based on it. Outcome of energy audit and energy saving potential, action plans for implementation of energy conservation options. Bench-marking energy performance of an industry. Energy Audit Report writing as per prescribed format.

- **Content delivery methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical Questions related to above contents

Unit-5 Energy conservation in application: (05 Hrs.)

- **Prerequisite:**

Concept of conservation.

- **Objectives:**

1. To know about energy conservation.
2. To know areas of energy conservation.

- **Outcomes:**

After completing this unit

1. Students should able to understand the need of energy conservation
2. can able to understand different challenges in energy conservation.

- **Unit contents:**

a) Motive power (motor and drive system). b) Illumination c) Heating systems (boiler and steam systems) c) Ventilation (Fan, Blower, Compressors) and Air Conditioning systems d) Pumping System e) Cogeneration and waste heat recovery systems f) Utility industries (T and D Sector) g) Diesel generators

- **Content delivery methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical Questions related to above contents

Text Books:

1. Energy Auditing in Electrical Utilities by Rajiv Shankar
2. Energy Management And Conservation by Shrama K V, P. Venkataseshaiah, I K International
3. Handbook on Energy Audit and Environment Management", by Abbi Y.P. and Shashank Jain, The Energy and Resources Institute, TERI
4. Diwan, P., Energy Conservation, Pentagon Press (2008).

Reference Books:

1. Energy Audit and Management 1st Edition 2022 by L. Ashok Kumar and Ganesan, Gokul, CRC Press
2. Handbook Of Energy Audits 9th Edition (Hb 2013) by Albert Thumann, Terry Niehus and William J Younger, Taylor & Francis Publisher
3. Energy Audit Approach for Beginners: A Practitioner's guide for Energy Manager & Auditors, by S Babu & M Karthikkaruppu
4. Energy Efficiency and Management for Engineers, 1st Edition, Mehmet Kanoğlu and Yunus A. Çengel, McGraw-Hill Education

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Tech. Electrical Engineering
Semester-II
SELF-LEARNING MODULE--IV
High Voltage DC Transmission (EL 422.2)

Teaching Scheme
Theory: -2 Credits

Examination Scheme
ESE – 50 Marks

- **Course Prerequisite:**

Electrical Power System I and II. The knowledge of Power Electronics is additionally required.

- **Course Objectives**

1. The control strategy for frequency and voltage regulation in DC link is covered in detail for interconnected HVDC systems. It also presents the power system stability and fault analysis.
2. Students will be able to enhance their learning domain by distinguishing the requirement of HVDC system over HVAC system.
3. They will also learn the components used and role of power electronics involved for regulating the voltage angle and frequency for power flow and interconnection

- **Course Outcome:**

After completion of this course the student is able to

1. Compare EHV AC and HVDC system and to describe various types of DC links
2. Analyze Graetz circuit for rectifier and inverter mode of operation
3. Describe various methods for the control of HVDC systems and to perform power flow analysis in AC/DC systems
4. Describe various protection methods for HVDC systems and classify Harmonics and design different types of filters

SECTION-I

Unit-1 Introduction to HVDC transmission: (05 Hrs.)

Unit contents:

Early discoveries and applications, Limitation and advantages of AC and DC transmission, Classification of HVDC links, Components HVDC Transmission system, Ground Return Advantages and Problems, Advances in HVDC transmission. HVDC system application in wind power generation

- **Content delivery methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical Questions related to above contents

Unit-2 Analysis of Line Commutated Converters Line Commutated Converters: (05 Hrs.)

- **Unit contents:**

Basic Principle of three-phase AC–DC Conversion, six pulse converter operation, Effect of Delaying the Firing Instant, The Commutation Process, Analysis of the Commutation Circuit, Analysis neglecting commutation overlap, Rectifier Operation, Inverter Operation, Power Factor and Reactive Power, Characteristic Harmonics, DC Side Harmonics, AC Side Harmonics, Twelve Pulse Converters operation, AC/DC side voltage and current waveforms, Expressions for average dc voltage

Content delivery methods:

Chalk and talk, power point presentation

Assessment Methods:

Theoretical Questions related to above contents

Unit-3 Converter and HVDC system control: (05 Hrs.)

Unit contents:

General, Principles of DC link control, Converter control characteristics, System control hierarchy, firing angle control, Current and extinction angle control, Starting and stopping of DC link, Power control, higher level controllers. Principles of DC Link Control in a LCC HVDC System. Higher level Controllers, Power control, Frequency Control, Reactive Power Control, Principles of DC Link Control in a VSC based HVDC system: Power flow and dc voltage control. Reactive Power Control / AC voltage regulation using VSC

Content delivery methods:

Chalk and talk, power point presentation

Assessment Methods:

Theoretical Questions related to above contents

SECTION-II

Unit-4 Components of HVDC Systems: (05 Hrs.)

- **Unit contents:**

Smoothing Reactors, Reactive Power Sources and Filters in LCC HVDC systems DC line: Corona Effects, Insulators and Transient Over-voltages. DC line faults in LCC systems. DC line faults in VSC systems, dc breakers, Mono-polar Operation. Ground Electrodes.

- **Content delivery methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical Questions related to above contents

Unit-5 Reactive power control: (05 Hrs.)

- **Unit contents:**

Reactive power requirements in steady state, Sources of reactive power, Static VAR systems, Reactive power control during transients, Harmonics and filters, Generation of harmonics, Design of AC filters, and DC filters. Power flow analysis in AC/DC systems: General, Modeling of DC links, Solution of DC

load flow, Discussion, Per unit system for DC quantities.

- **Content delivery methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical Questions related to above contents

Unit- 6 Harmonics & Filters: (05 Hrs.)

- **Unit contents:**

Characteristics Harmonics and Non-Characteristics Harmonics, Causes, Consequences, Trouble Caused by Harmonics, Means of Reducing Harmonics, Filters, AC & DC Filters. Multi Terminal HVDC System

- **Content delivery methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical Questions related to above contents

Reference Books:

1. Edwart, K., Direct Current Transmission (Vol. 1), John Wiley and Sons (2008).
2. Padiyar, K.R., HVDC Power Transmission System, New Age International (P) Limited, Publishers (2008).
3. Vijay K Sood, "HVDC and FACTS Controller" Springer Publication, 2004.
4. S Kamakshaiah and V Kamaraju, "HVDC Transmission" TMH Publications, 2011.
5. M. H Rashid, "Power Electronics Handbook" Academic Press, 2001.
6. J., HVDC Transmission, IEE Press (2007).

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **B.Tech. Electrical Engineering** **Semester-II** **SELF-LEARNING MODULE--IV** **Illumination Engineering (EL 422.3)**

Teaching Scheme	**Examination Scheme**
Theory: -2 Credits	**ESE –** 50 Marks

- **Course Prerequisite:**

Sources of light, Awareness about energy sources,

- **Course Objectives**

This course aims to:

1. To explain conventional and modern lamps and their accessories.
2. To get detailed insight of indoor and outdoor illumination system components, control and design aspects.
3. To know the requirements of energy efficient lighting.
4. To introduce the modern trends in the lighting

- **Course Outcomes**

At the end of this course, students will be able to:

1. Define and reproduce various terms in illumination.
2. Identify various parameters for illumination system design.
3. Design indoor and outdoor lighting systems.
4. Enlist state of the art illumination systems.

SECTION-I

Unit-1 Importance of Lighting in Human Life (05 Hrs.)

Unit contents:

Optical systems of human eye, Dependence of human activities on light, performance characteristics of human visual system, External factors of vision-visual acuity, contrast, sensitivity, time luminance, colour, visual perception, optical radiation hazards, Good and bad effects of lighting and perfect level of illumination, Artificial lighting as substitute to natural light, Ability to control natural light, Production of light, physics of generation of light, Properties of light, Quantification and Measurement of light.

- **Content delivery methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical Questions related to above contents

Unit-2 Light Sources and Electrical Control of Light Sources (05 Hrs.)

- **Unit contents:**

Light Sources- Lamp materials: Filament, glass, ceramics, gases, phosphors and other metals and nonmetals. Discharge Lamps: Theory of gas Discharge phenomena, lamp design considerations, characteristics of low- and high-pressure mercury and Sodium vapour lamps, Low Vapour Pressure discharge lamps -

Control of Light Sources Photometric Control of Light Sources and their Quantification: Types of Luminaries, factors to be considered for designing luminaries Types of lighting fixtures. Optical control schemes, design procedure of reflecting and refracting type of luminaries.

Content delivery methods:

Chalk and talk, power point presentation

Assessment Methods:

Theoretical Questions related to above contents

Unit-3 Design Considerations for illumination schemes (05 Hrs.)

Unit contents:

Zonal cavity method for general lighting design, determination for zonal cavities and different shaped ceilings using COU (coefficient of utilization), beam angles and polar diagrams. Factors to be considered for design of indoor illumination scheme

Content delivery methods:

Chalk and talk, power point presentation

Assessment Methods:

Theoretical Questions related to above contents

SECTION-II

Unit-4 Design of lighting schemes (05 Hrs.)

- **Unit contents:**

Indoor illumination design for following installations Residential (Numerical) Educational institute Commercial installation Hospitals Industrial lighting Special purpose lighting schemes Decorative lighting Theatre lighting Aquarium, swimming pool lighting

- **Content delivery methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical Questions related to above contents

Unit- 5 Modern trends in illumination (05 Hrs.)

- **Unit contents:**

LED luminary designs

Intelligent LED fixtures

Optical fiber, its construction as a light guide, features and applications

- **Content delivery methods:**

Chalk and talk, power point presentation

- **Assessment Methods:**

Theoretical Questions related to above contents

Text Books:

1. H. S. Mamak, "Book on Lighting", Publisher International lighting Academy.
2. Joseph B. Murdoch, "Illumination Engineering from Edison's Lamp to Lasers" Publisher -York, PA : Visions Communications
3. M. A. Cayless, A. M. Marsden, "Lamps and Lighting", Publisher-Butterworth Heinemann (ISBN 978-0-415-50308-2)
4. Designing with light: Lighting Handbook., Anil Valia; Lighting System 2002

Reference Books:

1. BIS, IEC Standards for Lamps, Lighting Fixtures and Lighting", Manak Bhavan, New Delhi.
2. "IES Lighting Handbook", (Reference Volume 1984), Illuminating Engineering Society of North America.
3. IESNA lighting Handbook., Illuminating Engineering Society of North America 9th edition 2000
4. "IES Lighting Handbook", (Application Volume 1987), Illuminating Engineering Society of North America
5. Organic Light Emitting Diodes (OLEDs): Materials, Devices and Applications, Alastair Buckley, University of Sheffieid, UK, ISBN: 978-0-85709-425-4

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Tech. Electrical Engineering
Semester-II
SELF-LEARNING MODULE--IV
(EL 422.4)

Teaching Scheme
Theory: -2 Credits

Examination Scheme
ESE – 50 Marks

Students can select & enroll for an approved minimum eight-week technical course from various NPTEL/SWAYAM technical courses, Or any other approved MOOC platform, complete its assignments and appear for certificate examination conducted by NPTEL, SWAYAM Or respective MOOC platforms.

BOS Chairman / Coordinator will announce the list of approved NPTEL/MOOC online courses/areas of minimum eight weeks duration for 'Self Learning Module-III' from the available NPTEL/SWAYAM/MOOC courses and will make them available to students through the University website.

List of approved NPTEL/MOOC online courses/areas of minimum eight weeks duration based on following topics

- Electric Vehicles
- Renewable energy
- Automation and Robotics
- Artificial intelligence
- Machine Learning and Deep Learning
- Sustainable Power System
- Advance Power Electronic and Control
- Design of Photovoltaic system
- Advance Electrical Drives
- Research Methodology

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: ELECTRONICS & TELECOMMUNICATION ENGINEERING

Name of the Course: Final Year B. Tech (Sem.– I & II)

(Syllabus to be implemented from w.e.f. July 2021)

PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF SCIENCE & TECHNOLOGY
Electronics & Telecommunication Engineering

Programme Educational Objectives and Outcomes

A. Program Educational Objectives

1. To make students competent for professional career in Electronics & allied fields.
2. To build strong fundamental knowledge amongst student to pursue higher education and continue professional development in Electronics & other fields
3. To imbibe professional ethics, develop team spirit and effective communication skills to be successful leaders and managers with a holistic approach.
4. To nurture students to be sensitive to ethical, societal & environmental issues while conducting their professional work.

B. Program Outcomes

Electronics and Telecommunication Engineering Graduate will be able to –

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of t h e engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

C. Program Specific Outcomes

1. Graduates will be able to attain a **solid foundation** in Electronics and Communication Engineering with an ability to function in multidisciplinary environment.
2. Graduates will be able to use **techniques and skills** to design, analyze, synthesize, and simulate Electronics and Communication Engineering components and systems.
3. Graduate will be capable of **developing programs** in Assembly, High level and HDL languages using contemporary tools for software development.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Faculty of Science & Technology

Choice Based Credit System (CBCS) Curriculum of

Final Year B. Tech Electronic & Telecommunication Engineering ***W.E.F. 2021-22***

Semester I

Course Code	***Theory Course Name***	***Hrs./week***			***Credit***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
ET411	Machine Learning	4	---	--	4	30	70	--	100
ET412	Data Communication	4	---	--	4	30	70	--	100
ET413	Internet of Things	4		--	4	30	70	--	100
ET414	Database Management System	3	1	--	4	30	70	25	125
ET415A & ET415B	Elective-II * Image & Video Processing * Wireless Sensor Network	3	1	--	4	30	70	25	125
Sub Total		**18**	**2**	**--**	**20**	**150**	**350**	**50**	**550**
Course Code	***Laboratory Course Name***								
							ESE		
							POE	***OE***	
ET411	Machine Learning	--	--	2	1	--	25	--	25	50
ET412	Data Communication	--	--	2	1	--	--	25	25	50
ET413	Internet of Things	--	--	2	1	--	25	--	25	50
ET416	Project Phase I	--	--	4	2	--	--	25	50	75
ET417	Vocational Training	--	--	--	1	--	--	--	25	25
Sub Total		--	--	**10**	**6**	--	**100**		**150**	**250**
Grand Total		**18**	**2**	**10**	**26**	**150**	**450**		**200**	**800**

Abbreviations: L: Lectures, P: Practical, T: Tutorial, ISE: In Semester Exam., ESE: End Semester Exam, ICA: Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Faculty of Science & Technology

Choice Based Credit System (CBCS) Curriculum of
Final Year B. Tech Electronic & Telecommunication Engineering ***W.E.F. 2021-22***

Semester II

Course Code	***Theory Course Name***	***Hrs./week***			***Credit***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
ET421	Microwave Engineering	4	--	--	4	30	70	--	100
ET422	CMOS VLSI Design	4	--	--	4	30	70	--	100
ET423A & ET423B	Elective- III * Industrial IOT *Artificial Intelligence and Applications	3	1	--	4	30	70	25	125
ET424A & ET424B	Elective-IV * Network Security * Data Analytics	3	1	--	4	30	70	25	125
Sub Total		14	2	--	16	120	280	50	450
Course Code	***Laboratory Course Name***								
							ESE		
							POE	***OE***	
ET421	Microwave Engineering	--	--	2	1	--	--	50	25	75
ET422	CMOS VLSI Design	--	--	2	1	--	50	--	25	75
ET425	Project Phase II	--	--	8	4	--	100	--	100	200
Sub Total		--	--	12	6	--	200		150	350
Grand Total		**14**	**2**	**12**	**22**	**120**	**480**		**200**	**800**

Abbreviations: L: Lectures, P: Practical, T: Tutorial, ISE: In Semester Exam., ESE: End Semester Exam, ICA: Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)

Note –

1. Batch size for the practical /tutorial shall be of 15 students. On forming the batches, if the strength of remaining student exceeds 7, then a new batch shall be formed.
2. Project group for Final Year B.Tech - Semester I and Semester II shall not be of more than three students.
3. Minimum strength of the students for Elective is 15.
4. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction, attendance for theory and lab sessions as applicable.
5. Project phase-I shall cover Literature survey, Problem statement Identification, and Synopsis submission of proposed work. Student shall submit hard copy of synopsis only after delivering seminar.
6. Project phase-II shall cover Simulation work, Software programming, and Hardware implementation. A hard copy of the final report shall be submitted to the department after successfully completion of project.
7. As per the guidelines of New Education Policy (NEP), the student of final year B.Tech. in Electronics and Telecommunication Engineering (Sem-II) can opt for any one "Employability Enhancement / Skill Development Course" from the list provided by PAH Solapur University, Solapur. This course will be 8 to 12 week duration and it can be taken in self learning mode or by physically attending at the affiliated institute wherever this course is offered. Though this course is not mandatory to any of the student, but the student attending this course will get the certificate from the university after successfully completion of this course. If any of the students could not complete this course within stipulated time then also he/she will be able to receive the regular B. Tech. Degree Certificate.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Final Year B.Tech. (Electronics& Telecommunication Engineering)

Semester-I

ET411: Machine Learning

Teaching Scheme:	**Examination Scheme:**
Lectures– 4 Hours/week, 4 Credits	**ESE – 70 Marks**
Practical – 2 Hours/week, 1 Credit	**ISE – 30 Marks**
POE – 25 Marks	**ICA – 25 Marks**

This course introduces Machine Learning applications perspective. The course also introduces practical design aspects of Machine Learning Models.

Course Prerequisite:

Student shall have knowledge of programming language like python / R, also fundamentals of probability and Statistics.

Course Objectives:

1. To make student learn necessity and different aspects of Machine Learning.
2. To make student understand Machine Learning Models.
3. To make student understand Classification and Regression.
4. To introduce to student real world applications of Machine Learning.

Course Outcomes:

At the end of this course students will be able to

1. Describe fundamental aspects of Machine Learning.
2. Distinguish between various characteristics of ML
3. Explore classification and regression algorithms
4. Design neural network for classification
5. Design and implement different Machine Learning models.
6. Apply Machine learning techniques that enable to solve real world problems.

Section - I

Unit 1- Introduction to Machine Learning (09)

Basics of Statistics, Introduction of Machine learning, Examples of Machine Learning Problems, Learning versus Designing, Training versus Testing, Characteristics of Machine learning tasks, Predictive and descriptive tasks, database and data processing for ML.

Features: Feature types, Feature Construction and Transformation, Feature Selection.

Unit 2- Flavours of Machine Learning (07)

Definition of learning systems, **Types:** Supervised, Unsupervised, Semi Supervised, Reinforcement learning with examples, Introduction to Deep Learning, Deep learning vs Machine Learning.

Unit 3- Classification and Regression (08)

Classification: Binary Classification- Assessing Classification performance, Class probability Estimation- Assessing class probability Estimates, Multiclass Classification.

Regression: Assessing performance of Regression- Error measures, Overfitting- Catalysts for Overfitting, Case study of Polynomial Regression.

Theory of Generalization: Effective number of hypothesis, Bounding the Growth function, VC Dimensions, Regularization theory.

Section - II

Unit 4- Neural Networks (08)

Introduction, Neural Network Elements, Basic Perceptron, Feed Forward Network, Back Propagation Algorithm, Introduction to Artificial Neural Network.

Unit 5- Machine Learning Models (10)

Linear Models: Least Squares method, Multivariate Linear Regression, Regularized Regression, Using Least Square regression for Classification.

Logic Based and Algebraic Models: Distance Based Models: Neighbours and Examples, Nearest Neighbours Classification,

Rule Based Models: Rule learning for subgroup discovery, Association rule mining,

Tree Based Models: Decision Trees

Probabilistic Models: Normal Distribution and Its Geometric Interpretations, Naïve Bayes Classifier, Discriminative learning with Maximum likelihood

Unit 6- Applications of Machine Learning (06)

Email Spam and Malware Filtering, Image recognition, Speech Recognition, Traffic Prediction, Self-driving Cars, Virtual Personal Assistant, Medical Diagnosis.

Internal Continuous Assessment:

ICA consists of minimum 8 practical based upon above curriculum.

Text books:

1. Tom Mitchell, "Machine Learning", McGraw Hill, 3rdEdition, 1997.
2. Peter Flach: Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, Edition 2012.
3. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Prentice Hall of India, 3rd Edition2014.

Reference Books:

1. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar " Foundations of Machine Learning", MIT Press,2012.
2. Hastie, Tibshirani, Friedman: Introduction to Statistical Machine Learning with Applications in R, Springer, 2nd Edition-2012.
3. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012
4. MACHINE LEARNING - An Algorithmic Perspective, Second Edition, Stephen Marsland, 2015.
5. Charu C.Aggarwal,"Data Classification Algorithms and Applications", CRCPress,2014.
6. Charu C. Aggarwal, "DATA CLUSTERING Algorithms and Applications", CRC Press, 2014.
7. Machine Learning Mastery With Python 2016 by Jason Brownlee.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Final Year B. Tech (Electronics and Telecommunication Engineering)

Semester-I

ET412: Data Communication

Teaching Scheme:	**Examination Scheme:**
Lecture: 4 Hrs/Week, 4 Credits	**ISE: 30 Marks**
Practical: 2 Hr/Week, 1 Credit	**ESE: 70 Marks**
OE: 25 Marks	**ICA: 25 Marks**

Course Objectives:

1. To explain need of Data Communications System and network components.
2. To aware students about the layers of the OSI model and TCP/IP with function(s) of each layer.
3. To develop building skills of subnetting and understand routing mechanisms.
4. To introduce students with the different types of network topologies and standards.
5. To acquaint students with the basic protocols of computer networks and how they can be used to assist in network design and implementation.

Course Outcomes:

After completion of this course, student will be able to

1. Explain Data Communications System and its components.
2. Develop building skills of subnetting and understand routing mechanisms.
3. Enumerate the layers of the OSI model and TCP/IP and explain the function(s) of each layer.
4. Identify the different types of network topologies and protocols.
5. Acquaintance with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

Section – I

Unit 1- Data Communication and Network (08)

Introduction to Data Communication, Network- Need, Types (LAN, MAN, WAN), Topologies, Layer communication, OSI model, TCPIP Suite, OSI Versus TCP/IP, Network Devices at each layer (RS232, MODEM, Repeaters, Switches, bridges, routers, gateway).

Unit 2- Data Link Layer **(12)**

Framing, Circuit Switching and Packet Switching, Error detection and error correction, Block parity code ,CRC code, Hamming code , Flow control methods- Stop and wait protocol, sliding window protocol, Piggybacking, MAC: Collision oriented and collision based protocols, ALOHA, CSMA, CSMA/CD, CSMA/CA, HDLC, STP Protocol.

Unit 3- Wireless LAN Standards **(04)**

IEEE Standards, IEEE802.3, IEEE802.4, IEEE802.5, USB-OTG, Bluetooth 5.1, 5.2.

Section-II

Unit 4- Network Layer **(08)**

Virtual circuit & datagram approach, Routing- Principle of optimality, shortest path routing, flow based routing, distance vector routing, link state routing routing protocols – shortest path, distance vector routing,link state, ICMP, ARP,RARP.

Unit 5- Transport Layer **(08)**

TCP & IP header format, encapsulation, IPv4 addressing ,IPv6 addressing subnetting& masking, user datagram protocol (UDP) – transmission control protocol (TCP) - three way handshake – congestion & its control,TCP practical applications.

Unit 6- Application Protocols: **(08)**

FTP, DNS, TELNET, HTTP, SMTP, E-mail, DHCP, Case study, Cisco DNA-Center Controller, IBM Virtual Router Appliance (VRA).

Internal Continuous Assessment (ICA):

ICA shall consist of a minimum eight experiments based on the above curriculum. Sample list is provided below.

1. Network Ethernet LAN driver installation and working.
2. Network topologies using CISCO packet tracer.
3. RS 232 based lab sessions-
    a. Character transfer using half duplex and Full duplex mode of operation.
    b. File transfer using serial port.
4. Flow control and error control mechanism using CISCO packet tracer.
5. Implementation of Scrambler and descrambler.
6. IP subnetting and masking in Intranet using CISCO Packet tracer.

7. All network protocol tree model setup in command prompt.
8. Internet application protocol-FTP and DNS.
9. Network analyzer (Protocol analyzer)-wire shark.

Text books:

1. Data communication- B.A. Forouzan, 4th Edition Tata Mc Graw hill Publication.
2. TCP/IP protocol suit- B.A. Forouzan, 4th Edition Tata Mc Graw hill Publication.
3. Computer networks- Andrew S. Tanenbaum.

Reference Books:

1. Internetworking TCP/IP Principal, Protocol and Architecture -Douglas Comer- Wesley
2. TCP/IP Illustrated, The Protocols – W. Richard Slevens, G.Gabrani –PE pub.
3. Data and computer communication – William Stallings. - PE pub.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Final Year B.Tech (Electronics & Telecommunication Engineering)

Semester-II

ET413: Internet of Things

Teaching Scheme	**Examination Scheme**
Lectures – 4 Hours/week, 4 Credits	**ESE - 70 Marks**
Practical – 2 Hour/week, 1 Credit	**ISE - 30 Marks**
POE – 25 Marks	**ICA - 25 Marks**

The Internet of Things (IoT) refers to the system in which different devices equipped with sensors and signal processing are connected through a network to communicate with each other and/or with central servers. This course provides a thorough introduction to the different components of an IoT System. The course also introduces cloud platforms of IoT and different communication protocols. Introduction to Cortex M Series ARM architecture is also a part of this course.

Course Prerequisite:

Student shall have knowledge of microcontroller and interfacing techniques and working of different peripherals.

Student shall have adept knowledge of assembly and C language programming,

Course Objectives:

1. To make student aware of different components of an IoT System
2. To make student learn the architecture of Cortex M3 series ARMmicrocontroller/Raspberry Pi
3. To make student learn interfacing of different peripherals with microcontroller.
4. To make student learn different communication technologies and application protocolsused in IoT.
5. To introduce to student different cloud platforms of IoT.

Course Outcomes:

1. Student can elaborate different components of an IoT System.
2. Student can describe the architecture Cortex M3 series ARM microcontroller/ RaspberryPi.
3. Student can write interfacing program for different applications with ARMmicrocontroller.
4. Student can describe different communication technologies and application protocolsused in IoT.
5. Student can elaborate different cloud platforms of IoT.

Section - I

Unit 1 - Introduction to Internet of Things **(06)**

Introduction to IoT, different components of an IoT system: embedded systems, sensors, communication systems, cloud, applications of IoT in various domains.

Unit 2 – Embedded Systems for IoT **(06)**

Introduction to embedded systems, different components of an embedded system, and basics of microcontroller based embedded systems; basics of Linux based embedded systems, various embedded platforms used in IoT, understanding the various IDEs used for embedded development.

Unit 3 – Development of IoT solution. **(12)**

ARM Cortex- M3 Architecture, registers, memory map, instruction set: data accessing, processing, arithmetic, program flow control etc., Assembly/C programs for interfacing I/O devices like LED's, Switch's, LCD etc.

Introduction to Raspberry Pi, Features, Setting up the hardware and software, python programs for interfacing of raspberry pi.

Section II

Unit 4 – Communication technologies for IoT **(08)**

Basics of the communication technologies like Bluetooth Low Energy (BLE), Zigbee, Wifi, RFID, their architecture, characteristics, limitation, power consumption parameters and applications

Unit 5 – Internet connectivity principles and Application protocols for IoT **(08)**

Internet connectivity, Communication, overview of Protocols: IPv4, IPv6, 6LoWPAN, Basics of application protocols like MQTT and CoAP, their features, framework, message formats, implementations and applications

Unit 6 – Cloud platforms for IoT **(08)**

Cloud architecture for IoT, concepts of application programming interface (API), survey of various IoT cloud platforms, understanding the costing structure of cloud for IoT services, performance metrics for cloud platforms in IoT.

Case study: Smart Cities, Home Automation, Weather Monitoring System.

- **Internal continuous Assessment (ICA)**

ICA shall be based on minimum 8 Experiments from the list mentioned below to be performed using LPC1768 / Raspberry Pi / Simulation software.

1. Installation and initial set up of Hardware.
2. Study of S/W (Operating system)
3. Study of Python IDE for programming in python.
4. Interfacing general purpose I/O devices like LED's, switches
5. Interfacing motors (DC/Stepper/Servo)
6. Reading sensor values and plotting them on the PC / LCD
7. Interfacing of Camera for capturing and storing the image.
8. Data transfer using MQTT & CoAP.
9. Interfacing sensor and sending data to the cloud using Wifi
10. Data Acquisition System
11. Project based on IoT.

- **Text Books**

1. Internet of Things by Raj Kamal
2. The Definitive Guide to the ARM Cortex-M3 by Joseph Yiu
3. Internet of Things for Architects by Perry Lea
4. Analytics for the Internet of Things (IoT) by Andrew Minteer

- **Reference Books**

1. Internet –of-Things (IoT) System: Architectures, Algorithms, Methodologies by DimitriosSerpanos, Marilyn Wolf
2. MQTT Essentials- A Lightweight IoT Protocol by Gaston C. Hillar
3. Mastering Internet of Things: Design and create your own IoT applications usingRaspberry Pi 3 by Peter Waher.
4. Designing Embedded Systems and the Internet of Things (IoT) with the ARM mbed byPerry Xiao
5. Raspberry Pi CookBook- Software and Hardware Problems and Solutions by Simon Monk(O'Reilly Media, Inc.,)

- **Recommended Online Free Courseware**

1. Udemy.com
2. Introduction to ARM mbed: playlist on Youtube

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Final Year B.Tech. (Electronics and Telecommunication Engineering)

Semester-I

ET414: Database Management System

Teaching Scheme:	**Examination Scheme:**
Lecture : 3Hrs/Week, 3 Credits	**ISE: 30 Marks**
Tutorial: 1Hr/Week, 1 Credit	**ESE:70 Marks**
	ICA: 25 Marks

This course introduces a Data Base Management System, which is the system software for easy, efficient and reliable data processing and management. It covers ER Model, Relational Model, Structured Query Language, Relational Database Design and Concurrency Control techniques.

Course Objectives:

1. To understand the basics of database, structure, design and applications.
2. To design of the database using data modeling concepts such as entity relationship diagrams.
3. To understand and use Structured Query Language to search, update and manage a database.
4. To apply normalization techniques to normalize the database.
5. To familiarize the students with the fundamentals of database transaction processing, techniques for concurrency control and recovery methods.
6. To introduce the concept of Bigdata and NoSQL.

Course Outcomes:

At the end of this course, the student will be able to

1. Design ER models to represent simple database application scenarios.
2. Construct relational tables from ER model, populate relational databases and formulate SQL queries on data.
3. Analyze & improve the database design by applying normalization.
4. Describe database storage structures and access techniques.
5. Elaborate the concept of transaction processing, concurrency control, recovery techniques, Bigdata and NoSQL.

Section– I

Unit 1: Introduction and E-R model (04)

Database- System Applications, Purpose of Database Systems, View of data, Database Languages, Database Architectures, Database users and administrators, history of databases system. Overview of design process, E-R Model, Constraints, E-R diagrams, E-R design issues, Weak Entity Sets, Extended E-R features, Reduction to relational schema.

Unit 2: Relational Model **(06)**

Relational Model: Basic structure of relational databases, Database schema, keys, Schema diagrams, Relational Query languages, Relational algebra-Fundamental, Additional and Extended Relational Algebra Operations.

Unit 3: Introduction to SQL **(06)**

Overview, SQL data definition, SQL data types, Integrity constraints, Basic structure of SQL Queries, Types of SQL Commands: DDL, DML, DCL and TCL statements, Basic SQL clauses [select, from, where, group by, having, order by etc.].

Unit 4: Intermediate SQL **(05)**

Additional basic operations, Set operations, NULL values, Aggregate functions, Nested sub queries, Modification of the databases. Join operations, Views, Integrity constraints, Authorization.

Section-II

Unit 5: Normalization **(05)**

Features of good Relational Designs, Atomic Domains, First Normal Form, Keys and Functional dependencies, Second Normal Form, Boyce-Codd Normal Form, Third Normal Form, Functional dependency theory.

Unit 6: Indexing and Hashing **(05)**

Basic Concepts, Ordered Indices, B+ Tree Index Files, B Tree Index Files, Multiple Key Access, Static Hashing, Dynamic Hashing, Comparison of Indexing and Hashing, Index definition in SQL.

Unit 7: Transactions and Concurrency Control **(07)**

Transaction concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Testing of Serializability. Concurrency Control - Lock based protocol: Locks, Granting of Locks, Two-Phase Locking Protocol. Time Stamp-based protocols, Deadlock handling.

Unit 8: Recovery System and Introduction to Bigdata and NoSQL **(04)**

Failure Classification, Storage Types, Log-Based Recovery, Shadow paging. Bigdata - What is Bigdata?, Characteristics of Bigdata, NoSQL- What is NoSQL?, Key-Value stores, Document databases.

Internal Continuous Assessment (ICA):

ICA shall consist of minimum 8 assignments based on the syllabus contents. The assignments are not limited to the one mentioned below.

1. For any real life application, draw an E-R diagram and create a data dictionary for the same.
2. Write queries in SQL using DDL and DML commands.
3. Write queries in SQL to demonstrate integrity constraints.

4. Write nested sub queries in SQL using Joins and Set operations.
5. Write queries in SQL to create Views and demonstrate Authorization.
6. Identify set of functional dependencies, find canonical cover and closure of functional dependency.
7. Convert the created database into 1NF, 2NF, 3NF and BCNF

Text books:

1. "Database System Concepts" by Abraham Silberschatz, Henry F. Korth, S. Sudarshan (McGraw Hill International Edition) sixth edition.
2. "Database System Concepts" by Peter Rob, Carlos Coronel (Cengage Learning) ninth edition.

Reference Books:

1. Fundamentals of Database systems by Ramez ElMasri, S. B. Navathe (Pearson Education) 5th edition.
2. Database Management Systems by Ramkrishnan Gehreke (Tata McGraw Hill), 3rd edition.
3. Principles of Database Systems by J. D. Ullman (Galgotia Publications)
4. Advanced Database Management System by Rini Chakrabarti, Shilbhadra Dasgupta (Dreamtech Press Publication).

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Final Year B.Tech (Electronics& Telecommunication Engineering)

Semester-I

ET 415A: Elective II - Image & Video Processing

Teaching Scheme:
Lectures – 3 Hours/week, 3 Credits
Tutorial – 1 Hours/week, 1 Credit

Examination Scheme:
ESE – 70 Marks
ISE – 30 Marks
ICA – 25 Marks

This course covers fundamental notions in image and video processing, as well as covers most popular techniques used, such as edge detection, motion estimation, segmentation, and case studies.

Course Prerequisite:

Student shall have knowledge of Digital Signal Processing

Course Objectives:

1. To describe and performs basic operations on image and video.
2. To design and apply filter on images in spatial and frequency domain.
3. To analyze and implement algorithm for image and video processing application using modern tools.
4. To select and apply appropriate technique for preprocessing, segmentation and feature extraction of images and videos in real time applications.

Course Outcomes:

After successfully completing the course student will able to

1. Describe and performs basic operations on image and video.
2. Design and apply filter on images in spatial and frequency domain.
3. Analyze and implement algorithm for image and video processing application using modern tools.
4. Select and apply appropriate technique for preprocessing, segmentation and feature extraction of images and videos in real time applications.

Section I

Unit 1: Image fundamentals (06)

Image acquisition, sampling and quantization, image resolution, basic relationship between pixels, color images, RGB, HSI and other models

Discrete Fourier Transform, Discrete Cosine Transform, KL Transform

Unit 2: Image Enhancement (08)

Spatial Domain: Point Processing: Digital Negative, contrast stretching, thresholding, gray level slicing, bit plane slicing, log transform and power law transform.

Neighborhood Processing: Averaging filters, order statistics filters, high pass filters and high boost filters.

Frequency Domain: DFT for filtering, Ideal, Gaussian and Butterworth filters for smoothening and sharpening, and Homomorphic filters.

Histogram Modeling: Histogram equalization and histogram specification**.**

Unit 3: Image segmentation and Morphology: (07)

Point, line and edge detection, edge linking using Hough transform and graph theoretic approach, thresholding, and region based segmentation. Dilation, erosion, opening, closing, hit or miss transform, thinning and thickening, and boundary extraction on binary images

Section II

Unit 4: Image Restoration (05)

Degradation model, noise models, estimation of degradation function by modeling, restoration using Weiner filters and Inverse filters.

Unit 5: Video Formation, Perception and Representation: (07)

Digital Video Sampling: Video Frame classifications, I, P and B frames, Notation, ITU-RBT 601Digital Video formats, Digital video quality measure.

Video Capture and display: Principle of color video camera, video camera, digital video.

Sampling of video Signals: Required sampling rates, sampling in two dimensions and three dimensions, progressive versus interlaced scans.

Unit 6: Two Dimensional Motion Estimation (9)

Optical Flow: 2-D motion Vs optical flow, optical flow equations, motion representation, motion estimation criteria, optimization method.

Pixel based motion estimation: Regularization using motion smoothing constraints, using multipoint neighborhood.

Block Matching Algorithms: Exhaustive block matching algorithms, phase correlation method, Binary feature matching.

Multi resolution Motion Estimation: General formulation, Hierarchical blocks matching Algorithms.

- **Internal Continuous Assessment (ICA):**

  ICA consists of minimum eight tutorials based upon above curriculum.

- **Text Books:**
  1. Gonzales and Woods--Digital Image Processing, Pearson Education, India, Third Edition
  2. Murat Tekalp--Digital Video Processing, Pearson, 2010.
  3. A.I.Bovik--Handbook on Image and Video Processing", Academic Press.

- **Reference Books:**
  1. Anil K. Jain, ―Fundamentals of Image Processing, Prentice Hall of India, First Edition, 1989.
  2. John W. Woods, ―Multidimensional Signal, Image and Video Processing, Academic Press 2012
  3. J.R. Ohm , ―Multimedia Communication Technology", Springer Publication.

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B.Tech. (Electronics and Telecommunication Engineering)

Semester - I

ET415B: Elective-II - Wireless Sensor Networks

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 Hrs/Week, 3 Credits	**ISE: 30 Marks**
Tutorial: 1 Hr/Week, 1 Credit	**ESE: 70 Marks**
	ICA: 25Marks

This course provides knowledge of the networks formed by spatially dispersed and dedicated sensors that monitor and record the physical conditions of the environment and forward the collected data to a central location. It comprises exploration of various aspects of wireless sensor networks.

Course Objectives:

1. To understand the basics of Wireless Sensor Networks with its architecture, Infrastructure, associatedprotocols and IEEE standards.
2. To study applications of WSN in various fields

Course Outcomes:

At the end of this course, the student will be able to

1. Know Wireless Sensor scenario with its challenges, architecture and protocols.
2. Apply their knowledge for the implementation of the Wireless Sensor Network in various applications.

Section– I

Unit 1: Introduction to Wireless Sensor Network (04)

Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks,applications of WSN and Mobile adhoc networks and wireless sensor networks.

Unit 2: Architectures of WSN (09)

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

Unit 3: Infrastructure Establishment **(08)**

Topology Control, Clustering, Time Synchronization, Localization and positioning, Sensor Tasking and Control

Section-II

Unit 4 - Protocols and Standards **(05)**

MAC protocol- Low duty cycle and wake up concepts, Connection based protocols, Schedule based protocols and The IEEE 802.15.4 MAC protocol.

Unit 5 - QoS and Energy Management **(08)**

Issues and Challenges in providing QoS, classifications, MAC, network layer solutions, QoS frameworks, need for energy management, classification, battery, transmission power, and system power management schemes.

Unit 6 - Applications Of WSN: **(08)**

WSN Applications - Home Control – Industrial Automation - Medical Applications - Reconfigurable Sensor Networks - Highway Monitoring - Military Applications - Habitat Monitoring - Nanoscopic Sensor Applications – Case Study: IEEE 802.15.4 LR-WPANs Standard - Target detection and tracking - Contour/edge detection - Field sampling.

Internal Continuous Assessment (ICA):

It should consists of 6-8 assignments on topics given above.

Text Books:

1. Protocols and Architectures for Wireless Sensor Networks -Holger Karl & Andreas Willig -John Wiley, 2005.
2. C. Siva Ram Murthy, and B. S. Manoj, "AdHoc Wireless networks ", Pearson Education – 2008

Reference Books:

1. Wireless Sensor Networks- Technology, Protocols, and Applications - Kazem Sohraby, Daniel Minoli, & Taieb Znati - John Wiley, 2007.
2. Wireless Sensor Network Designs - Anna Hac - John Wiley, 2003.
3. Ian F. Akyildiz and Mehmet Can Vuran, Wireless Sensor Networks, A John Wiley and Sons, Ltd,Publication, 2010.
4. Wireless Sensor Networks – A Networking Perspective, Jun Zheng, Abbas Jamalipour, Wiley-IEEE
5. Fundamentals of Wireless Sensor Networks- Theory and Practice, Waltenegus Dargie, Chrstian Poellabauer, Wiley
6. Networking Wireless Sensors, Bhaskar Krishnamachari, Cambridge University Press

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Final Year B.Tech (Electronics& Telecommunication Engineering)
Semester-II

ET 421: Microwave Engineering

Teaching Scheme:	**Examination Scheme:**
Lectures – 4 Hours/week	**ESE – 70 Marks**
Practical – 2 Hours/week	**ISE – 30 Marks**
OE– 50 Marks	**ICA – 25 Marks**

This course introduces importance of microwave engineering as emerging technology to be used for communication applications. It constitutes generation, transmission, and measurement of various parameters dealing with microwave frequency. The performance analysis is carried out using Microwave network analysis.

Course Prerequisite:

Student shall have knowledge of Electromagnetic Field Theory

Course Objectives:

1. To make students aware about Microwave communication and its importance,
2. To learn about different ways of microwave generation and transmission using active and passive components.
3. To do analysis of microwave components performance using network analysis techniques
4. To acquaint students about measurement of various microwave parameters.

Course Outcomes:

After successfully completing the course student will able to

1. Understand the importance of microwave Engineering
2. Formulate the wave equation in wave guide for analysis.
3. Understand the working principles of all the microwave tubes and solid state devices
4. Identify the use of microwave components and devices in microwave applications.
5. Carry out the microwave network analysis
6. Choose a suitable microwave measurement instruments and carry out the required measurements

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Section I

Unit 1–Microwave Waveguides (06)

Introduction to Microwaves engineering: History of Microwaves, Microwave Frequency bands, Microwave Hazards, Applications of Microwave.

Introduction to Waveguide: Comparison between Transmission Line and Waveguide, Solution of wave equations in rectangular coordinates, Waveguide parameters, TE modes, TM modes, Power transmission and losses

Unit 2–Microwave Components (08)

Multi port junctions: Construction and operation of E-plane, H-plane, Magic Tee and Directional couplers.

Ferrites components: Ferrite Composition and characteristics, Faraday rotation, Construction and operation of Gyrator, Isolator and Circulator.

Strip lines: Structural details and applications of Strip lines, Micro strip line, Parallel Strip line, Coplanar Strip line, Shielded Strip Line

Unit 3– Microwave Network Analysis (10)

The Transmission (ABCD) matrix: Introduction to Impedance and Admittance matrix, Relation to impedance matrix, Equivalent circuits for two port networks

Scattering Matrix: Significance, formulation and properties. S-Matrix calculations for-2 port network junction, E plane, H-plane and E-H (Magic Tee) Tees, Directional coupler

Section II

Unit 4- Microwave Tubes (10)

Limitations of conventional tubes, O and M type classification of microwave tubes, concept of reentrant cavity, velocity modulation.

O-type tubes: Two cavity Klystron: Construction and principle of operation, velocity modulation and bunching process Applegate diagram. Reflex Klystron: Construction and principle of operation, velocity modulation and bunching process, Applegate diagram, and efficiency.

M-type tubes: Magnetron: Construction and Principle of operation of 8 cavity cylindrical travelling wave magnetron, hull cutoff condition, modes of resonance, PI mode operation, o/p characteristics, Applications.

Slow wave devices: Advantages of slow wave devices, Helix TWT: Construction and principle of operation, Applications.

(Excluding mathematical derivations of Klystron, Magnetron and TWT, But numerical will included)

Unit 5-Microwave Solid State Devices (08)

Structural details, Principle of operation, specifications, and applications of Varactor Diode, PIN Diode, Schottky Barrier Diode, Tunnel Diode, TEDs, Gunn Diodes, IMPATT diode and TRAPATT diode, Microwave bipolar transistor, FET, MESFET.

Unit 6- Microwave Measurements **(06)**

Measurement of power, frequency, attenuation, phase shift, VSWR, Impedance, Dielectric constant and Insertion loss.

- **Internal Continuous Assessment (ICA):**

ICA consists of minimum eight practical shall be performed using Klystron and Gunn diode based microwave bench based upon above curriculum.

- **Text Books:**

1. Samuel Y. Liao, "Microwave Devices and Circuits", 3rd edition, Pearson
2. David M. Pozar, "Microwave Engineering", Fourth edition, Wiley publications.
3. M. Kulkarni, "Microwave and Radar engineering", 3rd edition, Umesh Publications

- **Reference Books:**

1. Foundations for Microwave Engineering by Robert Collin, Wiley publications
2. Microwave Engineering (Passive Circuit) by Peter Rizzi, Pearon Eucation
3. M L Sisodia& G S Raghuvanshi, "Basic Microwave Techniques and Laboratory Manual", New Age International (P) Limited, Publishers

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Final Year B.Tech. (Electronics& Telecommunication Engineering)

Semester-II

ET422: CMOS VLSI Design

Teaching Scheme:	**Examination Scheme:**
Lectures– 4 Hours/week, 4 Credits	**ESE – 70 Marks**
Practical – 2 Hours/week, 1 Credit	**ISE – 30 Marks**
POE - 50 Marks	**ICA – 25 Marks**

This course introduces how to design, simulate and test logic circuits using different CMOS Logic Design. It also describes the design of sequential logic circuits and timing issues present in the implementation of the logic circuits applications.

Course Prerequisite:

Student shall have knowledge of Digital Devices, combinational and sequential logic circuit design and simulation.

Course Objectives:

1. To make student learn EDA Tools for CMOS Logic Design and simulation.
2. To enable student to design CMOS Logic baseddesign modules for combinational logic circuits.
3. To enable student to design CMOS Logic based design modules for sequential logic circuits.
4. To acquaint students to timing issues, arithmetic and memory module design and testing.

Course Outcomes:

At the end of course, students will be able to

1. Describe MOS transistor theory and mathematical equations for behavior of E-MOSFET
2. Design combinational logic circuits using E-MOSFETs.
3. Design sequential logic circuits using E-MOSFETs.
4. Analyze timing issues in digital circuits

Section – I

Unit 1- MOS Transistor Theory: (08)

Physical structure of MOS transistor, accumulation, depletion & inversion modes, MOS device design equations, second order effects, Technology scaling, Static and dynamic behavior of CMOS inverter, power and energy delay, impact of technology scaling on inverter.

Unit 2- Circuit Design Processes: (06)

MOS Layers, Stick Diagrams, Design Rules and Layouts – Lambda based design and other rules.

Unit 3- Combinational Logic Design in CMOS: (10)

Static CMOS design- complementary CMOS,Implementation of Boolean Expressions using CMOS Logic, Ratioed logic and pass transistorlogic; dynamic CMOS design- dynamic logic basic principle, speed and power dissipation, issues in dynamic design, cascading dynamic gates, comparison of static and dynamic designs in CMOS

Section - II

Unit 4- Sequential Logic Designs in CMOS: (08)

Static latches and registers- the bistability principle, multiplexer based latches, Master-slave edge triggered register, low voltage static latches, static SR flip flops, dynamic latches and registers- dynamic transmission-gate edge triggered registers,C2MOS- A clock- skew insensitive approach, true single-phase clocked register(TSPCR)

Unit 5- Timing Issues in Digital Circuits: (08)

Timing classification: synchronous interconnect, mesochronous interconnect, plesiochronous interconnect, asynchronous interconnect, synchronous design- clock skew, jitter, clock distribution, latch based clocking, synchronizers and arbiters, using PLL for clock synchronization

Unit 6- Designing Arithmetic and Memory Building Blocks: (08)

Designing fast adders, designing fast multipliers, designing other arithmetic building blocks, designing ROMs, DRAMs & SRAMs

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Internal Continuous Assessment:

- Term work shall consist of minimum eight experiments based on above syllabus using any EDA software tool

Suggested List of Practical:

Design and Implementation of Following using CMOS / Ratioed Logic / Dynamic CMOS Logic.

1. Logic Gates
2. Universal Logic Gates
3. Boolean Expression
4. Half adder and full adder
5. Half subtractor and full subtractor
6. Multiplexer and DeMultiplexer
7. Latches
8. Flip flops

Text Books:

1. Digital Integrated Circuits, Rabey, Chandrakasan, Nikolic, Pearson Education
2. CMOS VLSI design, Neil H. E. Weste, David Harris, Ayan Banerjee, Pearson Education

Reference Books:

1. CMOS digital integrated circuits, Analysis and Design, Sung-Mo Kang, Yusuf Leblebici, TATA McGRAW Hill
2. Principles of CMOS VLSI Design, Neil Weste, Kamran Eshraghian, Addison Wesley/Pearson Education
3. Wayne Wolf, “Modern VLSI Design ", 2nd Edition, Prentice Hall,1998
4. Kamran Ehraghian, Dauglas A. Pucknell and Sholeh Eshraghiam, “Essentials of VLSI Circuits and Systems” – PHI, EEE, 2005 Edition.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Final Year B.Tech (Electronics & Telecommunication Engineering)

Semester-II

ET423A: Elective III- Industrial Internet Of Things

Teaching Scheme:	**Examination Scheme:**
Lectures: 3 Hours/week, 3 Credits	**ESE: 70 Marks**
Tutorials: 1 Hour/week, 1 Credits	**ISE: 30 Marks**
	ICA: 25 Marks

This course is a practical guide that lets one discover the technologies and the use cases for the industrial IoT considering the implementation of industrial processes, specialized control devices, and protocols, it covers the process of identification and connection of different industrial data sources gathered from different sensor sand the ability to be able to connect these sensors with cloud platforms such as AWS, GCP and open source IoT platforms.

Course Objectives:

1. To make student aware of the difference between IoT and IIoT.
2. To make student learn the architecture of Industrial IoT and key practices.
3. To make student learn different WAN communication technologies and protocols and associated security aspects.
4. To introduce students with different industrial cloud platforms of IoT and assist in building practical applications.

Course outcomes:

At the end of this course students will be able to**,**

1. Comprehend different components and technical requirements of an IIoT System.
2. Design reference IIoT architecture based solution for the development of IIoT application.
3. Select appropriate communication technology and/or protocol for a given application.
4. Analyze the security issues associated with identity access component of an IIoT system.
5. Implement cloud industrial IoT solutions for a given application.

Section I

Unit 1: Introduction to the Industrial IoT [6]

What is IIoT, Key IIoT Technologies Catalysts and Precursors of the IIoT, Innovation and the IIoT, Key Opportunities and Benefits, The Digital and Human Workforce, Technical requirements, IoT background, History and definition, IoT enabling factors, IoT use cases IoT key technologies, IoT and IIoT similarities and differences, IoT analytics and AI, Industrial Internet Use-Cases– Healthcare and Smart Office

Unit 2:IIoT Reference Architecture [7]

The IIC Industrial Internet Reference Architecture, Industrial Internet Architecture Framework (IIAF), Architectural Topology, The Three-Tier Topology, Connectivity, Key System Characteristics, Data Management. Designing Industrial Internet Systems- The Concept of the IIoT, The Proximity Network, WSN Edge Node, Legacy Industrial Protocols, Modern Communication Protocols, Wireless Communication Technologies, Proximity Network Communication Protocols, Gateways.

Unit 3: IIoT WAN Technologies and Protocols [8]

IIoT Device Low-Power WAN Optimized Technologies for M2M :SigFox, LoRaWAN, Low Power Wi-Fi, LTE Category-M, Weightless Securing the Industrial Internet - Security in Manufacturing: PLCs and DCS, Securing the OT, Network Level: Potential Security Issues, System Level: Potential Security Issues, Identity Access Management

Section II

Unit 4: Cloud Industrial IoT Solution with AWS [7]

The AWS architecture, AWS IoT, Registering for AWS IoT core, Storing data, AWS analytics , Quick Sight

Unit 5: Cloud Industrial IoT Solution with Google Cloud [6]

Google Cloud IoT Core, Google Cloud Bigtable, Google Cloud analytics

Unit 6: Practical Industrial IoT Solution using Open Stack [8]

Understanding the architecture, understanding the Open Stack ecosystem: core projects (identity, compute, storage, imaging, dashboard, networking), introduction to application development, deploying the application (only definitions of bare metal, virtual machines, and containers, orchestration and configuration management, monitoring and metering, elasticity, updating and patching)

Internal Continuous Assessment (ICA):

ICA shall consist of minimum eight assignments based on above curriculum.

Text Books:

1. Alasdair Gilchrist,"Industry 4.0: The Industrial Internet of Things" by, ISBN: 978-1-4842- 2046-7, APRESS.
2. Veneri, Giacomo; Capasso, Antonio. Hands-On Industrial Internet of Things: Create a powerful Industrial IoT infrastructure using Industry 4.0 . Packt Publishing.
3. Vijay Madisetti, Arshdeep Bahga," Internet of Things A Hands-On- Approach".

4. OpenStack Cloud Application Development Scott Adkins, John Belamaric, Vincent Giersch, Denys Makogon, Jason E. Robinson

Reference Books:

1. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition, Apress Publications, 2013

Additional Resources:

- AWS IoT Core Documentation: https://docs.aws.amazon.com
- Quickstart | Cloud IoT Core Documentation | Google Cloud https://cloud.google.com
- OpenStack Docs: https://docs.openstack.org/install-guide/overview.html
- Azure IoT documentation | Microsoft Docs https://docs.microsoft.com
- Docker Community Edition: https://store.docker.com
- JDK 1.8: http://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html
- Git: https://git-scm.com/downloads
- Node.js 8+: https://nodejs.org
- Python 3.7: https://www.python.org/downloads/
- Anaconda 5.3: https://www.anaconda.com/download/

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Final Year B. Tech. (Electronics and Telecommunication Engineering)

Semester-II

ET423B: Elective III - Artificial Intelligence and Applications

Teaching Scheme:	**Examination Scheme:**
Lecture : 3Hrs/Week, 3 Credits	**ESE:70 Marks**
Tutorial: 1Hr/Week, 1 Credit	**ISE:30 Marks**
	ICA: 25 Marks

This course presents an overview of the principles and practices of AI to address such complex real-world problems. The course is designed to develop a basic understanding of problem solving, knowledge representation, reasoning and learning methods of AI and applications of Artificial Intelligence. The course prepares students to take a variety of focused, advanced courses in various subfields of AI.

Course Prerequisite:

Student shall have some exposure to algorithms and programming.

Course Objectives:

1. To introduce the basic concepts and theory of Artificial Intelligence and its applications.
2. To develop problem solving approach using different search techniques.
3. To learn Natural Language Processing.
4. To understand kinematics and applications of Robotics.
5. To introduce basic concepts and applications of Deep Learning.

Course Outcomes:

At the end of this course, the student will be able to

1. Understand and able to use problem solving approach using Artificial Intelligence.
2. Understand the need of NLP and Probabilistic language models.
3. Understand basics of Robotics and apply AI in Robotics.
4. Differentiate between Machine Learning and Deep learning as well as apply deep learning for various applications.

Section– I

Unit 1– Overview **(06)**

Foundations, scope, problems and approaches of AI
Intelligent agents: Reactive, deliberative, goal-driven, utility-driven and learning agents

Unit 2- Problem-solving through Search **(07)**

Solving Problems by Searching, heuristic search techniques, constraint satisfaction problems, and stochastic search methods.

Game Playing: minimax, alpha-beta pruning.

Unit 3- Knowledge Representation and Reasoning (08)

Foundations of knowledge representation and reasoning, representing and reasoning about objects, relations, events, actions, time and space first order logic, situation calculus, description logics, reasoning with defaults, reasoning about knowledge, sample applications.

Section-II

Unit 4- Natural Language Understanding (06)

Why NL, Formal grammar for a fragment of English, Syntactic analysis, Augmented grammars, Semantic interpretation, Ambiguity and disambiguation, Discourse understanding, Grammar induction, Probabilistic language processing, Probabilistic language models

Unit 5- Introduction to Robotics (08)

Fundamentals of Robotics, A Brief History of Robotics: Industrial manipulators, Robotic Paradigms: From Tele operation To Autonomy, Making machine intelligent, Use of Robots, Space robotics with AI approach.

Unit 6– Introduction to Deep Learning (07)

Introduction to deep learning, Deep learning Vs. Machine learning, Introduction to deep learning networks and CNN, Applications of Deep learning in computer vision

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Internal Continuous Assessment (ICA):
ICA should consist of minimum 10 assignments using any programming language with openly available tools, frameworks and resources based on the following topics.

- Intelligent agents
- Problem solving through search
- First order logic

In addition to above students shall undertake a case study on **"Applications of AI: The Present and Future"**

Text books:

1. Artificial Intelligence: A Modern Approach,Stuart Russell and Peter Norvig, 3rd Edition, Prentice Hall.
2. A First Course in Artificial Intelligence, Deepak Khemani, McGraw Hill Education (India).
3. Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.
4. Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. "Deep Learning (Adaptive Computation and Machine Learning series)." (2016): 800.

पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया मृतमश्नुते ।।

Reference Books:

1. Artificial Intelligence, Elaine Rich and Kevin Knight, Tata McGraw Hill.
2. Ravichandiran, Sudharsan. Hands-on deep learning algorithms with python: master deep learning algorithms with extensive math by implementing them using tensor flow. Packt Publishing Ltd, 2019.
3. Murphy, Robin R. Introduction to AI robotics. MIT press, second edition,

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Final Year B.Tech (Electronics& Telecommunication Engineering)
Semester-II

ET 424A : Elective IV- Network Security

Teaching Scheme:	**Examination Scheme:**
Lectures – 3 Hours/week, 3 Credits	**ESE – 70 Marks**
Tutorial – 1 Hours/week, 1 Credit	**ISE – 30 Marks**
	ICA – 25 Marks

This course addresses security issues for TCP/IP based and NT networks. Access Control and Communications Security issued will be covered as well as Internet and intranet security. The course also surveys cryptographic and other tools used to provide security and reviews how these tools are utilized in protocols and applications.

Course Prerequisite:

Student shall have knowledge of communication principles and protocols of Computer Network

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Course Objectives:

1. To introduce fundamentals of Network Security Model and Cryptography.
2. To acquire knowledge of standard Cryptography Algorithms.
3. To get familiarized with various network security protocols to protect against threat.
4. To showcase IP Security Architecture at Network and Transport Layer for identifying the vulnerability of the Internet systems and recognize the mechanisms of the attacks.
5. To get familiarized with various tools and methods used in cyber crime and law acts.

Course Outcomes:

After successfully completing the course student will able to

1. Describe classical encryption techniques and cyber laws within the context of cyber security.
2. Identify working principles of secret key and public key cryptography.
3. Demonstrate Network and Transport layer communication standards/protocols for web security.
4. Apply network security principles, authentication mechanism for secure data transmission.
5. Select appropriate security services to prevent, detect and/or recover from a security attack.

Section - I

Unit 1 – Security Fundamentals **(05)**

Computer Security Concepts: The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security.
Classical Encryption Techniques: Symmetric Cipher Model, Cryptography.
Substitution Techniques: Caesar Cipher, Mono alphabetic Ciphers, Play fair Cipher, Hill Cipher, Poly alphabetic Ciphers, Transposition Techniques, Rotor Machines, Steganography.

Unit 2 – Block Ciphers and the Data Encryption Standard **(06)**

Traditional Block Cipher Structure: Stream Ciphers and Block Ciphers, Motivation for the Feistel Cipher Structure, Feistel Cipher.
Data Encryption Standard: DES Encryption, DES Decryption, The Strength of DES.
Public-Key Cryptography and RSA: Principles of Public Key Cryptosystem, RSA: Description of the Algorithm, Computational Aspects, Security of RSA.

Unit 3 – Key Management and Distribution **(04)**

Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, X.509 Certificates, Public-Key Infrastructure.

Unit 4 – Network and Internet Security **(06)**

Network Access Control and Cloud Security: Network Access Control, Extensible Authentication Protocol, IEEE 802.1X Port-Based Network Access Control Cloud Computing, Cloud Security Risks and Counter measures, Data Protection in the Cloud, Cloud Security as a Service. Intrusion Detection Systems along with Firewalls.
Transport-Level Security: Web Security Considerations, Secure Sockets Layer, Transport Layer Security HTTPS, Secure Shell (SSH).

Section - II

Unit 5 - Wireless Network Security **(04)**

Wireless Security 559, Mobile Device Security, IEEE 802. Wireless LAN Overview, Wireless LAN Security, Electronic **Mail & IP Security:** Pretty Good Privacy, S/MIME,

Unit 6 - IP Security **(04)**

IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange.

Unit 7 - Introduction to Cybercrime **(07)**

Introduction: Cybercrime definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals?, Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens.

Cyber Offenses: How Criminals Plan Them, How Criminals Plan the Attacks, Social Engineering, Cyber stalking.

Botnets: The Fuel for Cybercrime, Attack vector, Cloud computing.

Unit 8 - Tools and Methods Used in Cybercrime **(06)**

Introduction: Proxy Servers and Anonymizers, Phishing Password Cracking Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Phishing and Identity Theft(ID Theft).

- **Internal Continuous Assessment (ICA):**

  ICA consists of minimum eight assignment/tutorial based upon above curriculum.

- **Text Books:**

1. Willaim Stallings, “Computer Security: Principles and Practices”, Pearson Ed. ISBN :978-81-317-3351-6.
2. Cryptography and Network Security, Atul Kahate, TataMcGrawhill.
3. Bernard Menezes, “Network Security and Cryptography”, Cengage Learning, ISBN-978-81-315-1349-1.
4. Nina Godbole, “Cyber Security-Understanding Cyber crimes Computer Forensics and Legal Perspectives”.

- **Reference Books:**

1. Nina Godbole, “Information Systems Security”, Wiley India Pvt Ltd.
2. "Modern Cryptography, Theory & Practice", Pearson Education by Wenbo Mao.
3. Cryptography and Network Security; McGraw Hill; Behrouz A Forouzan.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Final Year B.Tech. (Electronics & Telecommunication Engineering)
Semester-II

ET424 B: Elective IV- Data Analytics

Teaching Scheme:	**Examination Scheme:**
Lectures – 3 Hours/week, 3 Credits	**ESE – 70 Marks**
Tutorial – 1 Hour/week, 1 Credit	**ISE – 30 Marks**
	ICA – 25 Marks

This course provides foundation level training that enables immediate and effective participation in big data and other analytics projects. It includes an introduction to big data and big data analytics. The course provides grounding in basic analytic methods and an introduction to big data analytics technology and tools.

Course Prerequisite:

Student shall have knowledge of Database Management Systems

Course Objectives:

1. To provide an overview of an exciting growing field of big data analytics.
2. To apply algorithmic strategies while solving problems
3. To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.

Course Outcomes:

After successfully completing the course student will able to

1. Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.
2. Use the right method to solve real problem.
3 Selecting appropriate data visualizations to clearly communicate analytic insights.
4. Use the tools and techniques to apply different algorithms and methodologies.

Section - I

Unit 1- Introduction to Data Analytics: (06)

What Can We Do With Data? Big Data and Data Science, Big Data Architectures, Small Data, What is Data? A Short Taxonomy of Data Analytics, Examples of Data Use, A Project on Data Analytics.

Unit 2 – Descriptive Statistics and Analysis: (08)

Scale Types, Descriptive Univariate Analysis, Univariate Frequencies, Univariate Data Visualization, Univariate Statistics, Common Univariate Probability Distributions, Descriptive Bivariate Analysis, Multivariate Frequencies, Multivariate Data Visualization, Multivariate Statistics.

Unit 3 - Data Quality and Preprocessing: (07)

Data Quality, Converting to a Different Scale Type, Converting to a Different Scale, Data Transformation, Dimensionality Reduction.

Section – II

Unit 4- Basic Data Analytics methods using R (07)

Introduction to R: GUI of R, Getting data into & out of R, Data types in R, Basic operations, Basic statistics, Generic functions, Data visualization using R, Data exploration & presentation, Statistics for model building & evaluation

Unit 5- Introduction to Big Data Analytics (07)

Definition of Big Data, Big data characteristics & considerations, Data repositories- analyst perspective, Business drivers for analytics, Typical analytical architecture, Business Intelligence Vs Data science, Drivers of Big data analytics, Role of data scientist in Big data ecosystem, Applications of Big data analytics.

Unit 6 - Big Data Visualization (07)

Introduction to Data visualization, Challenges to Big data visualization, Conventional data visualization tools, Techniques for visual data representations, Types of data visualization, Visualizing Big Data, Tools used in data visualization, Analytical techniques used in Big data visualization.

Internal Continuous Assessment (ICA):

ICA shall consist of minimum 6 assignments based on the syllabus contents.

Text Books:

1. David Dietrich, Barry Hiller, "Data Science and Big Data Analytics", EMC education services, Wiley publications, 2012, ISBN0-07-120413-X
2. A General Introduction to Data Analytics, by Joao Moreira, Andre Carvalho, Tomas Horvath, Wiley Publication.
3. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer
4. Ashutosh Nandeshwar , "Tableau Data Visualization Codebook", Packt Publishing, ISBN 978-1-84968-978-6

References:

1. Maheshwari Anil, Rakshit, Acharya, "Data Analytics", McGraw Hill, ISBN: 789353160258.
2. Mark Gardner, "Beginning R: The Statistical Programming Language", Wrox Publication, ISBN: 978-1-118-16430-3
3. Luís Torgo, "Data Mining with R, Learning with Case Studies", CRC Press, Talay and Francis Group, ISBN9781482234893
4. Carlo Vercellis, "Business Intelligence - Data Mining and Optimization for Decision Making", Wiley Publications, ISBN: 9780470753866.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY

FACULTY OF SCIENCE AND TECHNOLOGY

MECHANICAL ENGINEERING

Syllabus Structure for

FINAL YEAR B.TECH. MECHANICAL ENGINEERING

w.e.f.

ACADEMIC YEAR 2023-24

Choice Based Credit System

PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY
FACULTY OF SCIENCE & TECHNOLOGY
MECHANICAL ENGINEERING

Programme Educational Objectives and Outcomes

A. Program Educational Objectives (PEOs)

- **PEO1:** To make students competent for professional career in Mechanical and allied interdisciplinary areas
- **PEO2:** To build strong fundamentals required to pursue higher education and continue professional development in Mechanical and other fields
- **PEO3:** To imbibe professional ethics, develop team spirit and effective communication skills to be successful leaders with a holistic approach.
- **PEO4 :** To nurture students to be sensitive to ethical, societal and environmental issues while serving at their professional work

B. Program Outcomes (POs)

A Mechanical Engineering Graduate will be able to –

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science and Technology

Credit System structure of Final Year B. Tech. Mechanical Engineering W.E.F. 2023-2024 [Semester VII]

Semester VII - Theory Courses

Course code	*Name of Theory Course*	*Hrs./week*				*Credits*	*Examination Scheme*			
		L	*T*	*P*	*D*		*ISE*	*ESE*	*ICA*	*Total*
ME 411	Refrigeration and Air Conditioning	3	-	-	-	3	30	70	-	100
ME 412	Automobile Engineering	3	-	-	-	3	30	70	-	100
ME 413	Automation and Robotics	3	-	-	-	3	30	70	-	100
ME 414 P	Professional Elective-V	3	-	-	-	3	30	70	-	100
ME 415 O	Open Elective-I	3	-	-	-	3	30	70	-	100
	Sub Total	**15**	**-**	**-**	**-**	**15**	**150**	**350**	**-**	**500**

Semester VII - Laboratory / Tutorial Courses

Course code	*Name of Laboratory / Tutorial Course*	*Hrs./week*				*Credits*	*ISE*	*Examination Scheme*			
		L	*T*	*P*	D			*ESE*		*ICA*	*Total*
								POE	*OE*		
ME 411	Refrigeration and Air Conditioning	-	-	2	-	1	-	-	25	25	50
ME 412	Automobile Engineering	-	-	2	-	1	-	-	25	25	50
ME 413	Automation and Robotics	-	-	2	-	1	-	-	-	25	25
ME 414 P	Professional Elective-V	-	-	2	-	1	-	-	-	25	25
ME 415 O	Open Elective-I	-	-	2	-	1	-	-	-	25	25
ME 416	Industrial Training	-	1	-	-	1	-	-	25	50	75
ME 417	Project Phase – I	-	-	4	-	2	-	-	-	50	50
	Sub Total	**-**		**14**	**-**	**08**	**-**	**75**		**225**	**300**
	Grand Total	**15**	**1**	**14**	**-**	**23**	**150**	**425**		**225**	**800**

Abbreviations: *L- Lectures, P –Practical, T- Tutorial, ISE- In-Semester Examination, ESE - End Semester Examination (University Examination for Theory & / POE & / Oral), ICA- Internal Continuous Assessment.*

Professional Elective – V: *A. Production and Operations Management, B. Artificial Intelligence & Machine Learning, C. Railway Systems Management D. Analysis and Synthesis of Mechanisms E. Business Economics*

Open Elective – I: *A. Entrepreneurship Development, B. Operations Research, C. Research Methodology D. Supply Chain Management E. Finite Element Method*

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science and Technology

Credit System structure of Final Year B. Tech. Mechanical Engineering W.E.F. 2023-2024 [Semester VIII]

Semester VIII – Courses

Course code	*Name of Course*	*Hrs./week*				*Credits*	*ISE*	*Examination Scheme*			*ICA*	*Total*
		L	*T*	*P*	D			*ESE*				
								Theory	*POE*	*OE*		
ME 421	A. Self-Learning Technical (Swayam / NPTEL)	-	-	-	-	4	-	-	-	-	100*	100*
	B. Self-Learning Technical Course offered by institute	-	-	-	-		-	-	-	-		
	C. Apprenticeship/Internship	-	-	-	-		-	-	-	-		
ME 422	Project Phase – II (Progress Presentation - I)	-	-	2	-	1	-	-	-	-	50	50
ME 423	Project Phase – III (Progress Presentation - II)	-	-	2	-	1	-	-	-	-	50	50
ME 424	Project Phase – IV (Report Submission & Final Presentation)	-	-	4	-	2	-	-	50	-	50	100
	Grand Total			**08**		**08**			**50**		**250**	**300**

Abbreviations: *L_ Lectures, P –Practical, T_ Tutorial, ISE_ In Semester Examination, ESE _ End Semester Examination (University Examination for Theory & / POE & / Oral), ICA_ Internal Continuous Assessment.*

* Students shall opt for any one of the two courses (i.e. out of ME 421-A, ME 421-B), and obtain 4 credits of 100 marks.

ME 422, ME423 & ME424 are compulsory.

* Students are encouraged to undergo Apprenticeship/internship (ME 421-C) in any industry for obtaining 4 credits of 100 marks and should complete a project sponsored by the Industry/Organisation **as a part of ME422, ME423 & ME424.** However such students should submit Internship and project report separately.

❖ **M421A-Self Learning Technical Course (Swayam/NPTEL**):

- **ICA** 100 Marks, Credits: 4, Assessment of the student based on assignment during the course / quiz conducted on selected course and evaluated as part of ICA.
- Student should complete certified self-learning technical course before end of Semester-VIII.

❖ **M421B Self Learning Technical Course offered by institute:**

- **ICA** 100 Marks, Credits: 4, Course shall be designed by the Institute and Assessment of the student based on assignment during the course / quiz conducted on selected course and evaluated as part of ICA.

Note for M421A& M421B: Student may select any one course of minimum eight weeks **or** two self-learning technical Courses of four weeks based on content in the following areas:

- Electric Vehicles
- Advanced Manufacturing Processes
- Renewable energy
- Automation and Robotics
- Artificial Intelligence
- Machine Learning
- CAD/CAM/CAE
- Thermal Engineering
- Design Engineering
- Industrial Engineering

❖ **M421C Apprenticeship/Internship:**

- **ICA** 100 Marks, Credits: 4, Students may opt for semester long internship/apprenticeship (minimum 60 days).
- Apprenticeship/Internship may be of the following type:
  - Offered by industry at their premises.
  - Offered by industry at the institute campus.
  - Offered by institute jointly with the research funded agency/ industry.

Punyashlok Ahilyadevi Holkar Solapur University
Final Year B.TECH. (Mechanical Engineering)
Semester-VII
ME411 : Refrigeration and Air Conditioning

***Teaching Scheme**
Lectures : 03 Hours/week, 03 Credits
Practical : 02Hours/week, 01 Credit

***Examination Scheme**
ESE : 70 Marks
OE : 25 Marks
ISE : 30 Marks
ICA : 25 Marks

Course Introduction:

The **course** consists of different **refrigeration** cycles such as Air refrigeration cycle, Vapour Compression cycle, Vapour absorption cycle. It also covers properties of refrigerants and various alternative refrigerantsand understanding of psychrometric chart and psychrometric processes used for the purpose of **air- conditioning**. Further, the comfort **air-conditioning** and cooling load calculations are also addressed in this **course**.

Course Objectives:
During this course, student is expected to

1	Learning the fundamental principles and different methods of refrigeration and air conditioning.
2	To understand basic refrigeration processes
3	Comparative study of different refrigerants with respect to properties, applications and environmental issues.
4	Understand the basic air conditioning processes on psychometric charts, calculate cooling load forits applications in comfort and industrial air conditioning.
5	To acquire the skills required to design and analyze refrigeration and air conditioning componentsand systems.

Course Outcomes:
At the end of this course, student will be able to:

1	Evaluate performance of various types of refrigeration systems
2	Select appropriate refrigerant considering necessary properties
3	Use Psychrometric chart and tables and analyze psychrometric process for obtaining required air conditions.
4	Identify the factors of cooling load and its calculation
5	Describe comfort chart and compare duct design methods.

Section I

Unit-1: Basic Refrigeration Cycles and Refrigerants **No. of lectures-7**

A) Thermodynamics:

Principles and fundamentals of heat transfer, Refrigeration, Units of refrigeration, Applications of refrigeration, Reversed Carnot cycle with vapour as refrigerant, Calculation of COP (Numerical Treatment).

B) Refrigerant: Classification, Desirable Properties, Nomenclature of Refrigerants, Selection of refrigerant, ASHRAE std. 34 for refrigerant safety classification, Secondary refrigerants, Effect on Ozone depletion and Global warming, Total equivalent warming impact (TEWI), Alternative Refrigerant.

Unit-2: Vapour Compression Refrigeration Systems **No. of lectures-8**

Working of simple vapour compression system, representation of different vapour compression cycle (VCC) on T-s and P-h diagram, Vapour compression cycle, Sub cooling, Superheating, Analysis and Performance calculations of above cycles. Effect of operating parameters on performance of VCC, actual VCC, methods of improving COP, Flash gas removal, Flash inter cooling, Compound compression with intercooling, Multiple evaporator systems (Numerical Treatment).

Unit-3: Vapour Absorption Refrigeration Systems and Cryogenics **No. of lectures-5**

A) Limitations of VCRS, Working of simple vapour absorption system (VAS), Practical vapour absorption system, desirable properties of binary mixture (aqua-ammonia), COP of an ideal Vapour Absorption Refrigeration System, Li-Br absorption system, three fluid system (Electrolux refrigeration), applications of VARS, comparison between VCRS and VARS.

B) Introduction to cryogenics Limitations of vapour compression systems for the production of low temperature, Cascade Refrigeration System, Linde System for liquefaction of air. Applications of Cryogenics. (Descriptive Treatment).

Section II

Unit-4: Psychrometry **No. of lectures-7**

A) Introduction: Psychometrics terms, Dalton's law of partial pressure, Psychometrics relations, Enthalpy of moist air, Use of psychometric tables and Charts, Psychometrics Processes, Combinations And Calculations, SHF, BPF, ADP Coil condition line, **(Numerical Treatment)**

B) Comfort Conditions: Human Comfort Thermodynamics of human body, comfort and comfort chart, factors affecting human comfort, concept of infiltration and ventilation, indoor air quality requirements.

Unit-5: Heating and Cooling Load Calculations **No. of lectures-8**

Enumeration and brief explanation of the factors forming load on refrigeration and air conditioning systems, Ventilation requirements according to ASHRAE std. 62.1, Inside and Outside Design conditions, U-value for different building materials, CLTD, SCL, Cooling load calculations using E20 format/ software, Load analysis by RSHF, GSHF **(Numerical Treatment).**

Unit-6: Air Conditioning and Air Distribution Systems **No. of lectures-5**

A) Room air conditioning, Chilled water systems, DX systems, Comparison between Chilled water and DX systems, Air handling unit, Fan coil unit, Desert coolers, Air-washer, Industrial applications

B) Classification of ducts, pressure in ducts, flow through duct, equivalent diameter, Methods of duct system design: equal friction, velocity reduction, static regain method, types of fans used air conditioning applications, fan laws, External Static Pressure (ESP), grills, registers, diffusers.

Internal Continuous Assessment (ICA):

List of Experiments/Assignments/Case Studies, etc.

Group I (Study, Demonstration of any four assignments on following)

1. Study of Refrigeration methods
2. Study of Refrigeration Equipment's
3. Study of Refrigeration Systems–Domestic refrigerator, Split air conditioner, Ice Plant, Deep freezer etc.
4. Study of charging, leak testing of refrigeration systems
5. Case Study (Any One of the following)
    A. Refrigeration and Air-Conditioning systems used in Space Station/ Satellites/ Rockets/ Submarines/ Automobiles
    B. ASHRAE standards in Refrigeration and Air-Conditioning
    C. Application of Phase change materials in refrigeration

Group II (Any three experiments out of the following)

1. Trial on Refrigeration primer / bench
2. Trial on mini ice plant
3. Trial on Vapour Absorption system
4. Trial on Air conditioning tutor
5. Calculation of cooling load for given space drawing

Group III(Any one out of the following)

1. Visit to Refrigeration plant or Central Air Conditioning plant
2. Usage of software for cooling load calculation

Text Books:

1. 'Refrigeration and Air Conditioning' by R.S. Khurmi & J.K. Gupta
2. 'Refrigeration & Air Conditioning' by C. P. Arora
3. 'Refrigeration & Air Conditioning' by Arora & Domkundwar
4. 'Refrigeration and Air-conditioning' by S. N. Sapali

Reference Books

1. Basic Refrigeration and Air Conditioning by P. N. Ananthnarayanan
2. Principles of Refrigeration 'by Roy J Dossat
3. Air Conditioning Applications & design' by W. P. Jones
4. Refrigeration & Air Conditioning by Stocker
5. Refrigeration & Air Conditioning by Manohar Prasad

Punyashlok Ahilyadevi Holkar Solapur University
Final Year B.TECH. (Mechanical Engineering)
Semester-VII
ME412: Automobile Engineering

***Teaching Scheme**
Lectures:03 Hours/week, 03 Credits
Practical: 02Hours/week, 01 Credit

***Examination Scheme**
ESE: 70 Marks
OE : 25 Marks
ISE : 30 Marks
ICA: 25 Marks

Course Introduction:

An automobile is a self-propelled vehicle which contains the power source for its propulsion and is used for carrying passengers and goods on the ground, such as cars, buses, trucks, etc.,

Automobile engineering plays a vital role in engineering and the day-to-day modern world. It gained so much recognition and importance since vehicles became a fundamental mode of transportation. People want their own mode of transportation. Public transportation is present as a mode of transportation, making automobile engineering an important and rapidly growing field of engineering. Automobile engineering has great career scope and broad scope in engineering. It offers wide opportunities for students who want to become automobile engineers and want to build successful careers in the field. It includes automobile components manufacturing industries, vehicle manufacturing companies, production plants, transport companies, research and development departments, service stations, motor vehicle departments, private transport companies and many more.

Course Objectives:

1) To understand the need and role of chassis construction in the function of an automobile.
2) To understand the function of various parts of the automobile.
3) To identify the merits and demerits of the various components of the transmission and suspension systems.
4) To understand the working of different braking and steering systems.

Course Outcomes:

At the end of this course, the student will be able to:

1. Differentiate the types of vehicle chassis and transmission layouts.
2. Examine the various parameters influencing the vehicle's performance characteristics.
3. Select and explain the different transmission system components for efficient power transmission.
4. Analyse the different parameters influencing automobile steering systems.
5. Analyse the different parameters influencing automobile braking systems.
6. Compare the different suspension systems used in automobiles.

Section I

Unit-1: Introduction to Automobiles **No. of lectures-06**

Broad classification of Automobiles, Major components, and their functions. Types of vehicle drive layouts, Front engine front wheel drive, Front engine rear wheel drive, Rear engine rear wheel drive, All wheel drive.

Unit-2: Performance of Automobiles **No. of lectures-06**

Resistance to vehicle motion, Air, Rolling and Gradient resistance, Acceleration, Grade ability and draw bar pull, Traction and Tractive effort, Power required for vehicle propulsion, (Numerical treatment).

Unit-3: Transmission System **No. of lectures-08**

Requirements of transmission system, Requirements of automobile clutch, functions of clutch, Types of clutches: single plate, multi-plate, centrifugal, electromagnetic. Types of automotive gearboxes: sliding mesh gearbox, constant mesh gearbox and synchromesh gearbox, Automatic transmission, Overdrive, Propeller shaft, Universal and slip joint, Final drive and its types, Differential, Construction, and types of rear axles.

Section II

Unit-4: Steering System **No. of lectures-06**

Function of steering, Steering system layout, Types of steering gearboxes, Steering Geometry: Camber angle, Caster angle, Kingpin inclination, included angle, Toe-in and Toe-out, Wheel alignment, slip angle, Under steer & Over steer, Types and working of power steering.

Unit-5: Braking System **No. of lectures-06**

Function of the automotive brake system, Types of braking mechanism: internal expanding & Disc brake. Types of braking systems: Mechanical, Hydraulic & Air brake systems, Power brakes, Anti-lock braking system (ABS), Braking force and stopping distance (numerical treatment).

Unit-6: Suspension System **No. of lectures-08**

Requirements of the suspension system, Sprung and Un-sprung mass, Leaf springs, Coil springs, Shock absorber, Types of automotive suspension systems: Conventional suspension and Independent, Types of independent suspension systems: Double wishbone and MacPherson strut-type suspension systems, Rear axle drives: Hotch-kiss and Torque tube drive, Reaction Members: Antiroll/Sway/ Stabilizer bar.

Internal Continuous Assessment (ICA):

List of Experiments/Assignments/Case Studies (Any eight).

1. Study and demonstration of four-wheeler drive layout (2WD & 4WD).
2. Study and demonstration of working of single plate automobile clutch.
3. Study and demonstration of synchromesh gearbox, final drive and differential.
4. Study and demonstration of hydraulic braking system.
5. Study and demonstration of steering system layout and types of steering gearbox.
6. Study and demonstration of suspension system of a four-wheeler.
7. Demonstration/Experiment on wheel balancing & front wheel alignment.
8. Visit to servicing station for study of vehicle maintenance, repairs and report.
9. Study of awareness and practice of Road Safety Rules

Text Books:

1. Automobile Engineering by Kripal Singh
2. Automobile Mechanics by N. K. Giri
3. Automobile Mechanics by S. K. Gupta

Reference Books

1. Motor Vehicle by T. K. Garrett, K. Newton, W. Steeds
2. Handbook of Automotive Engineering by Hans-Hermann Braess, Ulrich Seiffert
3. Automotive Mechanics by William H. Crouse
4. Automotive Mechanics by Joseph Heitner

गुरुर्ब्रह्मा गुरुर्विष्णु गुरुर्देवो महेश्वर
सोलापूर विद्यापीठ
॥ विद्या अमृतम् ॥

Punyashlok Ahilyadevi Holkar Solapur University

Final Year B.TECH. (Mechanical Engineering)
Semester-VII

ME413: Automation and Robotics

Teaching Scheme

Lectures: 03 Hours/week, 03 Credits

Practical: 02 Hours/week, 01 Credit

Examination Scheme

ESE: 70 Marks

ISE: 30 Marks

ICA: 25 Marks

Course Introduction:

This course is designed to give the student an in depth understanding of Automation and Robotics. It covers the following topics: Basics of Automation, Automation types, Material handling and Identification Technologies, introduction to industrial robotics, Anatomy of an industrial robot, robot history, AGVs, service robots, Cobots, configurations, sensors and actuators, end effectors. Kinematics of multi-degree-of-freedom systems, Jacobean matrices, kinematics, and dynamics. Robot trajectories.

Course Objectives:

During this course, student is expected to:

1. Understand the basic construction of an industrial robot.
2. Acquaint with existing market distribution and future trends.
3. Understand the technology behind a modern robot such as sensors, actuators, grippers, Controllers.
4. Understand and bridge the gap (regarding industrial robots) between text books & industry
5. Understand the scope and applications of modern machine vision systems.
6. Understand the scope of AGVs and other mobile robots for industrial applications

Course Outcomes:

At the end of this course, student will be able to:

1. Solve simple kinematics and dynamics problems on robot motion.
2. Select appropriate robot specifications for industrial applications.
3. Use suitable software toolboxes to demonstrate machine vision concepts.
4. Use any suitable software to simulate a robot and its work cell.
5. Select mobile configuration based on applications.
6. Evaluate and compare robots based on their specifications.

Section I

Unit 1: – Introduction to Robotics **No. of lectures – 06**

History and fundamentals of Industrial Robots, Definition as per ISO & IFR, components of industrial robots, classification of robots. Collaborative Robots, Service Robots, AGVs, classification, navigation techniques, applications, Mobile robots, wheeled and tracked robots

Unit 02: Sensors, Actuators & End Effectors **No. of lectures - 09**

Sensors: Sensor classification; Internal Sensors: Position Sensors, Velocity Sensors Acceleration sensors & Force sensors External Sensors: Non-contact type- Proximity sensor,

Actuators: Compare Hydraulic, Pneumatic and Electric drives; Linear Actuators; Stepper motors, DC Motors, DC Servo Motors, AC Motors, Variable Frequency Drives, Selection of Actuator for given Application

End Effectors: End effectors & grippers, classification, applications, design, and selection criteria for end effectors.

Unit-3: Kinematics, Dynamics & Control **No. of lectures – 05**

Forward kinematics, Inverse Kinematics for 2 DOF and 3 DOF planar manipulators; Dynamics: Velocity Jacobian, singularities; Control architecture of robots, Overview of advanced control techniques such as force control, PID control adaptive control,

Section II

Unit 4 – Robot Vision/Machine Vision **No. of lectures – 08**

Machine Vision definition and system components, lighting techniques, Image processing fundamentals: Edge detection, shape analysis, segmentation, object identification,template matching, Cameras (CCD, CMOS, Area Scan, Line Scan), camera specification and selection, camera calibration.

Unit 5 – Robot Workcells & Programming **No. of lectures - 06**

Robot cell layout, considerations in workcell design, workcell control, cell safety, human machineinterface, robot cell controller.

Lead through programming, walk through programming, offline programming.

Unit 6 – Industrial Robot Applications **No. of lectures – 06**

General considerations for selecting robots (including layout and workcell) for material handling, Pick and place robot and machine tending, spot welding, continuous welding, sealant application, spray painting, assembly,inspection, electronics assembly, ASRS System.

Internal Continuous Assessment (ICA):

List of Assignments

1. Assignment on Sensors, Actuators and grippers used in Robotics
2. Forward Kinematics of 2 DOF and 3 DOF supported by suitable software.
3. Assignment on Robot cell layout
4. Assignment on Automated Storage/Retrieval Systems (ASRS).
5. Assignment on Navigation Techniques of AGV
6. Assignment on Survey of different robots – specifications, manufacturers and applications used in Robotics
7. Assignment on Basic Elements of Machine Vision system.
8. Assignment on Applications of Robots for Spray painting, pick & place, Welding etc.

Text Books:

1. S.K Saha - Introduction to Robotics, McGraw-Hill.
2. Mikell Groover- Automation, Production Systems and Computer Integrated Manufacturing, Pearson Education.

Reference Books:

1. Amber G.H & Amber P.S. - Anatomy of Automation, PrenticeHall.
2. Asitava Ghosal, Robotics: Fundamental Concepts and Analysis, Oxford Press.
3. Frank Lamb - Industrial Automation_ Hands On, McGraw-Hill Professional.

Punyashlok Ahilyadevi Holkar Solapur University
Final Year B.TECH. (Mechanical Engineering)
Semester-VII
ME414P: Production and Operations Management

***Teaching Scheme**
Lectures:03 Hours/week, 03Credits
Practical :02 Hours/week, 01Credit

***Examination Scheme**
ESE: 70 Marks
ISE: 30 Marks
ICA: 25 Marks

Course Introduction:
Strategic growth & competiveness of organizations are depending upon the effective utilization of the critical production resources of the organization. Production / operations function is concerned with design & control systems responsible for the productive use of raw materials, human resources, equipment and facilities in the development of a product or services. The syllabus is divided into two sections, each section contains three chapters.

Course Objectives:
During this course, student is expected to:

1. Develop knowledge about the principles of production and operations management.
2. Solve organizational problems related to production as well as operations management.
3. Empower students to handle case studies related to industrial problems.

Course Outcomes:
At the end of this course, student will be able to:

1. Explain the scope and need of production and operation management and evaluate the future demands using different forecasting methods.
2. Apply the concept of capacity planning and aggregate planning to various types of manufacturing systems
3. Explain the importance and functions of production planning and control
4. Apply the inventory control models in production processes
5. Apply the concept of plant maintenance
6. To get acquainted with various advanced techniques such as Lean manufacturing, value engineering, six sigma, Kanban, Supply chain management

Section I

Unit-1: Introduction to Production and Operation Management and Forecasting **No. of lectures- 09**

Introduction to POM- Definitions, objectives, Scope and History of Production Management, Manufacturing system and their types

Forecasting- Need, types of Forecasting, Statistical method, Moving average method, exponential smoothing method, Least square method, Regression and Co-relation method. (Numerical Treatment)

Unit-2: Capacity Planning **No. of lectures- 05**

Concept, measurement and measures of capacity, factor affecting, capacity planning procedure, Aggregate planning, Investment decision and replacement analysis. (Numerical Treatment)

Unit-3: Production Planning and Control **No. of lectures-06**

Objectives, Functions, Co-ordination of PPC with other Department, Routing Scheduling, Loading and Sequencing, Line balancing, Production Control – Dispatching, Function and documents, Follow up, Evolution

Section II

Unit-4: Inventory Management **No. of lectures- 06**

Inventory concepts, objectives, types of Inventory, different costs of Inventory, EOQ model, Economic batch quantity (EBQ) model, Inventory control techniques, ABC analysis, MRP, Fixed period and fixed quantity system. (Numerical Treatment).

Unit-5: Plant Maintenance **No. of lectures-06**

Definition, Need, Importance, Functions, scope and organization of maintenance department Types of maintenance- preventive, break down, Identification of break down using fishbone diagram, and TPM, Reliability and life testing

Unit-6: Value Engineering and Value Analysis and Advanced manufacturing System **No. of lectures-08**

Value Engineering and Value Analysis - Definition, objectives and use of value analysis, reason of unnecessary cost, value analysis procedure.

Advanced manufacturing System - Lean Manufacturing Basics , Just- in Time (JIT), Kanban System, KAIZAN, Zero defect, six sigma , Supply chain Management.

Internal Continuous Assessment (ICA):

List of Experiments/Assignments/Case Studies, etc. (Any six)

1. A micro project on categorization of industries based on production type and production system (Categorize any (minimum) six industries by type of production and production system and justify the categorization. This micro project is based on the Industry, products of the industry and further their categorization)
2. Numerical treatment on different forecasting techniques by using suitable software tool
3. Numerical treatment on capacity planning by using suitable software tool.
4. Numerical treatment on inventory management
5. A Case study on plant maintenance or TPM preferably from the research paper from reputed peer reviewed journal
6. A Case study on value analysis
7. A Case study on Six Sigma
8. A Case study/online course (minimum 2 hrs.) on Supply chain Management

Text Books:

1. Industrial engineering and Production management by Martand Telsang. (S. Chand)
2. Elements of Production Planning and Control by Samuel. (Universal Pub.)
3. Modern Production/Operation Management by BuffaSarin. (Wiley)
4. Industrial Engineering and Management by O. P. Khanna

Reference Books

1. Production and Operation Management by M. E. Thukaram Rao. (New Age International Pub)
2. Sunil Chopra and Peter Meindl "Supply Chain Management – Strategy, Planning, and Operation ",6th Edition, Pearson Education Asia , 2016.

Punyashlok Ahilyadevi Holkar Solapur University
Final Year B.TECH. (Mechanical Engineering)
Semester-VII
ME 414 P : Artificial Intelligence and Machine Learning

***Teaching Scheme**
Lectures: 03 Hours/week, 03 Credits
Practical : 02 Hours/week, 01 Credit

***Examination Scheme**
ESE: 70Marks
ISE: 30Marks
ICA: 25Marks

Course Introduction:

This course is designed to give the students of Mechanical Engineering a flavor of the buzz words of present and applications of future viz. 'Artificial Intelligence' and 'Machine Learning'. The course covers fundamental branches of Artificial Intelligence such as Problem Solving, Fuzzy Logic, Expert Systems, Natural Language Processing, Vision Processing, Machine Learning and so on. It further focuses on the advancements of Machine Learning including Supervised, Un-supervised and Reinforcement Learning models, Artificial Neural Networks, etc. The course puts forth the relevance of these AI and ML techniques in Mechanical Engineering by encompassing the major application areas of these techniques in Mechanical Industries through its various units.

Course Objectives:

During this course, learners are expected to:

1. Understand fundamentals of AI, its types, and applications.
2. Define Artificial Intelligence and explain of AI
3. Explain Applications of fuzzy logic, expert systems, Language and Vision Processing
4. Outline steps involved in development of machine learning model
5. Familiarize with concepts of supervised, un-supervised and reinforcement learning.
6. Analyze Artificial Neural Network models used for different applications

Course Outcomes:

At the end of this course, learners will be able to:

1. Describe need of Artificial Intelligence (AI) and problem-solving approaches in AI
2. Demonstrate fuzzy logic and expert systems
3. Outline the Language Processing and Vision Processing Systems
4. Describe Machine Learning (ML) and fundamental steps involved in ML.
5. Develop a machine learning model suitable to solve a given problem
6. Simulate an Artificial Neural Network to solve a particular problem

Section I

Unit-1: Fundamentals of Artificial Intelligence (AI) **No. of lectures- 07**

Introduction to Artificial Intelligence, History of AI, General Applications of AI, Need of Artificial Intelligence in Mechanical Engineering, Problem Solving Approaches in AI : General Problem Solving (Production Systems, State Space Search), Exhaustive Searching Methods (search space control - Depth First Search, Breadth First Search), Heuristic Approaches (Hill climbing, best-first search, branch and bound) [Approaches to be dealt with relevant practical examples]

Unit-2: Fuzzy Logic and Expert Systems **No. of lectures- 06**

Introduction to Fuzzy Logic: Basic concepts, history, and fuzzy set theory. Processes in a fuzzy logic system, Applications of Fuzzy Logic in Mechanical Engineering (Mechatronics)
Introduction to expert systems: Definition of expert systems, Inference mechanisms in expert systems, Case studies of expert systems in mechanical engineering, applications of expert systems in mechanical engineering

Unit-3 Natural Language Processing and Vision Processing **No. of lectures- 07**

Introduction to Natural Language Processing: Definition and goals of NLP, Applications of NLP (in Mechanical Engineering and in General), Text Preprocessing, Sentiment Analysis, Information Retrieval, Dialogue Systems, Chatbots.
Introduction to Vision Processing: Definition and goals of vision processing, Applications of Vision Processing (in Mechanical Engineering and in General), Image Processing Techniques steps and fundamentals, Case study in image processing.

Section II

Unit-4: Fundamentals of Machine Learning (ML) **No. of lectures- 06**

Introduction to Machine Learning, Types of Machine Learning, Applications of ML in Mechanical Engineering (Predictive Maintenance and Health Management, Fault Detection, Image based part classification, Process Optimization, Inspection, Improving control algorithms)
Data preprocessing in Machine Learning : Data cleaning and preparation, Feature selection and extraction, Data normalization and scaling

Unit-5: Supervised, Un-supervised and Reinforcement Learning **No. of lectures- 09**

Supervised Learning: Introduction to Supervised Learning, Classification and Regression (with examples)
Un-supervised learning : Introduction to Un-Supervised Learning, Clustering, Dimensionality reduction and Anomaly detection (with examples)
Reinforcement Learning : Introduction to Reinforcement Learning, Markov Decision Processes (MDPs), Policy Iteration, Value Iteration, Q-Learning (with examples)

Unit-6: Artificial Neural Networks **No. of lectures- 05**

Introduction to Artificial Neural Networks (ANNs) : Definition and history of ANNs, Basic architecture of ANNs, Definition and working of perceptron, Backpropagation algorithm Activation functions, Working of Multi Layered Perceptron, Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), Applications of ANNs in Mechanical engineering

Internal Continuous Assessment (ICA):

ICA shall include following assignments

1. Fundamentals of Artificial Intelligence and its Applications
2. Problem Solving Approaches in AI
3. Demonstration of Fuzzy Logic with relevant examples
4. Case Study on 'Chatbots used in any relevant application'
5. Steps in Vision Processing and Applications of Vision Processing
6. Pre-processing in Machine Learning
7. Demonstration of Supervised, Un-supervised and Reinforcement learning with suitable examples
8. Demonstration of different Artificial Neural Networks with suitable examples

** Suitable open source software, online tools and facilities like Virtual Labs may be used for demonstration of different techniques mentioned in above assignments*

Text Books:

1. Stuart Russel& Peter Norvig, Artificial Intelligence a Modern Approach.
2. E. Rich and K. Knight, "Artificial intelligence",TMH.
3. N.J. Nilsson, "Principles of AI", Narosa Publ. House, 2000.
4. Deisenroth, Faisal, Ong, Mathematics for Machine Learning, Cambridge University Press, 2020.
5. B Joshi, Machine Learning and Artificial Intelligence, Springer, 2020.

Reference Books

1. Robert Babuška, Fuzzy Modeling for Control, Springer.
2. Dan Patterson, Introduction to Artificial Intelligence and Expert Systems, Prentice-Hall.
3. Solanki, Kumar, Nayyar, Emerging Trends and Applications of Machine Learning, IGI Global, 2018.
4. Mohri, Rostamizdeh, Talwalkar, Foundations of Machine Learning, MIT Press, 2018.

Punyashlok Ahilyadevi Holkar Solapur University
Final Year B.TECH. (Mechanical Engineering)
Semester-VII
ME414 P: Railway Systems Management

***Teaching Scheme**

Lectures : 03 Hours/week, 03 Credits
Practical : 02Hours/week, 01 Credit

***Examination Scheme**

ESE : 70 Marks
ISE : 30 Marks
ICA : 25 Marks

Course Introduction:

This course seeks to provide a basic knowledge of railway systems & their management techniques. The first half of the syllabus covers various railway systems like Suspension & Braking Systems, Coupling, Bogie Assembly, HVAC Systems, Drive Train, Traction, and Signal Systems, whereas second half gives ideas about the Vehicle Maintenance and Management followed in railway workshops and manufacturing units also Vehicle Maintenance and Management, Vehicle Safety & Environment and Cutting-edge technologies in railways related issues are highlighted.

Course Objectives:

During this course, the student is expected to:

1. Differentiate between various suspension & Braking Systems used in railways.
2. Analyze the design of bogies considering various mechanisms and HVAC systems.
3. Correlate the generation of tractive effort traction and Signal System
4. Study Track maintenance procedures. Scrap management
5. Evaluate the impact of traffic composition on the environment and safety considerations in the vehicle.
6. Study the working of various Railway Management Systems

Course Outcomes:

At the end of this course, the student will be able to:

1. Explain various working of various suspension & Braking Systems used in railways.
2. Identify the assembly of bogies and the working of various mechanisms used in bogies.
3. Describe the generation of power for the tractive effort through various units and the working of each unit
4. Classify and Describe the Vehicle Maintenance of Railways.
5. Describe the Vehicle Safety and Environment
6. State and Explain Cutting-edge technologies in railways.

Section I

Unit-1: Suspension & Braking System **No. of lectures- 08**

Suspension System: Sprung and unsprang mass, types of suspension linkages, types of suspension springs- leaf, coil, air springs, hydro gas, rubber suspension, interconnected suspension, self-leveling suspension (active suspension), damping and shock absorbers, Dampers- Fresh Air Dampers, Diversion Dampers. Suspension systems of Diesel locomotives and effect on tractive effort.

Braking System: Types of brake systems - air brakes, vacuum brakes, dynamic brakes, servo and power braking, ABS, Recuperative braking system. Friction braking, Regenerative braking system, Utilization of generated power, Selection of appropriate braking system. Emergency braking system.

Unit-2: Coupling, Bogie Assembly and HVAC System **No. of lectures- 06**

Railway coupling: Mechanism used to connect rolling stocks, Screw coupler, Janney coupler, CBC Coupler.

Bogie Assembly: Components and design consideration.

HVAC System: Air Conditioning- Heating, Ventilation and cooling, heat exchangers to preheat or precool incoming air. Ventilation Cut-Out Switch, Freeze Protection

Unit-3: Drive Train, Traction, and Signal **No. of lectures- 06**

Drive train and traction: Power generation units, OHE (Catenary) System, Pantograph electric system, Transformer system, AC to DC conversion- Rectifier. Traction motors, Batteries. Lighting System & Accessories.

Signal System: Signals, Classification of Signals- Manual and Automatic

Section II

Unit-4: Vehicle Maintenance and Management **No. of lectures- 06**

Introduction, Maintenance Services, Classification of Maintenance/Repairs, Inspection and Maintenance - Records: Inspection and Records of maintenance, Building Inspection Register, Monitoring of Maintenance and Improvement, Duties of Engineering Officials, Water Treatment, Drainage, Sewerage, and Sanitation

Unit-5: Vehicle Safety & Environment **No. of lectures- 08**

Railway safety*:* Types of Railway Incidents and Definition Of Railway Safety, Significance of Safety in Railway Systems and Differences in Road Safety, Classification of Railway Incidents, Causes of Railway Incidents.

Environment: Natural environment of the railway, Air pollution, soil and water pollution, Ecosystem disturbance, Disturbance of local resident activities, Ground-borne noise, and vibrations. Green Initiatives in railway sectors. Solar Trains. Rainwater harvesting in Railways. Human waste management: Bio toilets, Vacuum toilets.

Unit-6: Cutting-edge technologies in railways **No. of lectures- 06**

Definition and Classification of Cutting-Edge Technologies, Smart Windows, Carbon and Glass Fibres, Laser Railhead Cleaner Systems, Catenary-Free Power Supply of Tramway Systems, Ground power supply systems: The APS system, The TramWave system, The PRIMOVE system,

Internal Continuous Assessment (ICA):
List of Experiments/Assignments/Case Studies, etc. (Any 8)

1. Assignment on Suspension & Braking System
2. Assignment on Coupling, Bogie Assembly and HVAC System
3. Assignment on Drive Train, Traction and Signal System
4. Assignment on Vehicle Maintenance and Management
5. Assignment on Vehicle Safety & Environment
6. Assignment on Cutting-edge technologies in railways
7. Case Study on Suspension & Braking System
8. Case Study on Coupling, Bogie Assembly and HVAC System
9. Case Study on Vehicle Safety & Environment
10. Industrial Visit Railway Workshop/Industry

Text Books:

1. Railway Transportation Systems – Design, Construction and Operation, Christos N. Pyrgidis, 2019, CRC Press.
2. Indian Railway Transportation Management, Vinod Pal, Bahri Brothers, (2018) edition 5.
3. A Text Book of Railway Engineering, S.C. Saxena, S.P.Arora, DhanpatRai Publications (p)Ltd.-new Delhi, 2010.

Reference Books

1. Technology in Rail Transport Management, Prabha Shastri Ranade,ICFAI Books; UK ed. edition (20 October 2009)
2. Indian Railway Maintenance Manual (Works)
3. Indian Railway Track, M. M. Agarwal, Ruby Jubilee
4. Railway Management and Engineering, V Profillidis, Routledge; 1 edition (29 Nov. 2017).

Punyashlok Ahilyadevi Holkar Solapur University

Final Year B.TECH. (Mechanical Engineering)

Semester-VII

ME414 P : Analysis and Synthesis of Mechanisms

***Teaching Scheme**

Lectures : 03 Hours/week, 03 Credits

Practical : 02Hours/week, 01 Credit

***Examination Scheme**

ESE : 70 Marks

ISE : 30 Marks

ICA : 25 Marks

Course Introduction: Analysis and Synthesis of Mechanisms is very important in design of various mechanisms for different applications. It is an important mathematical tool for analytical and graphical analysis and synthesis of complex mechanisms. Advanced software's need insight into this concept for better utilization of them.

Course Objectives:

During this course, student is expected to:

1. Perform velocity & acceleration analysis of complex mechanisms.
2. Perform dynamic analysis of planar mechanisms.
3. Apply curvature theory for applications of mechanisms
4. Carry out graphical synthesis of planar mechanisms.
5. Carry out analytical synthesis of planar mechanisms.
6. Perform kinematic Analysis of Spatial Mechanisms

Course Outcomes:

At the end of this course, student will be able to:

1. Perform velocity & acceleration analysis of complex mechanisms.
2. Perform dynamic analysis of planar mechanisms.
3. Apply curvature theory for applications of mechanisms
4. Carry out graphical synthesis of planar mechanisms.
5. Carry out analytical synthesis of planar mechanisms.
6. Perform kinematic Analysis of Spatial Mechanisms

Section I

Unit-1: Kinematic Analysis of Complex Mechanisms **No. of lectures- 9**

Definitions and assumptions, planar and spatial mechanisms kinematic pairs, degree of freedom, velocity-acceleration analysis of complex Mechanisms by the normal acceleration and auxiliary point methods.

Unit-2: Dynamic Analysis of Planar Mechanisms **No. of lectures- 6**

Inertia forces in linkages, kinetic, static Analysisof Mechanisms by matrix method. Analysis of elastic mechanisms, beam element, displacementfields for beam element, element mass and stiffness matrices, system matrices, elastic linkage model, equations of motion.

Unit-3: Curvature theory **No. of lectures- 5**

Fixed and moving centrodes, inflection circle, Euler- Savary equation, Bobillier constructions, cubic of stationary curvature, Ball's point, Applications in dwell Mechanisms.

Section II

Unit-4: Graphical Synthesis of Planar Mechanisms **No. of lectures- 7**

Type, number and dimensional synthesis, function Generation, path Generation and rigid body guidance problems, accuracy (precision) points, Chebychev Spacing, types of errors, Graphical synthesis for function generation and rigid body guidance with two, three and four accuracy points using pole method, center pointand circle point curves, Bermester points, Synthesis for five accuracy points, Branch and order defects, Synthesis for path generation.

Unit-5: Analytical synthesis of Planar Mechanisms **No. of lectures- 7**

Analytical synthesis of four-bar and slider- crank mechanism, Freudenstein's equation, synthesis for four accuracy points, compatibility condition, synthesis of four-bar for prescribed angular velocities and accelerations using complex numbers. Complex numbers method of synthesis, the dyad, center point and circle point circles, ground pivot specifications, three accuracy point synthesis using dyad Method, Robert Chebychev theorem, Cognates

Unit-6: Kinematic Analysis of Spatial Mechanisms **No. of lectures- 6**

Denavit- Hartenberg parameters, matrix method of analysis of spatial mechanisms.

Internal Continuous Assessment (ICA):
Any eight assignments out of the following.

1. Velocity-acceleration analysis of complex Mechanisms by the normal acceleration method
2. Velocity-acceleration analysis of complex Mechanisms by the auxiliary point method.
3. Static analysisof mechanisms by matrix method
4. Applications of Euler- Savary equation,Bobillier constructions
5. Assignment on Graphical Synthesis of Planar Mechanisms
6. Graphical synthesis for function generation and rigid body guidance
7. Analytical synthesis of four-bar and slider- crank mechanism
8. Complex numbers method of synthesis
9. Application of Robert Chebychev theorem
10. Matrix method of analysis of spatial mechanisms.

Text Books:

1. Theory of Machines and Mechanisms, A. Ghosh and A. K. Mallik, Affiliate d East-West Press.
2. Mechanism Design - Analysis and Synthesis (Vol. 1 and 2), A. G. Erdman and G. N. Sandor, Prentice Hall of India.
3. Design of Machinery: An introduction to the Synthesis and Analysis of Mechanisms and Machines, Robert L. Norton, Tata McGraw-Hill, 3rd Edition.

Reference Books

1. Kinematic Synthesis of Linkages, R. S. Hartenberg and J. Denavit, McGraw Hill.
2. Theory of Machines and Mechanisms, J. E. Shigley and J. J. Uicker, 2nd Ed., McGraw-Hill.
3. Kinematics and Linkage Design, A. S. Hall, Prentice Hall of India.

Punyashlok Ahilyadevi Holkar Solapur University
Final Year B.TECH. (Mechanical Engineering)
Semester-VII
ME414 P: Business Economics

***Teaching Scheme**
Lectures:03 Hours/week, 03 Credits
Practical: 02Hours/week, 01 Credit

***Examination Scheme**
ESE: 70 Marks
ISE : 30 Marks
ICA: 25 Marks

Course Introduction: In today's world, knowledge of Economics is necessary for everybody in all walks of life. In the days of globalization and free economy, every engineer in any discipline and any businessman must have the knowledge of fundamental concepts of economics to take correct decisionsfor any firm or business. With this purpose, the course covers various concepts of demand, supply, cost and cost estimation, time value of money, make or buy decisions, elementary economic analysis, project management life cycle, value analysis and value engineering.

Course Objectives:

During this course, student is expected to:

1. Analyze factors affecting demand and supply.
2. Determine various costs and total cost, apply break even analysis.
3. Calculate worth using different techniques in time value of money.
4. Take correct decisions regarding make or buy, process or design modifications based onelementary economic analysis.
5. Carry out better maintenance; take appropriate decisions regarding replacement of assets.
6. Prepare project appraisals and compare various alternatives on economic basis, applyvalue analysis and value engineering for a product.

Course Outcomes:

At the end of this course, student will be able to:

1. Analyze factors affecting demand and supply.
2. Determine various costs and total cost, apply break even analysis.
3. Calculate worth using different techniques in time value of money.
4. Take correct decisions regarding make or buy, process or design modifications based on elementary economic analysis.
5. Carry out better maintenance; take appropriate decisions regarding replacement of assets
6. Prepare project appraisals and compare various alternatives on economic basis, apply value analysisand value engineering for a product.

Section I

Unit-1: Fundamentals of Business Economics **No. of lectures- 08**

Definition of Economics, Definition and scope of Business Economics, major topics in EngineeringEconomics, importance of economics in a business, concept of efficiency, Theory of Demand, Law ofdemand, determinants of demand, Price Elasticity of Demand, profit and loss, total revenue, averagerevenue, marginal revenue, Income Elasticity of Demand, Cross Price Elasticity of Demand, Supply andlaw of Supply, relationship between demand and supply, Market equilibrium, Indifference Curves,Welfare Analysis

Unit-2: Costs, Cost Estimation and Break Even Analysis **No. of lectures- 07**

Concept of Cost, difference between cost and price, types of costs, implicit and explicit costs in a business or a firm, historical and current costs, sunk and incremental costs, fixed and variable costs, long run and short run costs, Elements of cost, direct and indirect costs, material cost, labour cost, prime cost, overheads, factory cost, production cost, total cost, Break Even Analysis, Profit/Volume ratio, applications

Unit-3: Time Value of Money **No. of lectures- 05**

Time Value of Money, inflation, causes, consequences and control of inflation, interest formulae and theirapplications, cash flow diagram, present worth method, future worth method, annual equivalent orannuity method, E.M.I., rate of return method, applications of these to determine worth.

Section II

Unit-4: Make or Buy Decision and Elementary Economic Analysis **No. of lectures- 08**

Make or Buy decisions, importance in a business, factors affecting make or buy decision, various aspects of make or buy decision, break-even point in make or buy decision, elementary economic analysis, material selection for a product, raw material selection and substitution, design selection and modification, process selection and modification, engineering and economic approach

Unit-5: Maintenance Management and Replacement **No. of lectures- 06**

Maintenance and its importance, objectives of plant maintenance, types of maintenance practices, cost ofmaintenance, types and causes of failure, strategies to prevent them, planned and unplanned maintenance, preventive and breakdown maintenance, routine maintenance, predictive maintenance, opportunisticmaintenance, design out maintenance, condition based monitoring and modern techniques, need ofreplacement of an asset, defender and challenger, replacement decision, lives of an asset - economiclife, useful life, physical life, ownership life

Unit-6: Project Management Life Cycle and Value Engineering **No. of lectures- 06**

Project, various definitions of project, features of a project, importance of projects in a firm or business, types of projects, project management life cycle and its block diagram, project appraisals - technical appraisal, financial appraisal, economic appraisal, social appraisal, market appraisal, ecological appraisal, value of a product, types of values, performance of a product, functions of a product, value analysis, phases of value analysis, value engineering, aims of value engineering, value engineering procedure, applications of value engineering and value analysis

Internal Continuous Assessment (ICA):

List of Experiments/Assignments/Case Studies, etc.

1. Assignment on Fundamentals of Business Economics with a case study ondetermination of PED or IED.
2. Assignment on Costs, Cost Estimation and Break Even Analysis with a case study on determination of total cost of any part used in engineering practice.
3. Assignment on Time Value of Money with numerical problems on worth calculationand cash flow diagram.
4. Assignment on Make or Buy Decision and Elementary Economic Analysis.
5. Assignment on Maintenance Management and Replacement.
6. Assignment on Project Management Life Cycle and Value Engineering with a case study on value analysis of any product.

Text Books:

1. Fundamentals of Engineering Economics: Pravin Kumar, Wiley India Pvt. Ltd., New Delhi.
2. Engineering Economics, R. Panneerselvam: PHI Learning Pvt. Ltd., Delhi.
3. Industrial Engineering and Production Management: MartandTelsang, S. Chand & Company Pvt. Ltd., Delhi.

Reference Books

1. Managerial Economics: Varshney and Maheshwari, Sultan Chand & Sons, New Delhi.
2. Principles of Engineering Economic Analysis: John White, Kenneth Case, David Pratt, Wiley India Pvt. Ltd., New Delhi.

Punyashlok Ahilyadevi Holkar Solapur University
Final Year B.TECH. (Mechanical Engineering)
Semester-VII
ME415 O: Entrepreneurship Development

***Teaching Scheme**

Lectures : 03 Hours/week, 03 Credits

Practical : 02Hours/week, 01 Credit

***Examination Scheme**

ESE : 70 Marks

ISE : 30 Marks

ICA : 25 Marks

Course Introduction:

Entrepreneurship education in India has gained relevance in today's context. Education in the area of entrepreneurship helps students to develop skills and knowledge, which could benefit them for starting, organizing and managing their own enterprises. Entrepreneurship education encourages innovation, fosters job creation, and improves global competitiveness. This course will focus on key attributes of Entrepreneurship: Qualities required to become a successful entrepreneur, Entrepreneurship DevelopmentProgrammers, Ideation Techniques, Business Plan Formulation and its Appraisal, Problems faced by Entrepreneurs and ways to get through, Different Government Agencies and Policies, Taxation, Accounting, Marketing, Export-Import and so on. To sum up, the course will make students to have an understanding of the complete entrepreneurial ecosystem.

Course Objectives:

During this course, student is expected to:

1. To familiarize with entrepreneurship and its significance in national development
2. To develop skills required to establish and run a successful enterprise
3. To acquaint with the options available with new entrepreneurs
4. To formulate business plan/project report for a startup
5. To acquaint with Government policies and agencies associated with entrepreneurial development

Course Outcomes:

At the end of this course, student will be able to:

1. Identify the qualities required to become a successful entrepreneur
2. Identify the business opportunities that fit the individual or the group
3. Explain factors influencing on entrepreneurial development
4. Analyze various options available for deciding entrepreneurial career
5. Explain various methods and sources for idea generation
6. Select financial institutions for establishing new enterprise and Develop a feasible project report suitable for individual or group.

Section I

Unit-1: Entrepreneurship **No. of lectures-10**

Concept, meaning and definitions of entrepreneur and entrepreneurship, Importance and significance of growth of entrepreneurial activity, History of entrepreneurship development in India, Corporate entrepreneurship (intrapreneurship), Social entrepreneurship, Characteristics and qualities of entrepreneurs, Factors influencing entrepreneurial development and motivation, Role of culture in entrepreneurial development, Classification and types of entrepreneurs.

Unit-2: Entrepreneurship Development **No. of lectures- 10**

Entrepreneurial development programmes (EDP): Introduction, Curriculum, Phases, Problemsfaced by EDPs, Managerial, marketing, financial & technological problems faced by new entrepreneurs and their probable solutions, Options available to entrepreneurs - ancillarisation, franchising and outsourcing (characteristics,advantages, limitations, suitability of each option).

Section II

Unit-3: Entrepreneurial Project Development **No. of lectures- 10**

Idea generation – sources and methods, Identification and classification of ideas, Environmental Scanning, SWOT analysis and Tools for Exploring Change, Business model formulation, lean canvas model, Preparation of a project report/business plan including: market plan, financial plan, operational plan, HR plan, Working capital management, Break Even Analysis, etc, Significance of project report, Project appraisal (feasibility study) – Aspects and methods: Economic oriented appraisal, Financial appraisal, Market oriented appraisal, Technological appraisal, Managerial competency appraisal

Unit-4: Small-Medium Enterprises and Support Systems **No. of lectures- 10**

Meaning and definition (evolution) of micro, small & medium enterprises, Steps in setting up a small unit, Ownership patterns : sole proprietorship, partnership, private limited company, Policies governing SMEs, Funding options available : angel investors, venture capitalists, commercial banks, financialinstitutions, Support agencies: SIDBI, SISI, NABARD, DIC, MCED, EDII, NIESBUD, EPC etc. – Their rolein the development of SMEs, Technology business incubation (TBI) centers, Export Potential of SMEs, Export procedure, Taxation benefits for SME sector, Prospects and Turnaround strategies for SMEs

Internal Continuous Assessment (ICA):

Students of a batch may be divided into groups (consisting of maximum four members) to carry out the following tasks:

A. Case studies

1. Case study on male entrepreneur
2. Case study on female entrepreneur
3. Case study on Product/Service and business model innovation
4. SWOT analysis of existing enterprises (minimum 2) and also used tools for exploring change and uncover the resulting commercial opportunities
5. Case Study on Managing risk in the entrepreneurial organization

B. Preparation of project report/business plan for starting a small unit and presentation on the same (includingdetails of business idea, market survey, business model, different plans, etc)

Text Books:

1. Management of small scale industries - J.C. Saboo, Megha Biyani, Himalaya Publishing House
2. Small-Scale Enterprises and Entrepreneurship - Vasant Desai, Himalaya Publishing House
3. Entrepreneurial Development, S. S. Khanka, SChand Publications

Reference Books

1. Dynamics of Entrepreneurial Development and Management - Dr. Vasant Desai, HimalayaPublishing House
2. Entrepreneurship - Robert D Hisrich, Michael P Peters and Dean A. Shepherd, McGraw HillEducation
3. Social Entrepreneurship For The 21st Century: Innovation Across The Nonprofit, Private, AndPublic Sectors - Georgia Levenson Keohane, McGraw Hill Education
4. Corporate Entrepreneurship and Innovation 4th Edition, Paul Burns, Macmillan International Higher Education ISBN 978-1-352-00879-1

Punyashlok Ahilyadevi Holkar Solapur University
Final Year B.TECH. (Mechanical Engineering)
Semester-VII
ME415 O : Operations Research

***Teaching Scheme**
Lectures : 03 Hours/week, 03 Credits
Tutorial : 01Hours/week, 01 Credit

***Examination Scheme**
ESE : 70 Marks
ISE : 30 Marks
ICA : 25 Marks

Course Introduction:

Industries across the globe are facing the problems of global unrest due to multiple reasons. Hence, they continuously try to adopt various optimization techniques in their organizations. Which help them to reduce the time and cost of production. This course covers different optimization techniques assisting the Organizations in managing their resources optimally had better decision making, transportation issues, effective planning, replacement policies and allied issues in conducting their activities. These optimization techniques are expected to offer maximum profit and reduced cost and time.

Course Objectives:

During this course, student is expected to:

1. Acquire knowledge of various techniques under operations research.
2. Study quantitative techniques in management decision-making and its applications.
3. Apply maximization and minimization techniques for real life problems.
4. Create awareness about preparation of Project Plan
5. Solve problems of waiting line and average time
6. Acquire knowledge of various financial terms.

Course Outcomes:

At the end of this course, student will be able to:

1. Apply LPP theory to solve the industrial problems
2. Apply the concept of Assignment models to maximize profit and minimize time for production.
3. Apply the concept of Transportation models to optimize available resources.
4. Apply the sequencing and waiting line theory to solve real life problems.
5. Determine project duration & different floats & probability of project completion
6. Apply the financial concept for real life problems.

Section I

Unit-1: Introduction to OR & LPP **No. of lectures- 08**

History and development of OR, methodology in operation research, O.R. models and their applications. Introduction to LPP, Formulation of problem, Graphical solution, Simplex method, Duality in LPP (No numerical problems).

Unit-2: Assignment Model **No. of lectures- 06**

Mathematical statement, Methods to solve balanced and unbalanced assignment problems,

Maximization problems, Assignment with restrictions,

Unit-3: Transportation Model **No. of lectures- 06**

Mathematical formulation, methods to obtain initial basic feasible solution (IBFS), NWCR, LCM, VAM method for balanced and unbalanced problem.

Section II

Unit-4: Job sequencing and Queuing or waiting line theory **No. of lectures- 06**

Job sequencing, Johnson's Rule for optimal sequence of n jobs on two machines, process Jobs on three Machines. Applications, Characteristics, Waiting Time and Idle Time costs, Single channel Queuing Problems for calculating average number of customers and average time in system and queue.

Unit-5: CPM & PERT **No. of lectures-08**

Fundamentals of CPM / PERT networks, CPM – construction of networks, critical path, forward and backward pass, floats & their significance. PERT – Time Estimates, Construction of Networks, Probability of completing projects by scheduled date.

Unit-6: Engineering Economics **No. of lectures-06**

Importance, demand and supply, types of costs, Interest- Simple, compound, continuous, and effective interest. Value of money - time and equivalence, tangible and intangible factors, Introduction to inflation. Cash flow diagram. Interest factors – Uniform series factors, derivations.

Internal Continuous Assessment (ICA): List of Assignments/Case Studies, etc.

1. Numerical problems on LPP.
2. Numerical problems on Assignment model.
3. Numerical problems on Transportation model.
4. Case study of one of the application of waiting line theory.
5. Case study of one of the project report.
6. Case study of one of the financial report.

Text Books:

1. Hira and Gupta, "Operation Research", S. Chand and Co.
2. S. D. Sharma, "Operation Research", Kedarnath and Rannalt Pub.
3. Hamdy Taha, "Operations Research – An Introduction", 7th edition PHI (2003)
4. N. D. Vohra, "Quantitative Techniques in Management", TMGH

Reference Books

1. Operations Research by Hillier and Lieberman TMGH
2. R. Panneerselvam, "Operations Research", PHI (2002)
3. Swarop Kanti Gupta P.K. & Manmohan- OR - S.Chand & Sons, New Delhi
4. Shrinath L.S.: PERT & CPM –Affiliate East West Press

गणेशश्लोक: अविघ्नमस्तु सततं कुरु
मान्यवर विद्यापीठ
॥ विद्यया संपन्नता ॥

Punyashlok Ahilyadevi Holkar Solapur University
Final Year B.TECH. (Mechanical Engineering)
Semester-VII
ME415 O: Research Methodology

***Teaching Scheme**

Lectures : 03 Hours/week, 03 Credits

Practical : 02Hours/week, 01 Credit

***Examination Scheme**

ESE : 70 Marks

ISE : 30 Marks

ICA : 25 Marks

Course Introduction:

Research is searching for and gathering information, usually to answer a particular question or problem. The word research is derived from the French word 'recherché' which means "to go about seeking". The word research consists of two syllables, "re" and "search". Research includes creative work which is undertaken on an organized basis in order to increase the bank of knowledge, including knowledge of humans, culture and society, and the use of this bank of knowledge to formulate new applications. It is used to create or confirm facts, reconfirm the results of previous work, solve new or existing problems, support theorems, or develop new theories. A research project may also be an extension on past work in the related field. Research is a continuous process and is useful in decision making.

Course Objectives:

During this course, student is expected to:

1. Develop an understanding of fundamental Research Process.
2. Identify the sources of information for literature review and data collection.
3. Develop an understanding of various Research Methods and its use.
4. Develop an understanding of various Research Design and its techniques.
5. Understand applications of statistical tools and methods.
6. Develop an ethical understanding and sense of technical writing.

Course Outcomes:

At the end of this course, student will be able to:

1. Understand the psychology of research which includes different perspectives and necessity of research.
2. Perform Literature Reviews using print and online databases.
3. Apply the research knowledge to formulate a suitable problem statement by adopting different research methods and models.
4. Apply different Research Design Techniques as per different applications.
5. Analyze the research outcome by using suitable statistical tool.
6. Write or present a scientific report and research proposal by adopting copyright based ethical values.

Section I

Unit-1: Introduction to Research Methodology **No. of lectures- 08**

Research - Meaning and Importance, Objectives, Motivation. Types of Research – Descriptive, Analytical, Applied, Fundamental, Quantitative, Qualitative, Conceptual, And Empirical. Research methods and Methodology. Selection and formulation of Research Problem. Research Design Motivation and objectives. Defining and formulating the research problem. Selecting the problem. Necessity of defining the problem.

Unit-2: Literature Review **No. of lectures- 04**

Importance of literature review in defining a problem. Primary and secondary sources - reviews, treatise, monographs, patents, web as a source, searching the web, Critical literature review. Identifying gap areas from literature review.

Unit-3: Research Methods **No. of lectures- 08**

Traditional Methods – Historical, Institutional, Legal, Philosophical, Comparative, Ethical methods. Modern Methods – Survey of Literature, Sampling method, Questionnaire, Schedule etc, Interview method and Focus Group discussion, Observation Method, Case Study method, Content analysis, Delphi method, Statistical Method, Experimental method, Brainstorming Techniques, Rating Scale. Ethnographic methods. Documentation methods.

Section II

Unit-4: Research Design **No. of lectures-06**

Basic Principles- Need of research design, features of good design important concepts relating to research design, Observation and Facts, Laws and Theories, Prediction and explanation, Induction, Deduction. Development of Models. The nature of research design, formulation of research design, classification of research designs - Descriptive, experimental, exploratory, diagnostic, correlative, action and evaluation. Developing a research plan. Determining experimental and sample designs. Pilot Study.

Unit-5: Statistical Tools & Methods **No. of lectures- 08**

Execution of the research, observation and Collection of data, diagrammatic & graphical presentation of data, sampling methods, tools & software, data Processing and analysis strategies, data analysis with statistical tools like mean, median, mode; dispersion: variance and deviation, analysis of variance: ANOVA and ANOCOVA, correlation, regression, hypothesis testing (Introductory Treatment)

Unit-6: Report and Technical Paper Writing **No. of lectures- 06**

Structure and components of scientific reports, types of report, Significance, Different steps in the preparation, layout, structure and language of typical reports, illustrations and tables, bibliography, Webliography, referencing, Appendices, plagiarism. Conference papers, Survey papers, Poster papers, Review papers Comparison, Structure of a survey, conference and journal paper. Research proposal: preparation, budgeting, presentation, funding agencies for engineering research.

Internal Continuous Assessment (ICA):
List of Experiments/Assignments/Case Studies, etc. (Any eight)

1. Assignment on Introduction to Research Methodology
2. Assignment on Literature Review
3. A case study on Research Method
4. Assignment on Research Design
5. Assignment on use and applications of Statistical Tools
6. Assignment based on use of Statistical Methods (theory and simple numerical)
7. A case study on Regression Analysis
8. A case study on Report Writing and Research Proposal
9. Assignment on Introduction, requirement, type and importance of Intellectual Property rights in research.

Text Books:

1. Research Methodology: Methods and Techniques, Kothari C.R., 2011.. New Age International
2. An introduction to Research Methodology; Garg B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. RBSA Publishers.
3. Research Methodology; Panneerselvam R., PHI, Learning Pvt. Ltd., New Delhi - 2009
4. Research Methodology: Concepts and cases, Chawala D. and N. Sondhi ; Vikas Publishing House Pvt. Ltd.

Reference Books

1. Research Methods: A Process of Inquiry Anthony, M., Graziano, A.M. and Raulin, M.L., 2009, Allyn and Bacon.
2. Proposal Writing; Coley, S.M. and Scheinberg, C. A., 1990, Sage Publications.
3. Research Methodology: A practical and scientific Approach, Vinayak Bairagi and Mousami V Munot, CRC Press.

Punyashlok Ahilyadevi Holkar Solapur University
Final Year B.TECH. (Mechanical Engineering)
Semester-VII
ME415 O : Supply Chain Management

***Teaching Scheme**
Lectures : 03 Hours/week, 03 Credits
Practical : 02Hours/week, 01 Credit

***Examination Scheme**
ESE : 70 Marks
ISE : 30 Marks
ICA : 25 Marks

Course Introduction:

Supply chain management is a process that involves the planning, organizing, directing, and controlling of the flow of goods and services from the point of origin to the point of consumption. It is a vital process for companies that want to ensure that their products are delivered on time and in the right quantities. It is a complex process, and you may be wondering how to get started with it. It is not as difficult as you might think though. To begin, you will need to decide what your goals are in supply chain management, is your goal to learn supply chain management, or is it to be a successful supply chain manager? Both are great. The course will teach you the essentials of supply chain management and give you the tools for success. This course on supply chain management can teach you how to effectively manage their supply chains and improve their overall operations.

Course Objectives:

During this course, student is expected to:

1. To introduce students with basic concepts of Logistics and supply chain Management
2. To teach students practical application of the subject for enhancing business efficiency.
3. To expose students to contemporary business concepts.
4. To learn about the latest trends and developments in the field
5. To develop strategies for improving supplier relationships
6. To learn how to cut costs without compromising quality or delivery times

Course Outcomes:

At the end of this course, student will be able to:

1. Explain the basic concept of supply chain management.
2. Explain the importance of coordination in supply chain management.
3. Explain the global supply chain strategy
4. Solve the problems on inventory models.
5. Evaluate the Performance in global supply chains.
6. Explain the recent trends in supply chain management.

Section I

Unit-1: Basics of Supply Chain Management **No. of lectures-07**

Introduction, Definition of Supply Chain Management, Evolution of the Concept of Supply Chain Management, Key Drivers of Supply Chain Management, Typology of Supply Chains, Cycle View of Supply Chain, Types of SCM, Problems in SCM and Suggested Solutions.

Unit-2: Coordination in Supply Chain **No. of lectures- 07**

Importance of Coordination in Supply Chain, Bullwhip Effect, Effect of lack of Coordination on performance, Obstacles to Coordination, Strategies to achieve coordination, Building Strategic Partnership and Trust In Supply Chain.

Unit-3: Supply Chain Strategy **No. of lectures- 06**

Supply chain as a competitive advantage, Global Supply chain strategy, Structuring supply chain capabilities, Business matching supply chain design with business strategy

Section II

Unit-4: Inventory Flow modeling **No. of lectures- 07**

Approaches to Inventory Management in Global Supply Chain Management;; Distribution Resource Planning; Symptoms of poor Inventory Management, Modeling in Supply chain: inventory models, safety stock determination for service level, and lead time; forecasting models, routing problem

Unit-5: Performance Measurement and Trends **No. of lectures- 07**

Dimensions of Performance Metrics, Approaches/tools for Performance Measurement, Measuring logistics cost and performance. Benchmarking the supply chain, Performance measurement and evaluation in global supply chains, Impediments to improve Performance, Trends in International supply chain management

Unit-6: Recent Trends in Supply Chain Management **No. of lectures- 06**

Introduction, New Developments in Supply Chain Management, Outsourcing Supply Chain Operations, Co-Maker ship, The Role of E-Commerce in Supply Chain Management, Green Supply Chain Management, Distribution Resource Planning, World Class Supply Chain Management.

Internal Continuous Assessment (ICA):

List of Experiments/Assignments/Case Studies, etc. (Any six)

1. Case study on problems in SCM
2. Case study on supply chain strategy
3. Assignment/ Case study on supply chain performance measurement and trends
4. Solve the problems related to inventory models
5. Case study on World Class Supply Chain Management
6. Case study on E-Commerce in Supply Chain Management
7. Case study on Green Supply Chain Management

Text Books:

1. Supply Chain Logistics Management - Bowersox, Closs & Cooper – McGrawHill, 2nd Indian Ed.
2. Sridhar R. Tayur (Editor), Michael J. Magazine (Editor), RAM Ganeshan (Editor) Quantitative Models for Supply Chain Management Kluwer Academic.

Reference Books

1. Douglas Long International Logistics: Global Supply Chain Management Springer Verlag New York, LLC;2004
2. Philippe-Pierre Dornier, Panos Kouvelis, Michel Fender Global Operations and Logistics: Text and Cases Wiley, John & Sons, Incorporated 1998
3. Alan Branch Global Supply Chain Management in International Logistics Routledge 2007
4. Kent N. Gourdin Global Logistics Management: A Competitive Advantage for the New Millennium Blackwell Publishing 2006

Punyashlok Ahilyadevi Holkar Solapur University
Final Year B.TECH. (Mechanical Engineering)
Semester-VII
ME415 O: Finite Element Method

***Teaching Scheme**
Lectures : 03 Hours/week, 03 Credits
Practical : 02Hours/week, 01 Credit

***Examination Scheme**
ESE : 70 Marks
ISE : 30 Marks
ICA : 25 Marks

Course Introduction:

The Finite Element Method (FEM) or Finite Element Analysis (FEA) is a numerical technique to find approximate solutions of partial differential equations. FEM is an integral part of CAE and is extensively used in analysis and design of real life complex problems. Several sophisticated commercial and free FEM software are available in the market, but to use these effectively and to understand & analyze the results theoretical foundations of FEM are essential. This course is designed to cover both aspects (theory and software) of FEM. This course will enable the student to formulate and solve the mathematical equations for 1D, 2D and 3D finite by hand and using FEM software.

Course Objectives:

During this course, the student is expected to:

1. Understand general procedure involved in FEM as applied to structural & thermalproblems.
2. Apply direct method to formulate FEM equations for 1D, 2D and 3D elements.
3. Understand the use of variational formulation and method of weighted residuals insolving field problems.
4. Use the latest FEM software in solving problems for research and industry.

Course Outcomes: At the end of this course, student will be able to:

1. Implement general procedure of FEA for structural and thermal problems.
2. Write down shape functions for 1D, 2D and 3D elements.
3. Solve 1D, 2D and 3D problems using FEA procedure.
4. Solve boundary value problems using variational calculus and weighted residuals methods.
5. Analyze of 1D, 2D and 3D problems for static and dynamic loads in commercial or opensource FEA software.
6. Analyze of 1D, 2D and 3D problems for linear and non-linear responses in commercial oropen source FEA software.

Section I

Unit -1: FEA fundamentals, Mathematical Background **No. of lectures - 8**

History and fundamentals of FEA, General FEM procedure, direct formulation for uniaxial elements using matrix methods, applications of FEM, comparison to other computational techniques such as FDM, BEM, FVM and their applications, merits and demerits of FEM compared to exact solutions and experimentation. Types of elements, interpolation function definition. Variational calculus, Ritz method, methods of weighted residuals such as, Elimination Method, Penalty Method, (Simple numerical exercises on Ritz Method and Galerkin-Bubnov method only, simple problems on elimination and penaltymethod)

Unit -2 : Model Validity, Solvers, Software capability and comparison **No. of lectures - 6**

Model validity, mesh design & refinement, element distortion. Sub modelling and sub structuring. Overview of solvers, selection of solvers. Overview review of free and commercial software, comparison of capabilities, Preprocessors, Solvers, Post Processors, Comparison of capabilities of free and commercial software packages

Unit -3: Finite element formulation for 1D elements **No. of lectures - 6**

Types of 1D elements, interpolation functions for 1D elements such as truss, beams and thermal elements, shape functions for the same, formulation of system equations for trusses and beam elements, calculation of stresses and strains. Shape functions for 1D elements in global and natural coordinates. Applications of 1D elements.(Derivations using Lagrangian Polynomials and Simple Numerical Exercises)

Section II

Unit - 4: Finite element formulation for 2D elements **No. of lectures - 6**

2D Elements such as triangles and quadrilaterals, Pascal triangle for formulating interpolation functions, shape functions for 2D elements, LST, CST, linear and parabolic quads, axisymmetric elements, 2D shell elements. Shape functions for 2D elements for in global and natural coordinates. Applications of 2D elements.(Derivations using Lagrangian Polynomials and Simple Numerical Exercises)

Unit -5: Finite Element Formulation for 3D elements **No. of lectures - 6**

3D elements such as tetrahedrons and brick elements, Interpolation functions for 3D elements, Pascal Tetrahedron, shape functions, formulation of system equations, calculation of stresses and strains. Applications of 3D elements (Derivations using Lagrangian Polynomials and Simple Numerical Exercises

Unit - 6: Nonlinear and Dynamic Analysis **No. of lectures - 8**

Nonlinear elasticity problems: Material, geometric and boundary condition non-linearity, contact and gaps. Dynamic Problems: Modal Analysis, transient response analysis, harmonic analysis, spectrum analysis, transient thermal analysis. Introduction to explicit analysis, fatigue

Internal Continuous Assessment (ICA):

List of Experiments/Assignments/Case Studies, etc. (Any eight)

1. One assignment on FEA fundamentals and comparison with other techniques.
2. One assignment with numerical exercises on variational formulation and method of weighted residuals formulation
3. One software assignment supported by hand calculations on 1D structural and thermal analysis..
4. One software assignment (supported by hand calculations if applicable) on 3D Structural and thermal analysis.
5. One software assignment (supported by hand calculations if applicable) on 3D structural analysis.
6. One software assignment on non-linear FEA.
7. One software assignment on dynamic FEA.
8. One assignment on Natural Coordinates and Isoperimetric formulation
9. One assignment on FEA applications and future developments.
10. One software assignment on fatigue analysis using FEA

Text Books:

1. David V. Hutton, Fundamental of Finite Element Analysis, Tata McGraw-Hill Education Pvt.Ltd.
2. P. Seshu, Text book of Finite Element Analysis, PHI Learning Private Ltd., New Delhi.
3. U. S. Dixit, Finite Element Methods, Cengage Learning.
4. S.S Bhavikatti, Introduction to Finite Elements, New Age International Publications.
5. Daryl Logan, A First Course in the Finite Element Method, Cengage

Reference Books

1. R. D. Cook, et al., Concepts and Applications of Finite Element Analysis. Wiley, India
2. K. J. Bathe, Finite Element Procedures Prentice, Hall of India (P) Ltd., New Delhi.
3. O. C. Zienkiewicz, R. I. Taylor, The Finite Element Method, Butterworth - Heinemann
4. M. J. Fagan, Finite Element Analysis, Theory and Practice, Pearson Education Limited.

Punyashlok Ahilyadevi Holkar Solapur University
Final Year B.TECH. (Mechanical Engineering)
Semester-VII
ME416: Industrial Training

***Teaching Scheme**

Tutorial: 01Hours/week, 01 Credit

***Examination Scheme**

OE : 25 Marks

ICA: 50 Marks

Course Introduction:

Industrial training is must for every engineering student. Students know the theoretical knowledge but practical application of same in industry need to be understood. Students should understand working of industry, machinery, quality process, manufacturing process etc for which training is important. Student has to undergo a training of minimum 15 days at core Mechanical Industry either in summer vacation after second year Part-II or Third year Part-I or after Third year Part-II, i. e in winter vacation/summer vacation. This will help student to understand industrial culture, working, role of an engineer in industry.

Course Objectives:

During this course, student is expected to:

1. Learn the basic concepts of Project & Production Management.
2. study the concept of Facility, Location & Layout & implement in their Industrial In-plant training Project work.
3. Expose the students to the real life working experience and expanding the knowledge in their specific field.
4. Understanding of the impact of engineering solutions and industrial safety in a global and social context.
5. Interact and build interpersonal skills

Course Outcomes:

At the end of this course, student will be able to:

1. Explain the basic concepts of Project & Production Management.
2. Implement Project Planning in their Industrial In-plant Training Project work.
3. Interact with industrial personnel and follow engineering practices and discipline prescribed in industry.
4. Develop awareness about general workplace behavior and build interpersonal and team skills.
5. Prepare professional work reports and presentations.

- **Procedure for Assessment of Industrial Training done by student**:
  1. Undergo Industrial Training of minimum 15 days.
  2. Prepare a report of training done in a prescribed format before end of Part I Semester of final year B.Tech. (Along with a certificate from the concerned industry).
  3. Format of the report will be decided by the concerned guide/institute.
  4. The report is to be comprehensive and presented in duplicate, typed on a standard A4 size sheet and bound.
  5. Deliver the presentation to project guide on industrial Training Report.

ग्रामश्लोकः अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
॥ विद्यया अमृतमश्नुते ॥

Punyashlok Ahilyadevi Holkar Solapur University
Final Year B.TECH. (Mechanical Engineering)
Semester-VII
ME417: Project Work Stage-I

***Teaching Scheme**
Practical : 04 Hours/week, 02 Credit

***Examination Scheme**
ICA: 50 Marks

Course Introduction:

Project work is kept in the final year of engineering so that students' will apply their knowledge gained through previous classes to create and evaluate innovative things. In this it is expected to solve some pressing problem related to industry or society. While carrying out the work many qualities are developed in students such as problem solving ability, modern tool usage, leadership, ethics, communication, project management, finance and lifelong learning etc.

Course Objectives:

During this course, student is expected to:

1. Understand the basic concepts & broad principles of Industrial or social project ideas.
2. Study a sound technical knowledge of their selected project topic.
3. Locate and use technical information from multiple sources.
4. Identify the problem as per need of industry or society.

Course Outcomes:

At the end of this course, student will be able to:

1. Identify the problem which is related to industry or society.
2. Carry out state of the art related to the problem identified.
3. Plan the work for solving identified problem.
4. Apply basic engineering knowledge for solving the identified problem.

Guidelines for Project content & Mark Distribution:

a. Work diary and weekly reporting -05 marks
b. Synopsis- 10 marks
c. Progress report submission and presentation-10 marks

Project Term Work:

The term work under project submitted by students shall include:

a. Work diary and weekly reporting:

Work Diary maintained by group and countersigned by the guide weekly. The contents of work diary shall reflect the efforts taken by project group for:

1. Searching suitable project work

2. Brief report, preferably on Journals/ conference papers/ books or literature surveyed to select and bring out the project.

3. Brief report of feasibility studies carried to implement the project objectives.

4. Proposed diagram/ Design calculations, etc.

b. Synopsis:

The group should submit the synopsis (of 4-5 pages) in following form.

1. Title of Project

2. Names of Students

3. Name of Guide

4. Proposed work (Must indicate the scope of the work & weekly plan up to March end)

5. Approximate Expenditure (if any)

The synopsis of project is expected to approve by the guide and endorsed by the Head of the Department.

Note:- The project group consist not more than four students.

c. Progress report submission and presentation:

The group has to give a power point presentation in front of the faculty of department on the progress completed till end of first semester along with the progress report.

Punyashlok Ahilyadevi Holkar Solapur University
Final Year B.TECH. (Mechanical Engineering)
Semester-VIII
ME422 : Project Phase – II (Progress Presentation - I)

***Teaching Scheme**
Practical : 02 Hours/week, 01 Credit

***Examination Scheme**
ICA : 50 Marks

Course Objectives:

During this course, student is expected to:

1. Review on project phase -I.
2. Collect sufficient information to provide solution of defined problem.
3. Apply the fundamentals of mechanical engineering for solving the project problem.
4. Plan, implement and execute the project.

Course Outcomes:

At the end of this course, student will be able to:

1. Communicate with various stakeholders and perform the work in team.
2. Formulation and possible solution for project problem
3. Develop model using suitable software.
4. Test the developed model.
3. Write effective technical report and demonstrate through presentation.

In project work stage-II following work is expected from the students:

1. Formulation and possible solution for project problem.
2. Design, develop model and simulate it using suitable software.
3. Development of virtual and physical model
4. Carry out testing using suitable testing instrument and technique.
5. Prepare technical report and presentation.

Punyashlok Ahilyadevi Holkar Solapur University
Final Year B.TECH. (Mechanical Engineering)
Semester-VIII
ME423 : Project Phase – III (Progress Presentation - II)

***Teaching Scheme**
Practical : 02 Hours/week, 01 Credit

***Examination Scheme**
ICA : 50 Marks

Course Objectives:

During this course, students is expected to:

Apply the knowledge/concepts acquired in the project phase I and II to create/ design/ implement project relevant to the field of Mechanical Engineering.

Course Outcomes:

At the end of this course, students will be able to:

1. Design and develop the Project model.
2. Implement/Simulate/Test and deploy the project application.
3. Compile relevant data, interpret & analyze it.
4. Present and defend the project relevance/creation/design/implementation/simulation
5. Prepare project report in a standard format

In project stage-III, following work is expected from the students:

- Design and develop the project model.
- Simulate/Test and arrange the project application.
- Compile relevant data and do analysis
- Arrive at logical conclusions and defend the project work
- Report writing and preparing presentation.

a) Project Report format:

1. Front cover page: Containing title of the project, year, prescribed authority, names of students, guide name, department, institution name and address.

2. Certificate page: Certificate stating the completion of the Bonafide project, certified by guide, HOD, Principal and external examiner.

3. Acknowledgement and Abstract

4. List of contents/tables/figures

5.Body of the report: Body of the project should normally contain the following appropriate/relevant parts/chapters

- Introduction (History, Importance of Project Area, Problem identification, Objective of the Project)
- Literature survey
- Design/ Experimentation/ Fabrication/ Production/ simulation of Virtual/ physical model and implementation
- Assembly/Fabrication/User manual/Operational instructions
- Observation/ Analysis/ Findings/Results
- Discussion on Results and Conclusion
- Conclusion and Future Developments
- Reference/Bibliography: For Books: “Title of Book”; Authors; Publisher; Edition; For Papers: Authors, Year of Publication, “Title of Paper”; Conference Details/General Details;

6.Back cover page

7. Physical attributes: Project report should be of 25 to 50 pages (More pages can be used if needed). Back to back printing. Spiral binding.

8. Fonts and Page layout: A4 size with standard/default MS word page layout. Times New Roman font, Font size: 10 for captions, 12 for running text and sub-titles, 14 for paragraph titles and 16 for chapter titles, Line Spacing: 1.5 Lines, Top Margin: 1.00 Inches, Bottom Margin: 1.32 Inches, Left Margin: 1.5 Inches, Right Margin: 1.0 Inches Page Numbers: Right aligned at footer.

b) Presentation:

The group has to prepare a power point presentation on project report, project and present it in front of the faculty of department along with the demonstration of the project. One copy of the report should be submitted to Institute/ Department, One copy to Guide and one copy should remain with each student of the project group.

(Sample Format for Project Work Diary):

Project Progress Sheet

Activity Week: Date from…… to……..

Description of the Work Performed by the student:

(Literature Survey /Design/ Drawings / Purchase/ Manufacturing / Testing/Data Collection / Analysis/ Algorithm/ Flowchart/ Simulation)

……

Space for Drawings:

Constraint / Problem Found:

……

……

……

Activity to be carried out in next week:

……

……

Remarks by the Guide/ Co-Guide:

……

……

……

Date: Sign of Guide/Co-Guide:

Punyashlok Ahilyadevi Holkar Solapur University
Final Year B.TECH. (Mechanical Engineering)
Semester-VIII
ME424: Project Phase – IV
(Report Submission & Final Presentation)

***Teaching Scheme**
Practical : 04 Hours/week, 02 Credit

***Examination Scheme**
POE: 50 Marks
ICA : 50 Marks

Course Objectives:

During this course, student is expected to:

1. Prepare Project report as per format given in Project Phase-III.
2. Communicate effectively both in verbal/non-verbal and written form.
3. Defend the completed project work in front of the experts.

Course Outcomes:

At the end of this course, student will be able to:

1. Prepare presentation and report as per prescribed format
2. Demonstrate project work in front of various stakeholders.
3. Develop lifelong learning skill.

In Project Work (Report Submission & Presentation), students are expected to complete the following work:

1. Submit the project report in the prescribed format.
2. Prepare the power point presentation and present it in front of examiners.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Commerce & Management

Choice Based Credit System

Syllabus: Master of Business Administration (MBA)

(w. e. f. June 2020)

MASTER OF BUSINESS ADMINISTRATION
(M. B. A. Part I Sem. - I and II) Semester Pattern
(Choice Based Credit System) June 2020

1. Introduction:

Considering the current requirement and present scenario of globalization and emerging trends in the Industry, Information Technology, there is need to make students aware and synchronize with the skills required in the industry. It is necessary to make changes in present curriculum of MBA.

2. A. Basic objectives

The basic objectives of an M.B.A. course are-

1. To provide competent young men and women with necessary knowledge, skills, values and attitudes to occupy positions of management and administration in business.
2. To impart the students latest and relevant knowledge from the field of management theory and practice.
3. To provide opportunities to the students for developing necessary managerial skills.
4. To impart/ develop the right kind of values and attitude to function effectively in Managerial/ administrative positions.
5. The course is conducted with semester system which includes Four semesters with following purposes:
   a. **Hard core** subjects provide Foundation of Management.
   b. **Soft core** subjects focus on preliminary knowledge to enhance specific skills and a student gets an opportunity to choose amongst the group of subjects.
   c. **Skill core** subjects focus on in-depth knowledge and practical approach with the subjects. It aims to nurturing student's proficiency and skills.
   d. **Open Elective** A subject elective course chosen generally, with an intention to seek cross-functional exposures is called Open Elective.

B. Program Educational Outcomes

At the end of MBA program student should take of either of following.

1. Managerial decision making through the application of knowledge of management discipline
2. Set up business enterprise and manage diversified growth of entrepreneurship.

C. Program Outcomes:

At the end of MBA program students should be with following abilities.

1. Recognize the functioning of business opportunities involvement of business enterprises
2. and exploring the entrepreneurial opportunities.
3. Develop skills on analyzing the business data application of relevant analysis and problem solving.
4. Demonstrate a global outlook with the ability to identify aspects of the global business and cross cultural understanding
5. Identify the contemporary social problems, exploring the opportunities for social entrepreneurship, designing business solutions and demonstrate ethical standards in organizational decision making.
6. Develop effective and oral communication especially in business applications, with the use of appropriate technology.

3. Eligibility for Admission

1. Candidate should have passed with minimum 50% marks in aggregate (45% marks in case of Backward class candidates from Maharashtra State only) in any full time Bachelor's Degree of Minimum 3 years duration in any discipline recognized by Association of Indian Universities.
2. Obtained score in one of the following CET examinations conducted by the Competent Authority. CET conducted by the Competent Authority, MBA/MMS CET by Maharashtra State Competent Authority, Common Admission Test conducted by Indian Institute of Management (CAT) and Common Management Aptitude Test Conducted by All India Council for Technical Education (CMAT) or Any other CET exams conducted by National level Agencies / institutes and as notified by State CET Cell and DTE to be eligible for Admission to MBA/MMS in the state.
3. Candidate should have completed the admission related process as prescribed by the Competent Authority for Common Admission Process (CAP) in the state.

4. Choice Based Credit System

With the view to ensure worldwide recognition, acceptability, horizontal as well as vertical mobility for students completing post graduate degree, the Solapur University is implementing **Choice Based Credit System** (CBCS) of Evaluation at Postgraduate level.

CBCS offers wide ranging choice for students to offer courses based on their aptitude and their career goals. CBCS works on the fundamental premise where students are matured individuals capable of making their own decisions.

Credit is a numerical value that indicates student's work load (Lectures, Seminars, Assignments, Group Exercises, seminars, mini projects etc.) to complete a course unit. In most of the universities 15 contact hours constitute one credit. The contact hours are transformed into Credits. As per present norms, there are 4 contact hours per paper (subject) per week which works out to be 60 contact hours per paper (subject) per semester.

In PAH Solapur University, for M.B.A-I, there are 8 subjects for each semester and each subject has 4 contact hours per week. Therefore, total contact hours per week are 32 for each class. The evaluation process includes an 80 + 20 pattern wherein the candidate has to appear for University Evaluation for 80 marks and a Continuous Internal Evaluation of 20 marks. This format is applicable for theory as well as practical subjects.

1. MBA Course Structure:

MBA COURSE STRUCTURE FOR COLLEGE & UNIVERSITY CAMPUS
Choice Based Credit System w.e.f. 2020-21

First Semester

Paper Code	Title of the Paper	Semester Exam			No. of weekly lectures	Credits
		UP	IA	Total		
Hard Core						
101	Principles of Management	80	20	100	4	4
102	Financial Accounting	80	20	100	4	4
103	Managerial Economics	80	20	100	4	4
104	Organizational Behaviour	80	20	100	4	4
105	Business Statistics	80	20	100	4	4
Soft Core (Select Any Two Subjects)						
106	Computer Operations And Management	80	20	100	4	4
107	Business Law.	80	20	100	4	4
108	Disaster Management	80	20	100	4	4
109	Banking Operations & Services	80	20	100	4	4
Skill Core						
110	Enhancing Business Communication Skills	80	20	100	4	4

Hard Core and Skill core subjects are compulsory subjects while students can choose **Any Two** subjects **From Soft Core**.

Second Semester

Paper Code	Title of the Paper	Semester Exam			No. of weekly lectures	Credits
		UP	IA	Total		
Hard Core						
111	Marketing Management	80	20	100	4	4
112	Financial Management	80	20	100	4	4
113	Human Resource Management	80	20	100	4	4
114	Production Management and Operational Research	80	20	100	4	4
115	Research Methodology	80	20	100	4	4
Soft Core (Select Any One Subjects)						
116	Event Management	80	20	100	4	4
117	Hospitality & Tourism Management	80	20	100	4	4
118	Logistics and Supply Chain Management	80	20	100	4	4
Skill Core						
119	Employability Skills	80	20	100	4	4
Open Elective						
120	Digital Business	80	20	100	4	4

Hard Core, Skill core and open Elective subjects are compulsory subjects where as students can choose **Any One** subject **from Soft Core**.

Third Semester

Paper Code	Title of the Paper	Semester Exam			No. of weekly lectures	Credits
		UP	IA	Total		
Hard Core						
121	Strategic Management	80	20	100	4	4
122	Management Accounting	80	20	100	4	4
123	Project Report	50	50	100	4	4
Elective Core						
124	Elective Subject I (Paper – I)	80	20	100	4	4
125	Elective Subject I (Paper – II)	80	20	100	4	4
126	Elective Subject II (Paper – I)	80	20	100	4	4
127	Elective Subject II (Paper – II)	80	20	100	4	4
Open Elective						
128	Entrepreneurship Development	80	20	100	4	4

Fourth Semester

Paper Code	Title of the Paper	Semester Exam			No. of weekly lectures	Credits
		UP	IA	Total		
Hard Core						
129	Business Ethics & Corporate Governance	80	20	100	4	4
130	Total Quality Management	80	20	100	4	4
Elective Core						
131	Elective Subject I (Paper – III)	80	20	100	4	4
132	Elective Subject I (Paper – IV)	80	20	100	4	4
133	Elective Subject 1 (Paper – V)	80	20	100	4	4
134	Elective Subject II (Paper – III)	80	20	100	4	4
135	Elective Subject II (Paper – IV)	80	20	100	4	4
136	Elective Subject II (Paper – V)	80	20	100	4	4

Dual Specialization Groups.

- **Elective Specializations:** The University offers Dual specialization**.** Student has to select **ANY TWO** of the Three Groups **A, B, C** and **ANY ONE** specialization subject from a selected group

Group	Elective Specialization
A	• Marketing Management
B	• Financial Management • Tourism and Hospitality Management • Production and Materials Management
C	• Human Resource Management • International Business Management • Banking Management • Systems Management • Agriculture & Co-operative Management

- **Elective Specializations:** Student has to select **ANY TWO** of the Three Groups **A, B, C** and **ANY ONE** Specialization from the selected groups.

Elective Specialization Groups with Subjects Papers:

Group	Specialization	Paper	Subject
A	**Marketing Management**	I	Brand Management
		II	Sales and Distribution Management
		III	Integrated Marketing Communications & Digital Marketing
		IV	Services and Retail Marketing
		V	International Marketing
B	**Financial Management**	I	Corporate Tax Management
		II	Financial Decision Analysis
		III	Financial System of India, Markets & Service.
		IV	Investment Management
		V	International Finance
	Tourism and Hospitality Management	I	Fundamentals of Hospitality Management
		II	Tourism and Travel Management
		III	Accommodation Management
		IV	Facility and Security Management
		V	Hospitality and tourism Marketing.
	Production and Materials Management	I	Purchasing and Inventory Management
		II	Logistics and Supply Chain Management
		III	Industrial Engineering
		IV	Quality Management
		V	World Class Manufacturing
C	**Human Resource Management**	I	Strategic Human Resource Management
		II	Human Resource Initiatives
		III	Industrial Relations and Labour Laws
		IV	Competence based HRM.
		V	International Human Resource Management
	International Business Management	I	International Business Environment
		II	Export Policy, Procedures and Documents
		III	International Marketing
		IV	EXIM Management
		V	International Logistics
	Banking Management	I	Banking Operations Management
		II	Indian Banking Structure
		III	E-Banking
		IV	Marketing of Financial Services
		V	Retail & Universal Banking

Group	Specialization	Paper	Subject
C	**Systems Management**	I	Management Information System
		II	ERP and SPD
		III	Relational Database Management System
		IV	Security And Control Information System
		V	Programming Concepts and Practices
	Agriculture & Co-operative Management	I	Fundamentals of Agriculture & Co-Operative Management
		II	Agricultural Marketing
		III	Agricultural Production Management
		IV	Agro- Processing Industries & Rural Industrialization
		V	International Trade And Agriculture

2. Schedule of Teaching and Examination:

This is full time, Masters Degree program. The curriculum of the course is of Two years divided into Four semesters. The teaching for Semester I will start from 1st August and III should be conducted from 20th July to 20th November and teaching for Semester II and IV should be conducted from 1st January to 20th April. There will be an End of Semester University Examination in December and May for all Semesters. In addition there will be internal assessment for each paper conducted by the respective institute.

3. Internal Evaluation

The internal evaluation will be undertaken on continuous basis for 30 marks and will consist of following heads scaled down to mentioned weight-age of marks

Elements for Continuous Internal Evaluation	**Marks**
MCQ Online Test (MOOC) (2 Test of 25 marks each)	05
Assignments (Minimum 2) (Open Book/ Class/ Home)	05
Seminar / Group Exercises (Minimum 2)	05
Case Studies (Minimum 3)/ Industry Analysis/ Computer Lab Exercise.	05
Total	**20 Marks**

The internal evaluation should be done by the institute accordingly throughout the semester and internal marks shall be send to the university through Online Portal before the End of Semester Examination

4. Passing Criteria and ATKT Rules:

- Every student must secure a minimum of 40% marks for each subject in End of Semester University Examination and Continuous Internal Evaluation separately for passing in the respective subject.
- The student has to secure a minimum of 4.0 grade points (Grade C) in each paper. A student who secures less than 4.0 grade point (39% or less marks, Grade FC/FR) will be declared 'Fail' in that paper (subject) and shall be required to reappear for respective paper.
- A student who fails in University Examination (Theory) & passed in Continuous Internal Evaluation of the same paper (subject) shall be given FC Grade. Such student will have to reappear for University Examination Only.
- A student who fails in Continuous Internal Evaluation and passed in University examination (Theory) shall be given FR Grade. Such student will have to re-appear for both University examination as well as Continuous Internal Evaluation.

The M.B.A. examination will be held in four semesters. The student will eligible to appear for the examination with a minimum attendance of 75%.

a. A candidate failing in any number of subjects of Semester I, may be allowed to keep the term for Semester-II
b. A candidate seeking admission to Semester III shall not have failed in more than five subjects of Semester I & Semester II put together.
c. A candidate failing in any number of subjects of Semester III may be allowed to keep the term for Semester IV.
d. A candidate will not be awarded degree unless he/she has passed all subjects of all the semester examinations.

5. Conversion of Marks into Grades:

A table for the conversion of the marks obtained by students in each paper (out of 100) to grade and grade points is given below:

Sr. No.	Range of Marks	Grade	Grade Points
1	80 – 100	O	10
2	70 – 79	A +	9
3	60 – 69	A	8
4	55 – 59	B +	7
5	50 – 54	B	6
6	45 – 49	C +	5
7	40 – 44	C	4
8	<=39	FC	0 - Failed in Semester Exam
9	<=39	FR	0 - Failed in Internal Assessment

6. Conversion of Average Grade Points into grades:

The student's performance of course will be evaluated by assigning a letter grade on ten points scale as given below:

CGPA / CBCS / FGPA / SGPA	Letter Grade
9.5 – 10	O
8.5 – 9.4	A +
7.5 – 8.4	A
6.5 – 7.4	B +
5.5 – 6.4	B
4.5 – 5.4	C +
4.0 – 4.4	C
< =3.9	FC
< =3.9	FR

7. Additional Specialization:-

A student who has passed the M.B.A. Examination of this University with any two electives may be allowed to appear for the M.B.A. examination again, in any other one elective, by keeping terms for the third and fourth semester for that special group i.e. for papers comprising of 500 marks, by paying (40%) of the Tuition Fees for that academic year.

8. Improvement in Marks:

A student who has passed the MBA examination of this university and has secured less percentage in the last year may be allowed for class improvement in any of the two subjects of last year.

9. Degree Completion:

In case a student fails to complete the degree within the stipulated period of 4 years, such a student will be declared INCOMPLETE EXIT and in such a case the student can seek a fresh admission as per the admission rules prevailing at that time.

University Question Paper Pattern:

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Nature of Question Paper for

M.B.A. Semester Pattern Model Question Paper

(w.e.f. June 2019)

Time: 2.30 hrs. **Total Marks : 80**

Q. No. 1: Multiple Choice Questions. **16**

(four alternatives should be given)

1. _____

(a) (b) (c) (d)

2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.
16.

Q. No. 2: Answer the following (short answers / Short problem) **16**

(A) 8 marks

(B) 8 marks

Q. No. 3: Answer the following (short answers/ Short problem) **16**

(A) 8 marks

(B) 8 marks

Q. No. 4: Answer the following Long answers **16**

(A)

OR

(B)

Q. No. 5: Answer the following (Long problem/ Case Study) **16**

Semester – I

<table>
<tr><td>Semester : I</td><td>Hard Core</td><td colspan="3">Semester Exam</td><td rowspan="2">L</td><td rowspan="2">Credits</td></tr>
<tr><td>Code: 101</td><td rowspan="2">Principles & Practices of Management</td><td>Theory</td><td>I A</td><td>Total</td></tr>
<tr><td>Subject Title</td><td>80</td><td>20</td><td>100</td><td>4</td><td>4</td></tr>
<tr><td>Course Objectives</td><td colspan="6">1. To introduce the functions of management in the workplace.
2. To develop holistic approach to management.
3. To makes students as effective manager.</td></tr>
<tr><td>Course Outcomes</td><td colspan="6">• Better understanding of management and link them to organizational contexts
• Developing students regarding skills of management
• Better decision making ability</td></tr>
<tr><td>Module 1</td><td colspan="6">Introduction</td></tr>
<tr><td colspan="7">Concept, definitions and levels, basic managerial roles, skills and functions, Evolution of management thought- F.W. Taylor & Henry Fayol contribution, modern management- Bottom of Pyramid- Prof. C.K. Pralahad, Characteristics of 21st century executives, Social responsibility of managers.</td></tr>
<tr><td>Module 2</td><td colspan="6">Business Environment and Planning</td></tr>
<tr><td colspan="7">Concept of environment, factors of environment and changing Indian business environment, meaning, definition importance and nature of planning, steps and levels in planning process; kinds of organizational plans- strategic, tactical and operational. Objectives – management by objectives (MBO) method. Decision making-types, decision making conditions and steps in decision making</td></tr>
<tr><td>Module 3</td><td colspan="6">Organizing and Staffing</td></tr>
<tr><td colspan="7">Definition, basic elements of organizing and types of organizations, Departmentalization, basis for departmentalization, reporting relationships and authority distribution. Forms of organization structure -functional, flat, project & matrix etc. work from home, outsourcing, virtual organizations, and boundary less organizations, Concept, elements, functions of staffing, advantages of proper staffing, Concept, elements, functions of staffing, advantages of proper staffing.
Staffing: - Meaning, Principles in Staffing, Staffing Functions</td></tr>
</table>

Module 4	**Directing**
Concept and importance, concept of motivation, Theories of motivation –Maslow theory of human needs, Herzberg's theory of motivation, Stacy Adam's Equity theory, McGregor's theory X & theory Y, William Ouchi- Theory Z and Edwin A. Locke	
Module 5	**Leadership, Creativity and Innovation**
Leadership-traits, styles, behavior – Likert's four systems, Managerial Grid, Hersey-Blanchard's Situational Model, Leadership styles in Indian organizations, Transactional and transformational theory Creativity, creative thinking, characteristics of creative people, stimulating innovation in organizations.	
Module 6	**Controlling**
Concept, importance of controlling, controlling process, types of control, factors influencing control effectiveness.	
Recommended Books	1. Management Text and Cases - V S P Rao, Excel Books (ISBN : 978-81-7446-317-3) 2. Principles of Management - P C Tripathi and P N Reddy, Himalaya Publishing House (ISBN-10: 978-00-7133-333-9; ISBN-13: 978-00-7133-333-7) 978-93-5260-535-4 3. Principles and Practice of Management - L M Prasad, S. Chand and Sons (ISBN : 978-93-5161-050-2) 4. Principles of Management - T. Ramaswamy, McGraw Hill Education - (ISBN-10: 818-48-8871-6, ISBN-13:978-81-8488-87-1) 5. Principles of Management - Knootz & O'Donell, Tata McGraw Hill (ISBN-10:0070581924, ISBN-13:978-00-7058-192-)0 6. Principles of Management - Meena Sharma, Himalaya Publishing House (ISBN-10: 93-5202-192-4, ISBN-13: 978-93-5202-192-5)

<table>
<tr><td>Semester : I</td><td>Hard Core</td><td colspan="3">Semester Exam</td><td rowspan="2">L</td><td rowspan="2">Credits</td></tr>
<tr><td>Code: 102</td><td rowspan="2">Financial Accounting</td><td>Theory</td><td>I A</td><td>Total</td></tr>
<tr><td>Subject Title</td><td>80</td><td>20</td><td>100</td><td>4</td><td>4</td></tr>
<tr><td>Course Objectives</td><td colspan="6">1. To make the students understand the Accounting Concepts and process of Accounting from Journal Entry to Final Accounts.
2. To make students capable of implementing accounting process practically with any business activities
3. To make students understand the features and benefits of Computerised Accounting.
4. To make students capable of using Accounting Package Tally in real business environment and generate various reports from the software.</td></tr>
<tr><td>Course Outcomes:</td><td colspan="6">• At the end of this course, the students will be able to do practical accounting for any business in books as well as using Accounting Software and extract various reports useful for the organisation.</td></tr>
<tr><td>Module 1</td><td colspan="6">Introduction to Financial Accounting</td></tr>
<tr><td colspan="7">• Meaning of Book-keeping and Accountancy
• Objectives of Accountancy
• Branches of Accounting
• Users of Accounting information
• Accounting Principles – Concepts and Conventions
• Basic Accounting Terminologies</td></tr>
<tr><td>Module 2</td><td colspan="6">Accounting Cycle – Process & System</td></tr>
<tr><td colspan="7">• Concept of Accounting Process and stages
• Double entry system
• Classification of Accounts, Golden rules of accounting.
• Recording the business transactions in Journal
• Single, Two and Triple Column Cash Book
• Maintaining different Ledger Account</td></tr>
</table>

Module 3	**Capital & Revenue income and Expenses**
• Classification of Capital & Revenue Income & Expenses • Meaning and effect of Deferred Expenses • Preparation of Trial Balance.	
Module 4	**Preparation of Final Accounts**
• Introduction to different Financial Statements • Preparation of Final Accounts including adjustments	
Module 5	**Computerized Accounting Package**
• Working of Tally - Features, – Accounting, Taxation, Payroll and Financial MIS. • Company creation, Company features and configuration, • Financial accounting using tally: Creation of Ledgers, Ledger Groups, Voucher Types, Voucher entry, Day book and ledgers, Final Accounts Reports. Display, Printing.	
Module 6	**Depreciation Accounting**
• Meaning of Depreciation • Causes of depreciation. • Different methods of depreciation • Problems on Straight Line Method, Written Down Value Method.	
Recommended Books	1. Financial Accounting – Dr. K. A. Sontakke – Himalaya Publishing House (ISBN : 978-83-5142-201-3) 2. Financial Accounting & Analysis – Dr. Prashanta Athma – Himalaya Publishing House (ISBN : 978-93-5051-483-2) 3. Simple Tally 9 – Asok K. Nadhani – BPB Publications (ISBN : 978-81-8333-244-8) 4. Tally ERP 9.0 in Simple Steps – DT Editorial Services – Dreamtech Press (ISBN : 978-93-5004-053-9) 5. Financial Accounting - V. Rajasekaran and R. Laitha, Pearson Publication (ISBN 10: 8131731804 / ISBN 13: 978-81-3173-180-2.) 6. Accounting For Management - S. N. Maheshwari, Vikas Publishing (ISBN: 9325956195, 978-93-2595-619-3)

Semester :I	**Hard Core**	**Semester Exam**			**L**	**Credits**
Code: 103	**Managerial Economics**	**Theory**	**I A**	**Total**		
Subject Title		80	20	100	4	4
Course Objectives	1. To expose students to basic managerial economic concepts. 2. To apply economic analysis in formulation of business policies. 3. To use economic reasoning to problems of business.					
Course Outcomes:	• Students will be prepared to apply both micro and macro economic concepts in business environment. • Students will develop analytical and problem solving skills by learning the subject through case based approach. • The fundamentals of business economics shall provide practical orientation to be applied in corporate industries.					
Section-I : Micro Economics						
Module 1	**Managerial Economics**					
Meaning, Nature, scope and significance of Managerial Economics, Importance of managerial economics in decision making of an organization, The Indifference Curve Analysis, Demand analysis, Demand Forecasting, Methods of demand Forecasting, Elasticity of demand. Types of elasticity of demand.						
Module 2	**Revenue concepts**					
Total revenue, Marginal revenue Average revenue and their relationships. Supply analysis: Supply function, Law of supply, Elasticity of supply. Cost Analysis: Short run cost analysis Fixed, Variable and Total cost curves, Average and Marginal Cost curves Long run cost analysis Long run average and Marginal cost curves. Economies and diseconomies of scale						
Module 3	**Market structures and concept of market equilibrium**					
Characteristics of different market structures, Concept of Market equilibrium Price determination and firms equilibrium under monopolistic competition, Monopoly and Perfect Competition Price discrimination, International price discrimination and dumping, pricing Methods.						

Section –II : Macro Economics	
Module 4	**Indian Economy and Basic Concepts of Business Economics**
Introduction, composition importance of Indian Economy, Major problems of Indian Economy Industrial Growth, Planning and Development. New Economic Policy and reforms in Indian economy, Liberalization, Privatization and Globalization concept of GDP & GNP, National Income and methods of measuring national income, Inflation & deflation- types, causes, effects remedial measures	
Module 5	**Trade Policies and Banking Reforms**
Monetary Policy and fiscal policy, Public economies- public revenue, public expenditure and public debt, Budget and types of budgets. Central bank of India, Commercial Banks - types, functions, Role in Economic Development , Banking reforms in India, Role of RBI in banking reforms	
Module 6	**Foreign Trade**
Introduction, India's Import –Export policy, Trends in India's Foreign Trade, Impact of WTO on India's Foreign Trade, Role of MNCs and FDI in India's foreign trade. Balance of Payment-equilibrium and disequilibrium in the BOP, measures to correct India's adverse Balance of payment	
Recommended Books	1. Managerial Economics - Theory and Applications, Dr. D.M Mithani, Himalaya Publishing House (ISBN Number : 978-93-5262-330-3) 2. Managerial Economics - D.N.Dwidevi, Vikas Publishing House Pvt. Ltd (ISBN : 8125923470, 978-81-2592-347-3) 3. Managerial Economics - P. L. Mehta, S. Chand & Sons, New Delhi (ISBN 10: 8180549607 / ISBN 13: 978-81-8054-960-1) 4. Indian Economy - Ruddar Datt and K.P.M Sundharam, S. Chand & Sons (ISBN : 97893525312955.) 5. Indian Economy - S.K. Mishra and V.K. Puri, Himalaya Publishing House (ISBN-10: 9352731727, ISBN-13: 978-93-5273-172-5) 6. Managerial Economics - H. L Ahuja, S. Chand & Sons, 2011 (ISBN:978-93-5253-518-7) 7. International Business (Text and Cases)-P. Subba Rao, Himalaya Publishing House. (ISBN Number : 978-93-5367-011-5)

<table>
<tr><td>Semester : I</td><td>Hard Core</td><td colspan="3">Semester Exam</td><td rowspan="2">L</td><td rowspan="2">Credits</td></tr>
<tr><td>Code: 104</td><td rowspan="2">Organizational Behaviour</td><td>Theory</td><td>I A</td><td>Total</td></tr>
<tr><td>Subject Title</td><td>80</td><td>20</td><td>100</td><td>4</td><td>4</td></tr>
<tr><td>Course Objectives</td><td colspan="6">1. To impart basic knowledge into Organisation Behaviour.
2. To provide insights into Individual & Group Behaviour and its implications in modern Organizations.
3. To deliver basic knowledge of Organisation Culture and its role in Management.</td></tr>
<tr><td>Course Outcomes:</td><td colspan="6">• Understand the determinants and various theories of personality development.
• Understand the concept of attitude, perception and the process.
• Understand the various strategies for managing conflicts in organization.
• Understand the concept of organizational culture, organizational change and Development.</td></tr>
<tr><td>Module 1</td><td colspan="6">Introduction to Organisational Behaviour</td></tr>
<tr><td colspan="7">• Meaning and Definition
• Levels of OB
• Approaches to OB
• Factors affecting individual behavior- Environmental factors, Personal Factors</td></tr>
<tr><td>Module 2</td><td colspan="6">Individual Behaviour</td></tr>
<tr><td colspan="7">• Attitude
o Types of attitudes
o Cognitive dissonance theory
• Learning
o Meaning and definition
o Learning theories – classical & operant conditioning.
• Perception
o Meaning and Definition
o Perceptual Process
o Factors influencing perception
• Personality:
o Meaning
o Traits of personality
o Big five
o Myers-Briggs Type Indication</td></tr>
</table>

Module 3	**Group Behaviour and Group Decision Making**

- **Group Behaviour:**
  - Definition and Classification of Groups
  - Group dynamics - Group cohesiveness
  - Stages of group development
- **Group Decision Making**
  - Group decision making process
  - Strategies to improve group decision making

Module 4	**Teams and Culture**

- Teams – Definition.
- Teams vs. groups, Types of teams.
- Culture – Definition, characteristics of culture.
- Cultural Dimensions.
- How culture is created.

Module 5	**Organisational Change**

- Meaning, Definition, Levels of change.
- Forces for change – External & Internal forces.
- Change Process – Unfreezing, changing, refreezing.
- Resistance to change – Individual & Organisation resistance.
- Managing resistance to change.

Module 6	**Organizational conflict and stress**

- **Organisational Conflict**
  - Meaning and concept
  - Functional and dysfunctional conflicts
  - Levels of conflicts
- **Stress**
  - Meaning and Importance
  - Sources of stress and its consequences
  - Managing Stress

Recommended Books	1. Organizational Behavior – Stephen Robbins. Prentice-Hall of India (ISBN-10: 8120328752, ISBN-13: 978-81-2032-875-4). 2. Organisational Behaviour – K. Ashwathappa, Himalaya Publishing (ISBN: 8183188346, 978-81-8318-834-0) 3. Organizational Behaviour – P.G.Aquinas, Excel Books. (ISBN-10: 8174464743, ISBN-13: 978-81-7446-474-3) 4. Organisational Behaviour – Rao & Narayana. Konark Publishers. (ISBN : 8122000274, 978-81-2200-027-6) 5. Organisational Behaviour – Dr. S. S. Khanka, S.Chand (ISBN:978-81-2192-014-8) 6. Organisational Behaviour – Suja R.Nair, Himalaya Publishing (ISBN: 8178667509, 978-81-7866-750-8)

Semester : I	**Hard Core**	**Semester Exam**			**L**	**Credits**
Code: 105	**Business Statistics**	**Theory**	**I A**	**Total**		
Subject Title		80	20	100	4	4
Course Objectives	1. To educate different statistical methods. 2. To teach data presentation techniques. 3. To apply different statistical techniques in business/real-life conditions. 4. To develop the knowledge on descriptive & inferential statistics.					
Course Outcomes:	• Understanding different statistical methods for data analysis and presentation. • Applying different statistical techniques in business/real-life conditions. • Solving statistical problems.					
Module 1	**Introduction**					
Definition of Statistics – Importance and scope of Statistics, Statistical Data: Primary and Secondary Data – Sources of Data –Classification of Data - Frequency Distribution: Discrete or Ungrouped Frequency Distribution, Grouped Frequency Distribution, Continuous Frequency Distribution. – Diagrammatic and Graphic Representation: Line Diagram, Bar Diagram, Rectangle Diagram, and Pie Diagram -Choice of a Suitable Diagram Presentation of data to convey meaning - Tables, Graphs. Graphs : Histograms, Frequency Polygon, Cumulative Frequency Curves or Ogives.						
Module 2	**Measures of Central Tendency**					
Mean, Combined Mean, Median and Mode and their implications, Missing frequency problems.						
Module 3	**Measures of Dispersion**					
Range, Mean deviation, Quartiles, Quartile Deviation, Standard deviation and Combined Standard Deviation, Variance-Coefficient of Variation						
Module 4	**Correlation & Regression**					
Concept, Scatter Diagram, Karl Pearson's coefficient of Correlation, Spearman's Rank Correlation, Introduction to Multiple Correlation.						
Module 5	**Index Numbers & Time Series Analysis**					
Meaning, Types of index numbers, Uses of index numbers, Construction of Price, Quantity and Volume indices, Fixed base and Chain base methods, Introduction, Objectives of Time Series, Identification of Trend - Variations in Time Series: Secular Variation, Cyclical Variation, Seasonal Variation, and Irregular Variation						

Module 6	**Association of Attributes**
Introduction, Yule's coefficient of Association & Coefficient of colligation calculations.	
Recommended Books	1. Statistical Methods - S. P. Gupta, S. Chand & Sons (ISBN 8180548627, 978-81-8054-862-8) 2. Statistics for Management - Richard I Levin & David S. Rubin, PHI Learning (ISBN-10: 9332581185, ISBN-13: 978-93-3258-118-0) 3. Statistics for Management - P. N. Arora & S. Arora, S Chand & Sons (ISBN:978-81-2192-285-2) 4. Business Statistics - S. C. Gupta & Indra Gupta, Himalaya Publishing House (ISBN-13:978-93-5097-407-0) 5. Statistics for Management - T N Srivastava & Shailaja Rego, Tata McGraw Hill (ISBN, 0070660298, 978-00-7066-029-8)

<table>
<tr><td>Semester : I</td><td>Soft Core</td><td colspan="3">Semester Exam</td><td rowspan="2">L</td><td rowspan="2">Credits</td></tr>
<tr><td>Code: 106</td><td rowspan="2">Computer Operations & Management</td><td>Theory</td><td>I A</td><td>Total</td></tr>
<tr><td>Subject Title</td><td>80</td><td>20</td><td>100</td><td>4</td><td>4</td></tr>
<tr><td>Course Objectives</td><td colspan="6">1. To make the students Understand Computer system and its importance in an Organisation.
2. To make students capable of organizing of computers and effectively using software tools that are mostly required to complete office activities viz., Documentation, Data computation and presentation.
3. To make students capable of using internet services securely and efficiently.
4. To provide conceptual knowledge of use of computer system for information procession and decision making through knowledge of MIS.</td></tr>
<tr><td>Course Outcomes:</td><td colspan="6">• At the end of this course, the students will understand computer system better and handle the most used tools of word processing, spreadsheet, presentation and internet well organized, effectively and efficiently.</td></tr>
<tr><td>Module 1</td><td colspan="6">Introduction to IT</td></tr>
<tr><td colspan="7">• Concept of IT, IT Application in Management, Components of IT
• IT Infrastructure: Hardware Components (Input/output Devices, Memory, Secondary Storage Devices, Processing, Networking.
• Software System, Application, Packaged, Programming
• Networking : Types – LAN; MAN; WAN; Protocols. Concept of Web Technology, Internet, Intranet, Extranet application, Cloud computing -Meaning, benefit and model.</td></tr>
<tr><td>Module 2</td><td colspan="6">Computer Organisation using MS Windows</td></tr>
<tr><td colspan="7">• Meaning & Functions of Operating System
• Organization of Elements in Computers, Folders, Files, Shortcuts – Creating, Relocating, Replicating, Deleting, restoring. Concept of Window, Path, Addresses and Locations. Searching
• Elements of Windows OS Interface – Desktop, My Computer, My Documents, Network places, Start Menu, Quick launch bar, Recycle Bin, Control Panel – Display, Taskbar, Date & Time, Mouse, Regional & Language, Programs & Features settings.</td></tr>
</table>

Module 3	**Word Processing using MS Word**

- Concept of Word Processing, Overview of MS Word.
- Creating, Editing, spell & Grammar check, Text & Paragraph Formatting, Tabs spacing.
- Tools : Find – Replace, Header and Footer, Autocorrect,
- Working with Pages - Page Setup, Margins, Mirror Margins,
- Inserting Hyperlink, Book Marks, Table of Contents, Saving in different formats.
- Working with Tables – Rows Columns, Insert, Merging, Splitting, Delete, Borders, Alignments, Sorting, Simple Formulae, Convert to Text.
- Mail merge
- Printing Documents.

Module 4	**Spreadsheets using MS Excel**

- Concept of Spreadsheet, Working with spreadsheet using MS excel, Formatting Cells, Concept of cell address, creating well formatted tables, Manipulating in respect of Cells, rows, columns, sheets. Freeze Panes,
- Formulas and Functions: Cell referencing – Absolute & relative, Math & Trig , Statistical, database, text, date functions. (Sum, Average, Max, Min, Count, Countif, If, Dget, Proper, Left, Right, Concatenate, Len, , Today)
- Conditional Formatting, Sorting and Filtering Data.
- Charts & Graphs, Data Security – Cell Level, Sheet Level, Book Level.
- Printing Spreadsheets

Module 5	**Presentations using MS PowerPoint**

- Concept of Presentation, Overview of MS Power Point
- Elements of PowerPoint presentation, Slides, Layouts, Adding Content, rearranging, Duplicating and reusing slides, applying themes, shapes, text, charts,
- Animation: Using Animation for entry, exit, motion and emphasis, Custom Animation, Transition of Slide, Rehearse timings.
- Printing Presentations.

Module 6	**Management Information System:**
• Concept of Information System, Components , Uses, of information System, Major roles of information systems, Types of Information Systems – TPS, MIS, OAS, DSS, ESS, ES, KWS, Relationship between different Information systems.	
Recommended Books	1. Computer Fundamentals – Pradeep K. Sinha, Priti Sinha, BPB Publications (978-81-765-6752-7) 2. Microsoft Office 2016 All-in-one for Dummies – Peter Weverka – Wiley India Pvt. Ltd. (ISBN : 978-81-265-5903-4) 3. Microsoft Office – Laurie Ann Ulrich, McGraw Hill Osborne (ISBN : 0-07-222937-3) 4. Information Technology for Management – Ramesh Behl, Tata McGraw Hill Education (ISBN - 13: 978-1-25-900479-7 / ISBN-10 : 1-25-900479-1) 5. Management Information Systems – Text & Cases – Waman S. Jawdekar, Tata McGraw Hill Education Pvt. Ltd. (ISBN: 978-12-590-2669-0) 6. Management Information System – Nitin C. Kamat, Jyotindra Zaveri, Himalaya Publishing House (ISBN: 978-93-505-1385-9)

Semester : I	**Soft Core**	**Semester Exam**			**L**	**Credits**
Code: 107	**Business Law**	**Theory**	**I A**	**Total**		
Subject Title		80	20	100	4	4
Course Objectives	1. To learn about the important provisions of some of the important, newly Introduced & amended business laws.					
Course Outcomes:	1. Understanding Summarize The Key Legal Provisions Of Each Act. 2. Understand Legal Aspects Of Business With Respect To Indian Economy. 3. Relate Various Legal Provisions To Relevant Business Aspects And Situations. 4. Applying Illustrate the Use of the Acts in Common Business Situations. 5. Analysing Outline the Various Facets of Basic Case Laws of Each Act from a Legal and Managerial Perspective.					
Module 1	**Indian Contract Act 1872**					
Indian Contract Act 1872, Essential Elements of A Contract, Performance And Discharge of A Contract, Offer And Acceptance, Consideration, Legality of Object, Capacity To Contract, Free Consent, Modes of Discharge, Breach And Remedies, Quasi Contracts.						
Module 2	**Sale of Goods Act 1930**					
Sale of Goods Act 1930.Formation of A Contract of Sales And Its Features, Conditions And Warranties, Rights of An Unpaid Seller, Types of Goods, Distinction Between Sale And Agreement To Sell, Performance of Contract.						
Module 3	**Companies Act 1956 & Companies Act, 2013**					
Comparative Study Of The Companies Act, 1956 And The Companies Act, 2013 On the Basis of The Following Kinds of Companies, Formation Of A Company, Memorandum of Association (M/A), Articles Of Association (A/A), Prospectus, Meetings, Appointment And Removal of Directors, Shares, Types Of Shares and Dividends. Income Tax and GST.						
Module 4	**Consumer Protection Act, 1986.**					
Introduction, Consumer And Consumer Disputes, Definitions Of Consumer, Complainant, Goods, Service - Meaning Of Consumer Dispute Complaint-Unfair Trade Practices – Restrictive Trade Practices Rights Of Consumers, Consumer Disputes Redressal Agencies, Consumer Protection Councils, Objectives And Need Of The Competition Act, 2002.						

Module 5	**Introduction To IPR Laws**
A) The Copy Right Act, 1957 B) The Patents Act, 1970 C) The Trade Marks Act, 1999	
Module 6	**Security Issues in E-Commerce**
Security Risks of E-Commerce-Types and Sources Of Threats; Protecting Electronic Commerce Assets And Intellectual Property; Firewalls; Client Server Network Security; Data And Message Security; Security Tools; Digital Identity And Electronic Signature; Encryption Approach To E-Commerce Security. Salient Provisions For Security And Privacy; Legal And Regulatory Environment For E-Commerce, Cyber Laws In India And Their Limitations.	
Recommended Books	1. Business Law/Mercantile Law, M.C.Kucchal, Vikas Publishing.House. 2. Elements Of Mercantile Law, N. D. Kapoor 3. Law Relating To Intellectual Property, Dr. B. L Wghera, Universal Law Publication 4. Cyber Crime In India, Dr. M. Dasgupta 5. Law Of Arbitration And Conciliation, Avtar Singh 6. Business Laws, Lee Reach, Oxford University Press, UK. 7. Business Legislation For Management, M.C.Kucchal & Vivek Kucchal, Vikas Publishing House (P) Ltd. 8. Electronic Commerce – A Managerial Perspective, Efraim Turban , David King, Jae Lee 9. Cyber Law- Text & Cases, 3rd Edition, Gerald Ferrera, Jeffrey M, Aresty, Cengage Learning.

<table>
<tr><td>Semester : I</td><td>Soft Core</td><td colspan="3">Semester Exam</td><td rowspan="2">L</td><td rowspan="2">Credits</td></tr>
<tr><td>Code: 108</td><td rowspan="2">Disaster Management</td><td>Theory</td><td>I A</td><td>Total</td></tr>
<tr><td>Subject Title</td><td>80</td><td>20</td><td>100</td><td>4</td><td>4</td></tr>
<tr><td>Course Objectives</td><td colspan="6">1. To understand basic concepts in Disaster Management
2. To understand elements of Disaster Management.
3. To understand Types and Categories of Disasters
4. To understand the Challenges posed by Disasters</td></tr>
<tr><td>Course Outcomes</td><td colspan="6">• The application of Disaster Concepts to Management
• Analyzing Relationship between Development and Disasters.
• Ability to understand Categories of Disasters and
• Realization of the responsibilities to society</td></tr>
<tr><td>Module 1</td><td colspan="6">Introduction</td></tr>
<tr><td colspan="7">Concepts and definitions, disaster, hazard, vulnerability, risks severity, frequency and details, capacity, impact, prevention, mitigation).</td></tr>
<tr><td>Module 2</td><td colspan="6">Disasters</td></tr>
<tr><td colspan="7">Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.</td></tr>
<tr><td>Module 3</td><td colspan="6">Disaster Impacts</td></tr>
<tr><td colspan="7">Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.</td></tr>
</table>

Module 4	**Disaster Risk Reduction (DRR)**
Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, Business Organisations, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programs in India and the activities of National Disaster Management Authority.	
Module 5	**Disasters, Environment and Development**
Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.	
Recommended Books	1. Pradeep Sahni, Disaster Risk Reduction in South Asia, Prentice Hall. 2. Singh B.K., Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication. 3. Ghosh G.K., Disaster Management, APH Publishing Corporation 4. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003 5. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC 6. http://ndma.gov.in/ (Home page of National Disaster Management Authority) 7. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).

Semester : I	**Soft Core**	**Semester Exam**			**L**	**Credits**
Code: 109	**Banking Operations & Services**	**Theory**	**I A**	**Total**		
Subject Title		80	20	100	4	4
Course Objectives	1. To make the student understand the banking sector 2. To make the student knowledgeable in respect of products and services of banking 3. To make student known to various modes of operations with the bank 4. To make the student understand the relationship with banker and grievance mechanism of banking industry					
Course Outcomes:	• At the end of the course, student will be oriented with the knowledge of banking sector and its relationship with its customers.					
Module 1	**Banking Sector in India**					
• Concept of Banking, Development of Banking in India • Functions of Bank, Structure of Indian Banking System, types of banks, Banking Sector in India, Banking Sector Reforms • Introduction to NBFC, Difference between Bank and NBFC, Different Types of NBFC.						
Module 2	**Deposits and Advances**					
• Types of Deposits, Process of Opening Bank Account • Types of Consumer Loans, Loan Procedure on consumer loan • Principles of Sound Lending, Evaluating Consumer Loans, Credit Analysis, Credit Scoring a Consumer Loan • Priority Sector Lending, NPA, Categories of NPA, Causes						
Module 3	**Electronic Banking**					
• Meaning of E-banking, Automated Teller Machine, Internet Banking, Telephone Banking, Electronic Clearing Service • Electronic Funds Transfer (EFT), NEFT and RTGS • Credit Cards, Smart cards (Credit cards, Debit cards) • Risks in E-banking, Introduction to M-Banking, IMPS						

Module 4	**Banking Rates**
• Introduction to Bank Rate, CRR, SLR, REPO RATE, REVERSE REPO RATE, CALL RATE, BASE RATE, MARGINAL STANDING FACILITY RATE (MSF), MARGINAL COST OF FUND LENDING RATE (MCFL)	
Module 5	**Banker & Customer Relationship**
• Relationship between banker & customer, Obligation to Honour cheques, Modes of charging security – Lien, Pledge, Mortgage, Assignment, Hypothecation. Banker's Right of Lien, Banker's duty to maintain customer account secrecy, Bankers right to claim incidental charges	
Module 6	**Customer Service in Bank**
• Expectations of a Customer, Rights of the customer, Areas of Concern, Customer Charter, Grievance Redressal Machinery, Establishment of banking ombudsman, powers & duties of banking ombudsman	
Recommended Books	1. Elements of Banking and Insurance - Jyotsa Sethi and Nishwan Bhatia, PHI Learning Pvt. Ltd. (ISBN : 978-81-203-3316-1) 2. Banking Theory Law and Practice - Gordon and Natarajan Himalaya Publishing House 3. Principles & Practice of Banking and Insurance - O.P. Agarwal, Himalaya Publishing House (ISBN : 4. Banking Lokpal – Shyam Lal Gaur – Himalaya Publishing House (ISBN : 81-7866-420-8) 5. Management of Indian Financial Institutions - R.M. Srivastava and Divya Nigam, Himalaya Publishing House 6. Indian Financial System - Phatak, Pearson Education India 7. Indian Financial System - M.Y. Khan, Tata McGraw Hill. 8. Banking Theory & Practice Dr. P. K. Srivastava, Himalaya Publishing House

<table>
<tr><td>Semester : I</td><td>Skill Core</td><td colspan="3">Semester Exam</td><td rowspan="2">L</td><td rowspan="2">Credits</td></tr>
<tr><td>Code: 110</td><td rowspan="2">Enhancing Business Communication Skills</td><td>Theory</td><td>I A</td><td>Total</td></tr>
<tr><td>Subject Title</td><td>80</td><td>20</td><td>100</td><td>4</td><td>4</td></tr>
<tr><td>Course Objectives</td><td colspan="6">1. To enlighten the students about the fundamentals of Business Communication and enhance their skills necessary for day-today communication
2. To give practical knowledge in order to prepare for effective presentation, business writing, reporting, presenting during job interviews, etc.
3. To focus on competence and project them positive in terms of overall personality and grooming.</td></tr>
<tr><td>Course Outcomes:</td><td colspan="6">• This course will help students to learn the effective techniques of business communication.
• The course will help students learn to communicate professionally both in writing as well as oral.
• The course will help gain more competence than existing and enhance the personality.</td></tr>
<tr><td>Module 1</td><td colspan="6">Business Communication</td></tr>
<tr><td colspan="7">Meaning; Process of communication; Channels of Communication - Concept, Medias; Barriers to communication; Guidelines to overcome communication barriers.</td></tr>
<tr><td>Module 2</td><td colspan="6">Basics of Communication</td></tr>
<tr><td colspan="7">a) Effective Listening: Process of listening; Types of listening; Listening Comprehension; Listening to structured Talks; Guidelines for effective listening.
b) Effective Conversation: Concept, Social Conversation; Conversation Control; Transactional Analysis (TA); Applications of Conversational Control
c) Non Verbal Communication: Concept; Use of Non-verbal communication; Sign Language; Body language; Paralanguage (Concept and its components)</td></tr>
<tr><td>Module 3</td><td colspan="6">Employment Communication</td></tr>
<tr><td colspan="7">Presentation: Process of making a business presentation- Planning the presentation; Preparing the Presentation; Organizing the Presentation; Rehearsing the presentation; Improving delivery of presentation.</td></tr>
</table>

Module 4	**Managerial Writing**
Principles of Effective Writing; Parts & Style of Business Letters; Business Letters:- Enquiry letter, Quotation; Letters placing Orders, Complaint Letter, Adjustment Letters, Sales letter, Collection letters; Reports: Concept - Types of reports , Parts of Reports; Report Drafting.	
Module 5	**CVs, Personal Interviews and Group Discussions**
Writing CV/ Resume, Guidelines for preparing good CV; Interviews- Types of Interview, areas of assessment in Job Interview, Focus of Job Interviews, Group Discussion- Participation in a Group Discussion	
Module 6	**Communication Technology**
Email (Mailing List & News Groups), Teleconference & Videoconferencing (Like Skype, etc); Fax; Social Media; Chat Rooms & Forums; Web (Concept, Features, Advantages and Disadvantages)	
Recommended Books	1. Effective Technical Communication - M Ashraf Rizvi, Tata McGraw Hill (ISBN:1259082512, 978-12-5908-251-1) 2. Managerial Communication – Urmila Rai and S. M.Rai, Himalaya Publishing House (ISBN-10: 9350247992, ISBN-13: 978-93-5024-799-0) 3. Business Communication : Skills, Concepts and Applications – P. D. Chaturvedi, Mukesh Chaturvedi, Pearson Education (ISBN: 978-81-3171-872-8, 8131718727) 4. Communication – C. S. Rayudu, Himalaya Publishing House (ISBN Number : 978-93-5051-953-0)

Semester – II

Semester : II	**Hard Core**	**Semester Exam**			**L**	**Credits**
Code: 111	**Marketing Management**	**Theory**	**I A**	**Total**		
Subject Title		80	20	100	4	4
Course Objectives	1. To create an understanding of the fundamental concepts of marketing & the environment in which marketing system operates. 2. To explain key bases for segment marketing, target marketing, and market positioning. 3. To familiarise with basic elements of the marketing mix and make students to analyze the motives influencing buying behaviour.					
Course Outcomes:	• It increases knowledge of marketing management concepts and practices. • It gives an understanding of tools and techniques used in marketing management. • It enables a student to become aware about challenges required for effective Marketing Management.					
Module 1	**Introduction**					
Marketing Management and its evolution, Holistic Marketing, Scope, Core concepts, Marketing environment – macro and micro environments, Competition Analysis, Concept of market potential and market share.						
Module 2	**Market Analysis**					
Segmentation: Meaning, Need, Basis for segmentation, Effective segmentation criteria, Segmentation of Consumer/ Industrial markets; Targeting: Basis for identifying target customer, Evaluating & Selecting Target Markets, Target Market Strategies; Positioning: Meaning, Positioning strategies.						
Module 3	**Marketing Research and Consumer Behavior**					
Marketing Research: Meaning and scope of marketing research; Marketing research process, Modern Marketing Information System. Introduction to Consumer behavior and its importance; factors influencing Consumer behavior - economic, socio-cultural and psychological factors; comparing industrial and Consumer buying behavior; Consumer decision making process.						

Module 4	**Product and Pricing decisions**
Meaning and classification of products; New product development; product line and product mix decisions; branding decisions; packaging decisions; concept of product life cycle - implications on marketing strategy, Pricing decisions: Role of pricing in marketing; pricing objectives; different approaches to establish prices.	
Module 5	**Integrated Marketing Communication and Promotion**
Concept of communication mix, communication objectives, Marketing Communication Model; Promotion Mix - factors influencing promotion mix, an introduction to different promotion tools - Advertising, Sales Promotion, Public Relations, Personal Selling , New Trends- Social Marketing, , E-Marketing; Digital Marketing, Green marketing.	
Module 6	**Distribution decisions**
Factors influencing channel decisions, Major types of Distribution channels - channels for consumer and industrial products; channel design and channel modification decisions; Retailing, Wholesaling and Logistics Management.	
Recommended Books	1. Marketing Management: A South Asian Perspective - Philip Kotler, Keller, Koshy & Jha-, Pearson 13th Edition 2. Marketing Management - Analysis, Planning and Control - Philip Kotler, PrenticeHall, New Delhi. 3. Marketing Management, Philip Kotler, Kevin Keller -15th Edition 4. Principles of Marketing, Philip Kotler , Gary Armstrong – 15th Edition 5. Fundamentals of Marketing – William J Stanton -McGraw- Hill, New Delhi. 6. Fundamentals of Marketing - Cundiff EW, Still RR and Govani NAP - Prentice Hall 7. Marketing management - Arun Kumar and N Meenakshi – Vikas publishing House 8. Marketing Management: Text and Cases- Rajagopal – Vikas Publishing House.

Semester : II	**Hard Core**	**Semester Exam**			**L**	**Credits**
Code: 112	**Financial Management**	**Theory**	**I A**	**Total**		
Subject Title		80	20	100	4	4
Course Objectives	1. To understand the basic concepts and fundamentals used in financial accounting. 2. To learn all the intricacies of corporate financial statements.					
Course Outcomes:	• At the end of this course, the students will be able to do practical Financial Management for any business.					
Module 1	**Introduction to Financial Management**					
• Meaning of Financial Management • Objectives of Financial Management • Scope of Financial Management • Modern approaches to Financial Management • Finance and related Disciplines • Financial Planning – Principles and Steps in Financial Planning.						
Module 2	**Time Value of Money**					
• Time Value of Money Concept • Rationale of Time Value of Money • Concept of Compounding, discounting, simple interest and Compound interest • Future Value- Future Value of Single Cash flow, Future Value of Annuity • Present Value- Present Value of Single Cash flow, Present Value of Annuity • Equated Monthly Instalment Concept & Simple Calculations						
Module 3	**Capital Budgeting**					
• Meaning of Capital Budgeting • Importance of & difficulties in Capital Budgeting Decisions • Classification of Project • Techniques of Capital Budgeting- PBP, ARR, NPV, PI, IRR and Discounted PBP						
Module 4	**Working Capital Management**					
• Nature and Scope • Components of Working Capital • Operating Cycle • Types of Working Capital • Factors affecting Working Capital • Estimation of Working Capital Requirement.						

Module 5	**Financial Statement Analysis**
• Introduction • Techniques of Financial Statement Analysis • Introduction to Ratio Analysis • Advantages and Disadvantages of Ratio Analysis • Classification of Ratio- –Liquidity Ratios, Leverage Ratios, Activity Ratios, • Profitability Ratios • Computation and comparison of ratios	
Module 6	**Sources of Finance**
• Long Term Sources of Finance - Equity Shares, Preference Shares, Debentures/Bonds, Term Loans, Venture Capital, Leasing Financing, Hire Purchasing • Working Capital Financing /Short term Source of Finance - Trade Credit, Commercial Papers, Public Deposits, Commercial Bank- Loans, Overdraft, Cash Credit, Discounting of Bill	
Practical Problems should be covered on: • Simple problems on calculation of Future Value- Future Value of Single Cash flow, Future Value of Annuity • Simple problems on calculation of Present Value- Present Value of Single Cash flow, Present Value of Annuity • Capital Budgeting- PBP, ARR, NPV, PI, IRR and Discounted PBP • Estimation of Working Capital requirement. • Ratio Analysis simple problems and Construction of Balance Sheet problems	
Recommended Books	1 Financial Management- Text Problems & Cases - M.Y. Khan and P.K.Jain, McGraw Hill 2 Financial Management - P.V. Kulkarni & B.G. Satyaprasad, Himalaya Publishing House 3 Financial Management Principles & Practices - G.Sudarsana Reddy, Himalaya publishing House 4 Financial Management - I.M. Pandey, Vikas Publications 5 Financial Management - Prasanna Chandra, Tata McGraw Hill 6 Financial Management - S.C.Kuchal , Chitanya Publishing House 7 Financial Management & Policy - R.M.Shrivastava, Himalaya Publishing House 8 Financial Management – Bhalla, S.Chand 9 Financial Management Theory and Practice - Prasanna Chandra, McGraw Hill.

Semester : II	**Hard Core**	**Semester Exam**			**L**	**Credits**
Code: 113	**Human Resource Management**	**Theory**	**I A**	**Total**		
Subject Title		80	20	100	4	4
Course Objectives	1. To prepare a student for a career in industry and services. 2. To facilitate learning in modern concepts, techniques and practices in the management of human resources. 3. To expose the student to different functional areas of Human Resource Management to enhance the effectiveness.					
Course Outcomes:	• Understand the concept, objectives and changing role of HRM • Understand procurement process that includes; HRP, factors affecting Recruitment sources, selection process and placement • Differentiate training and development and understand methods of training • Analyze the need and problems of performance appraisal					
Module 1	**Introduction to HRM**					
Introduction to Human Resource Management - Definition, Objectives, Importance, Functions of HRM- Managerial & operative. Personnel Management Vs. Human Resource Management, HRM and HRD, Human Resource Development: Concept, Objectives, Significance, Benefits, Subsystems, HRD Process.						
Module 2	**Job analysis & Human Resource Planning**					
Job Analysis: Meaning, process of Job Analysis, methods of collecting job analysis data, Job Description and Job Specification. Human Resources Planning-Objectives, Importance, HRP Process.						
Module 3	**Recruitment and Selection**					
Recruitment-Sources of Recruitment-Selection Process-Placement and Induction-Retention of Employees. Selection: Definition and Selection Procedure. Placement: Meaning, Induction/Orientation.						
Module 4	**Training and Development**					
Training and Development- Objectives and Needs-Training Process-Methods of Training –Tools and Aids. Difference between training and Development, Evaluation of Training Programs.						

Module 5	**Performance appraisal and Career Planning**
• Performance Appraisal: Meaning, Need, Problems of Performance Appraisal, Process of Performance Appraisal, Methods to performance appraisal – Traditional and Modern methods. • Career Planning: - Meaning, use of career planning, Mobility of employees: - Internal and External, Succession Planning.	
Module 6	**New Trends in HR.**
HR in Virtual organisation, HR Accounting and Auditing, HRIS, Flexi time, Dual career, Glass ceiling of employees. Moonlighting of employees, International HRM and Cross Culture. Emerging concepts like Employee Engagement & Employer Branding. Green HRM, HR Capital, Talent Management, HR Metrics, HR Balance Scorecard, Competency Mapping.	
Recommended Books	1. Human Resource Management - Gary Dessler., Prentice Hall India. 2. Human Resource Management- Text and Cases. K. Aswathappa, (HPH) 3. Human Resource Management. P.Subba Rao Himalaya Publishing House (HPH). 4. Personnel Management – C.B Mamoria. 5. Human Resource Management: Text and Cases - VSP Rao. 6. Personnel/ Human Resource Management by David DeCenzo, Stephen Robbins, Prentice Hall of India.

Semester : II	**Hard Core**	**Semester Exam**			**L**	**Credits**
Code: 114	**Production Management And Operations Research**	**Theory**	**I A**	**Total**		
Subject Title		80	20	100	4	4
Course Objectives	1. To understand the functional area of Production Management 2. To appreciate the scientific basis for business decision making 3. To understand optimizing decision making techniques in different business situations					
Course Outcomes:	• At the end of this course, the students will be understand the role of production management in a manufacturing unit and will also be able to use scientific, quantitative techniques for efficient decision making to optimize utility of resources.					
Module 1	**Production Management and Layouts**					
• Concept, Nature, Scope Activities of Production Management • Plant Location, Factors affecting plant location selection. • Concept and objectives of good plant Layouts, Basic layouts - , Process Product, Fixed Location • Concept and Types of Production Process						
Module 2	**Production Planning & Control**					
• Functions of PPC • Flexible Manufacturing System, Lean Manufacturing System • Supply Chain Management, Maintenance Management • Inventory Techniques ABC, VED						
Module 3	**Operation Research & Linear Programming**					
• Operations Research : Concept, Characteristics, Necessity, Scope in Management, Limitations, Applications in business and Industry • LPP : Formulation, Graphical Solution, Maximization and Minimization Problems.						
Module 4	**Transportation Model**					
• Initial Basic Feasible Solution – North West Corner Method, Least Cost Method, Vogel's Approximation Method • Degeneracy, Unbalanced Problems, Maximization Problems • Optimization by MODI Method.						

Module 5	**Assignment Model**
• Hungarian Method, Minimization and Maximization Problems, Unbalanced Problems • Problems with Restrictions, Travelling Salesman Problems.	
Module 6	**Decision Theory**
Decision Making environments: • Under Certainty (concept) • Under Uncertainty – Numerical on Maximax, Maximin, Minimax, Hurwicz Alpha Criterion, Laplace Criterion, Regret Criterion • Under Risk – Numerical on Expected Monetary, Value (EMV) and Expected Value of Perfect Information (EVPI)	
Recommended Books	1. Production and Operations Management – S.A. Chunawala and D. R. Patel, Himalaya Publishing House (ISBN: 2. Production and Operations Management – K. Ashwathappa and K. Shridhar Bhat, Himalaya Publishing House (ISBN : 978-93-5097-188-8) 3. Industrial Engineering and Management – O. P. Khanna, Dhanpat Rai Publications (ISBN : 4. Operations Research – Er. P.K. Gupta and Dr. D.S. Hira, S. Chand & Co. 5. Operations Research – Prof. K. Shridhar Bhat, Himalaya Publishing House (ISBN : 978-93-5024-735-8) 6. Quantitative Techniques - L.C. Jhamb (Vol. I & II), Everest Publishing House 7. Statistical and Quantitative Methods - M. G. Dhayagude, Everest Publishing House 8. Operations Research – S. Kalavathy, Vikas Publishing House Pvt. Limited

Semester : II	**Hard Core**	**Semester Exam**			**L**	**Credits**
Code: 115	**Research Methodology**	**Theory**	**I A**	**Total**		
Subject Title		80	20	100	4	4
Course Objectives	1. To understand the basic components of research design. 2. To familiarize students with research process, conducting of research through projects. 3. To equip students with various research analytical tools used in business research. 4. To familiarize the students with preparing the research report.					
Course Outcomes:	• Better understanding of importance of Research Methodology. • Preparing the students to application of research techniques. • Better decision making by using research techniques.					
Module 1	**Introduction & Problem Definition**					
Meaning, Objectives, Types, Research Process, Features of good research study, problems encountered by researcher in India. Management problem, defining the research problem, formulating the research Hypothesis and types						
Module 2	**Types of Data**					
Primary and Secondary data Primary data collection methods – Secondary data -Sources – advantages and disadvantages.						
Module 3	**Research Design**					
Meaning, Need and Types- • **Exploratory Research:** Meaning, purpose, methods –secondary resource analysis, comprehensive case methods**,** expert opinion survey, focus group discussions**.-** • **Descriptive Research -** Meaning, Types – cross sectional studies and longitudinal studies. • **Experimental Research Design –** Meaning and types						
Module 4	**Sampling**					
Concepts- Census Vs Sampling**,** Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response, Characteristics of a good sample. Types of Sampling - Probability Sampling – simple random sampling, systematic sampling, stratified random sampling, cluster sampling -Non Probability Sampling – convenience sampling- judgmental sampling, snowball sampling- quota sampling – Errors in sampling						

Module 5	**Questionnaire Design and Measurement Scaling**
Meaning - process of designing questionnaire, Pilot test, Validity and Reliability of questionnaire. Basic measurement scales- Nominal scale, Ordinal scale, Interval scale, Ratio scale. Classification of Scales – Single Item v/s Multi Item Scales, Criteria for Good Measurement	
Module 6	**Data Analysis and Report Preparation**
Cleaning of Data, Editing, Coding, Tabular representation of data, frequency tables, Univariate analysis & Bi-variate Analysis (Chi-Square only), Validation Analysis and Interpretation. Parametric and Non Parametric Test: T-Test, Z Test, F-Test, U-Test, and K-W Test (Theory Only), Structure of Research report, Report writing and Presentation	
Recommended Books	1. Research Methodology - C R Kothari, Vishwa Prakashan 2. Business Research Methods - Naval Bajpai, Pearson Education 3. Business Research Methodology - J K Sachdeva, Himalaya Publishing House. 4. Marketing Research - Naresh K Malhotra & Satyabhushan Dash, Pearson Education 5. Marketing Research - G. C. Beri, Tata McGraw Hill 6. Business Research Methods - Donald Cooper & Pamela Schindler, Tata McGraw Hill.

Semester : II	**Soft Core**	**Semester Exam**			**L**	**Credits**
Code: 116	**Event Management**	**Theory**	**I A**	**Total**		
Subject Title		80	20	100	4	4
Course Objectives	1. To understand different types of events and scope. 2. To know various procedures, licenses and permissions required for events 3. To familiarize students with various opportunities in Event Management industry.					
Course Outcomes:	• At the end of the course, students shall understand and get overview of Event Management, thereby take interest and can find employment and business opportunities in this attractive industry.					
Module 1	**Introduction to Event Management**					
Event – Meaning – Why Event Management? – Analysis of Event, Scope of Event, Decision Makers – Event Manager, Technical Staff – Establishing of Policies and Procedure – Developing Record Keeping Systems.						
Module 2	**Event Management Procedure**					
Factors for successful conduct, General Details, Permissions – Policies, Government and Local Authorities – Phonographic Performance, License, Utilities – Fire Brigade, Ambulance, Catering, Electricity, Water, Taxes.						
Module 3	**Conduct of an Event**					
Preparing a Planning Schedule, Organizing and Staffing, Assigning Responsibility, Communication and Budget of Event – Checklist, Computer Aided Event Management, Roles and Responsibilities of Event Managers for Different Events.						
Module 4	**Public Relations**					
Introduction to Public Relations – Concept – Nature – Importance – Limitations – Media – Types of Media – Media Management, Public Relation Strategy and Planning. Brainstorming Sessions – Writings for Public Relations.						
Module 5	**Corporate Events**					
Planning of Corporate Event, Job Responsibility of Corporate Events Organizer, Arrangements, Budgeting, Safety of Guests and Participants, Creating Blueprint, Need for Entertainment in Corporate Events.						

Module 6	**Career Opportunities in Event Management**
Job Opportunities, Various Roles and Responsibilities.	
Students are supposed to carry out activities like – a) Preparation of Event Plan for Wedding, Annual General Body Meeting of an MNC. b) Preparation of Budget for Conduct of National Level Intercollegiate Sports Events. c) Preparation of Event Plan for College Day Celebrations. d) Preparation of Budget for Conducting Intercollegiate Commerce Fest e) Event Plan for small events like Birthdays, Get together, Family function etc.	
Recommended Books	1. Principles of Event Management – Annie Stephen & Hariharan, Himalaya Publishing House 2. Event Management – Annie Stephen & Hariharan, Himalaya Publishing House 3. Event Marketing and Management – Sanja Singh Gaur & Sanjay V. Saggere, Vikas Publications 4. Event Management – Lynn Van Der Wagen & Brenda R. Carlos, Pearson Higher Education 5. Event Management- Principles & Practice – Razaq Raj, Paul Walters, Tahir Rashid, SAGE Publications Ltd

Semester : II	**Soft Core**	**Semester Exam**			**L**	**Credits**
Code: 117	**Hospitality and Tourism Management**	**Theory**	**I A**	**Total**		
Subject Title		80	20	100	4	4
Course Objectives	1. To understand Hospitality and Tourism industry 2. To identify various components of Hospitality and Tourism industry 3. To familiarize students with various opportunities in Hospitality and Tourism industry.					
Course Outcomes:	• At the end of the course, students shall understand and get overview of Hospitality and Tourism industry, thereby take interest in these and can find employment and business opportunities in this emerging sector.					
Module 1	**Hospitality Management/Industry**					
Introduction of the Hospitality Industry. Nature, Evolution and Growth of Hospitality Industry, Hospitality Industry in Today's Scenario, Importance of Hospitality Management, Training for Hospitality Management.						
Module 2	**Hotel Management Overview of the Accommodation Industry**					
Hotel Organization Structure. Classification of Hotels, Departments of Hotel, Hotel Categories – Star Rating, Types of Hotel Rooms, Plans & Rates. Front Office & its Co-ordination with Other Departments. Food & Beverages, Housekeeping - Responsibilities & Duties of House Keeping Staff, Service Equipments: Linen, Furniture, Chinaware, Glassware, Tableware, Briefing, Banquets, Alcoholic & Non Alcoholic Beverages, Conference & Convention Management						
Module 3	**Tourism**					
Definition of Tourism, Evolution of Tourism Industry, Components of Tourism, Concept of Domestic & International Tourism, Basic Travel Regulation, Significance & Impacts of Tourism: Socio-Cultural, Economic & Environmental.						
Module 4	**Tourist Transportation**					
• Air transportation: The airline industry presents policies, practices. • Surface Transport: Rent-a-car Scheme and Coach-Bus Tour, Transport & Insurance documents, All-India Permits • Rail Transport: Major Railway Systems, General information about Indian Railways, Types of rail tours in India: Palace-on-Wheels and Royal Orient, Deccan Odessy, Toy Trains. • Water Transport: Historical past, cruise ships, ferries, hovercrafts, river and canal boats, Fly-cruise.						

Module 5	**Types and Forms of Tourism**
Inter–regional and intra–regional tourism, inbound and outbound tourism, domestic, international tourism. Forms of Tourism: religious, historical, social, adventure, health, business, conferences, conventions, incentives, sports and adventure, senior tourism, special interest tourism like culture or nature oriented, rural, ethnic or roots tourism Eco Tourism	
Module 6	**Laws & Guidelines**
Recognition of Travel Agency, Tour Operator and Travel Guide License & Permits required for Hotels National & International Organization: IATA, PATA, ICAO, WTO, UFTAA, FHRAI, TAAI.	
Recommended Books	1. Hospitality Operations. A System Approach - Stephen Ball, Jones Peter, Kirk David and Lockwood Andrew –(Cengage Learning) 2. Hotel Front Office Management - James A Bardi – (Wiley). 3. Hotel House Keeping - G. Raghubalan, Smritee Raghubalan – (Oxford University Press) 4. Hotel House Keeping Training Manual - Sudhir Andrews – (Tata Mc Graw Hill, 1st Ed.) 5. Hotel and Tourism Laws - Negi Jagmohan – (Frank Brothers) 6. Marketing for Hospitality and Tourism - Kotler Philip, Bowen John and Makens James – (Pearson Education, 3rd Ed.) 7. Tourism Development and Principles & Practices - Bhatia A.K.(2012) Sterling Publishers. 8. Strategic Management for Hospitality and Tourism - Okumus, F., Altinay, L., & Chathoth, P. (2010). (1st ed.). Butterworth-Heinemann. 9. Hospitality Strategic Management: Concepts and Cases - Enz, C. A. (2009). (2nd ed.). Wiley. 10. The Business Of Travel Agency Operations and Administration.- Foster Dennis L., (1993) Macmillan/ McGraw, Singapore 11. Tourism Operations and Management - Sunetra Roday, Archana Biwal & Vandana Joshi, Oxford University Press

Semester : II	**Soft Core**	**Semester Exam**			**L**	**Credits**
Code: 118	**Logistics and Supply Chain Management**	**Theory**	**I A**	**Total**		
Subject Title		80	20	100	4	4
Course Objectives	1. To introduce students with basic concepts of Logistics and supply chain Management 2. To teach students practical application of the subject for enhancing business efficiency. 3. To expose students to contemporary business concepts.					
Course Outcomes:	• Students will learn regarding effective support of logistics and supply chain in industry. • Students will develop analytical and problem solving skills to manage business in cost effective Manner. • The fundamental application of the subject shall provide value addition to corporate industries.					
Module 1	**Introduction to Logistics Management**					
Definition of Logistics and Logistics Management, Types of Logistic Activities, Importance of Logistics Management, Integrated Logistics and its Support, Determinants of Designing Logistical System, Transportation, Warehousing, Packaging						
Module 2	**Customer Service and outsourcing**					
Introduction, Objectives, Attributes of customer service, Different phases of customer services, Customer Service for Competitiveness, Value-Added Logistical Service Concept of Logistics Outsourcing, Benefits of logistics outsourcing, Issues in logistics outsourcing, Third-Party Logistics, Fourth-Party Logistics, Selection of Logistics Service Provider, Outsourcing-Value Proposition						
Module 3	**E-Commerce Logistics**					
Introduction, Objectives, Concept of E-Commerce, Requirements of Logistics in E-Commerce, E-Logistics Structure and Operation, Logistic Resource Management (LRM) Concept of Logistics Information System (LIS), Importance of LIS, Principles of designing LIS.						
Module 4	**Basics of Supply Chain Management**					
Introduction, Definition of Supply Chain Management, Evolution of the Concept of Supply Chain Management, Key Drivers of Supply Chain Management, Typology of Supply Chains, Cycle View of Supply Chain, Problems in SCM and Suggested Solutions						

Module 5	**Coordination In Supply Chain**
Importance of Coordination in Supply Chain, Bullwhip Effect, Effect of lack of Coordination on performance, Obstacles to Coordination, Strategies to achieve coordination, Building Strategic Partnership and Trust In Supply Chain	
Module 6	**Recent Trends in Supply Chain Management**
Introduction, New Developments in Supply Chain Management, Outsourcing Supply Chain Operations, Co-Maker ship, The Role of E-Commerce in Supply Chain Management, Green Supply Chain Management, Distribution Resource Planning, World Class Supply Chain Management	
Recommended Books	1. Supply Chain Logistics Management - Bowersox, Closs & Cooper – McGraw-Hill, 2nd Indian Ed. 2. Global Supply Chain Management SpringerVerlag New York, LLC 3. Alan Branch Global Supply Chain Management in International Logistics Routledge 2007 4. Sridhar R. Tayur (Editor), Michael J. Magazine (Editor), RAM Ganeshan (Editor) Quantitative Models for Supply Chain Management Kluwer Academic. 5. Handbook of Logistics and Distribution Management – John Gattorna 6. Strategic Logistics Management – P. Fawcett, R. McLeish and I Ogden 7. Strategic Logistics Management – D.M. Lambert & J R Stock, Richard D Irwin Inc.

Semester : II	**Skill Core**	**Semester Exam**			**L**	**Credits**
Code: 119	**Employability Skills**	**Theory**	**I A**	**Total**		
Subject Title		80	20	100	4	4
Course Objectives	1. The objective of the course is to train the students with the essential skills required for enhancing employability prospects in the Job Market					
Course Outcomes:	• To understand the soft skills • Develop professional etiquettes and manners • Develop effective communication skills					
Module 1	**Self Awareness**					
Introduction, Importance of knowing yourself, Process of knowing yourself, SWOT Analysis – Benefits, SWOT analysis grid.						
Module 2	**Critical thinking Skills**					
Introduction, Definition, importance of critical thinking, Critical thinking process- identification, research, identifying biases, inference, determining relevance, curiosity, Critical thinking habits, How to improve critical thinking skills						
Module 3	**Time Management, Goal Setting, Negotiation Skills**					
Introduction, The 80:20 rule, Time Management Matrix, Steps to successful time management, Difficulties in time management, Time wasters and Time savers .Goal Setting -Difference between wishes, dreams& goals, types of goals, benefits & areas of goals, SMART goals. Exercise on goal setting. Concept, Types of Negotiation, Need for Negotiation, Factors Affecting Negotiation, Stages in Negotiation, Negotiation Strategies.						
Module 4	**Etiquettes & Manners**					
Etiquettes –Introduction, modern etiquette, benefits of etiquette, classification of etiquette, accompanying woman. **Manners –** Introduction, reasons to practice good manners, Driving manners, manners in the flight. Corporate grooming tips.						
Module 5	**Industry Awareness**					
BPO, KPO, ITES, on shore, offshore, near shore, captive & virtual BPO, Scope of BPO, Importance & requirement of 24 / 7 work environment, Accounts Payable (AP), Accounts Receivable (AR), procurement ,Supply Chain Management (SCM) , Analytics, technical support, IT help desk.						

Module 6	**Business Proposals**
Meaning, Types of proposals, long proposals, steps in writing effective proposals.	
Recommended Books	1. Soft Skills: Know Yourself And Know the World, Dr. K Alex , S. Chand & Company Pvt. Ltd., New Delhi 2. Managing Soft Skills for Personality Development, B.N. Ghosh, McGraw Hill Education (India) Pvt. Ltd. New Delhi 3. Skills for All – Dr. R.B. Rao & Dr. S. Subbarao – Satyam Publishers & Distributors, Jaipur 4. Essential Communication Skills, Shalini Aggarwal, Ane Books Pvt .Ltd. 5. Business Communication (Skills, Concept and Application) Third Edition, P.D. Chaturvedi, Mukesh Chaturvedi – Pearson India Education Services Pvt. Ltd. 6. NASSCOM - Global Business Foundation (Students Handbook) powered by Accenture, Convergys, Dell, Deloitte, IBM, Foundation Books., Cambridge University Press India Pvt. Ltd., New Delhi 7. Microsoft Excel by Microsoft Press 8. Comdex Book on Excel 9. Personality Development & Soft Skills, Barun K Mitra, Oxford University Press 10. Communication :Skills and Soft Skills Avani Sharma, Yking Books, Jaipur 2017 11. Linguistics and the process of communication, , Dr. Vipul V. Makodia

Semester : II	**Open Elective**	**Semester Exam**			**L**	**Credits**
Code: 120	**Digital Business**	**Theory**	**I A**	**Total**		
Subject Title		80	20	100	4	4
Course Objectives	1. To make students to understand the important concepts related to Digital Business. 2. To acquaint the students with the latest techniques of Digital Business. 3. To familiarize the students with the applications of e-commerce.					
Course Outcomes:	• It increases overall knowledge of digital business concepts and practices. • It prepares the students to understand and apply the tools and techniques used in Digital Business. • It details the various types of digital business models and their benefits and limitations.					
Module 1	**Overview of Electronic Commerce and Social Commerce**					
Definition and Major EC Concepts, Electronic Markets and Networks, The Electronic Commerce Field: Growth, Content, Classification, and A Brief History of EC, The Content and Framework of E-Commerce, Classification of EC by the Nature of the Transactions and the Relationships Among Participants, Drivers and Benefits of E-Commerce, Web 2.0, The Major Tools of Web 2.0, Social Media, Social Networks and Social Network Services, Enterprise Social Networks, Social Commerce, The Digital Economy, The Digital Enterprise, The Social Business, EC Business Models, Impacts, and the Future of E-Commerce.						
Module 2	**E-Commerce Major Applications: Retailing in Electronic Commerce**					
Products and Services; Internet Marketing and B2C Electronic Retailing, Overview of Electronic Retailing, Size and Growth of the B2C Market, Characteristics and Advantages of Successful E-Tailing, E-Tailing Business Models, Classification of Models by Distribution Channel, Referring Directories, Malls with Shared Services, Other B2C Models and Special Retailing, B2C Social Shopping, Online Travel and Tourism (Hospitality) Services, Characteristics of Online Travel, Online Banking and Personal Finance, E-Banking, Online Banking Capabilities, Pure Virtual Banks, Shopping Portals. **Business-to-Business E-Commerce:** Basic B2B Concepts and Process, The Basic Types of B2B Transactions and Activities, The Basic Types of B2B E-Marketplaces and Services, Service Industries Online in B2B,The Benefits and Limitations of B2B.						

Module 3	**Mobile Commerce and the Internet of Things**
Mobile Commerce: Concepts, Landscape, Attributes, Drivers, Applications, and Benefits, Mobile Financial Applications, Mobile Enterprise Solutions: From Supporting the Workforce to Improving Internal Operations, Mobile Entertainment, Consumer Services, and Mobile Marketing. The Internet of Things; The Essentials of IoT, The Structure of IoT Applications, The Major Benefits of IoT, The Drivers of IoT, How the IoT Works, Illustrative Examples of Applications, Smart Homes and Appliances, Smart Cities, Smart Cars, Wearable Computing and Smart Gadgets	
Module 4	**E-Commerce**
Mechanisms, Platforms, and Tools and Electronic Commerce Payment Systems**:** Electronic Commerce Mechanisms: An Overview, E-Marketplaces, Customer Shopping Mechanisms: Web stores, Malls, and Portals, The Future: Web 3.0, Web 4.0, and Web 5.0, Changing Retail Landscape, Using Payment Cards Online, Using Payment Cards Online, EC Micropayments, PayPal and Other Third-Party Payment Gateways, Mobile Payments, Digital and Virtual Currencies	
Module 5	**Innovative EC Systems**
E-Learning, E-Training, and E-Books, An Overview of Knowledge Management, Knowledge Management Types and Activities, Knowledge Sharing, KM and Social Networks, E-Health; Definition, Electronic Medical Record Systems, Doctors' System, Patients Services, Medical Devices and Patients Surveillance, Medical Research.	
Module 6	**EC Supportive Services and E-Commerce Security Issues**
Marketing and Advertising in E-Commerce; Learning About Online Consumer Behavior, Personalization and Behavioral Marketing, Web Advertising, Online Advertising Methods: From E-Mail to SEO and Video Ads, Mobile Marketing and Advertising, The Information Security Problem, Basic E-Commerce Security Issues and Landscape, Technical Malware Attack Methods: From Viruses to Denial of Service, Nontechnical Methods: From Phishing to Spam and Fraud, Consumer and Seller Protection from Online Fraud	
Recommended Books	1. Introduction to E Commerce & Social Commerce, Turban E , Whiteside J , King D, Outland J Springer 2. Electronic Commerce – A Managerial Perspective, Efraim Turban, David King, Dennis Viehland, Jae Lee, Pearson Education. 3. Krishnamurthy S, E-Commerce Management: Text and Cases, Cengage South-Western, 2006. 4. Kenneth C. Laudon and Carol GuercioTraver, E Commerce: Business, Technology, Society, Pearson Education, 3rd Ed.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Commerce & Management

CHOICE BASED CREDIT SYSTEM

Syllabus: Master of Business Administion

Name of the Course: M.B.A. Part- II (Sem. III & IV)
(Syllabus to be implemented from w.e.f. June 2021)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

MBA Part II Syllabus (CBCS) w.e.f. 2021-22

Semester III						Semester IV					
Paper No.	**Subject**	**Weekly Theory**	**Internal Marks**	**Univ. Exam Marks**	**Total Marks**	**Paper No.**	**Subject**	**Weekly Theory**	**Internal Marks**	**Univ. Exam Marks**	**Total Marks**
17	Strategic Management	04	20	80	100	25	Business Ethics & Corporate Governance	04	20	80	100
18	Management Accounting	04	20	80	100	26	Quality Management	04	20	80	100
19	Entrepreneurship Development	04	20	80	100	*27	*Elective I - Paper III*	04	20	80	100
20	Project Report & Viva	--	50	50	100	*28	*Elective II - Paper-III*	04	20	80	100
*21	*Elective I - Paper I*	04	20	80	100	*29	*Elective I - Paper IV*	04	20	80	100
*22	*Elective II - Paper-I*	04	20	80	100	*30	*Elective II - Paper-IV*	04	20	80	100
*23	*Elective I - Paper II*	04	20	80	100	*31	*Elective I - Paper V*	04	20	80	100
*24	*Elective II - Paper-II*	04	20	80	100	*32	*Elective II - Paper-V*	04	20	80	100

Dual Specialization Groups.

Group	Elective Specialization
A	• Marketing Management
B	• Financial Management • Tourism and Hospitality Management • Production and Materials Management
C	• Human Resource Management • International Business Management • Banking Management • Systems Management • Agriculture & Co-operative Management

- **Elective Specializations:** The University offers Dual specialization**.** Student has to select **ANY TWO** of the Three Groups **A, B, C** and **ANY ONE** specialization subject from a selected group

Elective Specialization Groups with Subjects Papers:

Group	Specialization	Paper Code	Subject
A	**Marketing Management**	I	Brand Management
		II	Sales and Distribution Management
		III	Integrated Marketing Communications & Digital Marketing
		IV	Services and Retail Marketing
		V	International Marketing
B	**Financial Management**	I	Corporate Tax Management
		II	Financial Decision Analysis
		III	Financial System of India, Markets & Service.
		IV	Investment Management
		V	International Finance
	Tourism and Hospitality Management	I	Fundamentals of Hospitality Management
		II	Tourism and Travel Management
		III	Accommodation Management
		IV	Facility and Security Management
		V	Hospitality and tourism Marketing.
	Production and Materials Management	I	Purchasing and Inventory Management
		II	Logistics and Supply Chain Management
		III	Industrial Engineering
		IV	Quality Management
		V	World Class Manufacturing
C	**Human Resource Management**	I	Strategic Human Resource Management
		II	Human Resource Initiatives
		III	Industrial Relations and Labour Laws
		IV	Competence based HRM.
		V	International Human Resource Management
	International Business Management	I	International Business Environment
		II	Export Policy, Procedures and Documents
		III	International Marketing
		IV	EXIM Management
		V	International Logistics
	Banking Management	I	Banking Operations Management
		II	Indian Banking Structure
		III	E-Banking
		IV	Marketing of Financial Services
		V	Retail & Universal Banking

Elective Specialization Groups with Subjects Papers (*contd…*):

Group	Specialization	Paper	Subject
C	**Systems Management**	I	Management Information System
		II	ERP and SPD
		III	Relational Database Management System
		IV	Security And Control Information System
		V	Programming Concepts and Practices
	Agriculture & Co-operative Management	I	Fundamentals of Agriculture & Co-Operative Management
		II	Agricultural Marketing
		III	Agricultural Production Management
		IV	Agro- Processing Industries & Rural Industrialization
		V	International Trade And Agriculture

Semester – III

Semester : III	Hard Core	Semester Exam			L/W	Credits
Code: 301	Strategic Management	Theory	I A	Total		
Subject Title		80	20	100	04	04
Course Objectives	1. To make understand key concepts of business strategy. 2. To provide knowledge about strategy formulation and implementation. 3. To make aware about tools and techniques used for strategy analysis.					
Course Outcomes	• Understanding relevancy of strategic management concepts with the current business scenario • Ability to enhance strategic decision-making skills					
Module 1	**Strategy and Appraisal**					**8**
Defining strategy, Levels at which strategy operates, Strategic Decision Making, Vision, Mission, Objectives, and Strategic Management Process						
Module 2	**Environmental Analysis**					**12**
Concept of Environment, Internal and External, Environmental Sectors, Environmental Scanning, Appraising the Environment, Organizational appraisal, Organizational Capability, Competitive Advantage, Methods and techniques used for organizational appraisal.						
Module 3	**Strategy Formulation and Choice of Alternatives**					**12**
Corporate Level Strategies- Stability, Expansion (Concentration, Integration, Diversification, Internationalization, Co-operation strategies, Digitalization) Retrenchment (Turnaround, Divestment, Liquidation), Combination Strategies, Business Level Strategies						
Module 4	**Strategic Analysis and Choice**					**10**
SWOT analysis, Process of Strategic Choice- GAP Analysis, Tools and techniques for strategic Analysis, Mckinsey's 7 S Framework, Corporate Portfolio Analysis - Bostan's Consultancy Model,GE-9 Cell Model, Industry Analysis – Porter's 5 Force Model, Competitor Analysis, Factors in Strategic Choice						
Module 5	**Strategy Implementation**					**10**
Model of strategy Implementation, Project implementation, Procedural Implementation, Resource Allocation, Structural Implementation- Structures for Strategies, Behavioural Implementation – Strategic Leadership, Functional Strategies, Operational Strategies						
Module 6	**Strategy Evaluation and Control**					**08**
Participants, Barriers in evaluation, Strategic Control, Operational Control, techniques of strategic evaluation and control.						

Recommended Books	1. Business Policy – Kazmi Azhar – Tata McGraw Hill 2. Business Policy and Strategic Management – P. Subba Rao, Himalaya Publication 3. Strategic Management – Alpna Trehan, Dreamtech Press 4. Business Policy and Strategic Management –R. Shrinivasan 5. Business Ethics – Dr. A. K. Gavai (Himalaya Publishing House) 6. Business Ethics – A. C. Fernando (Pearson) 7. Business Ethics – C. S. V. Murthy (Himalaya Publishing House) 8. Business Ethics – Andrew Crane & Dirk Matten

Semester : III	Hard Core	Semester Exam			L/W	Credits
Code: 302	Management Accounting	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To make understand key concepts and techniques of management Accounting. 2. To provide knowledge about computing accounting information for effective decision making. 3. To make aware about tools and techniques used for strategy analysis.					
Course Outcomes	• Ability to compare and compute information required for managerial decision making • Ability to undertaking effective economic decisions based on past accounting information and comparative analysis					
Module 1	Nature and Scope					08
Introduction, Definitions of Management Accounting, Nature of Management Accounting, Functions of Management Accounting, Scope of Management Accounting, The Management Accountant, Management Accounting and Financial Accounting, Cost Accounting and Management Accounting, Limitations of Management Accounting.						
Module 2	Cost Volume Profit Analysis					12
Meaning of Cost Volume Profit Analysis, Contribution, PV Ratio, BEP , Margin of Safety, Angle of incidence , Decision making based on CVP analysis - Make or Buy decision, Shutdown, Dropping the Plant & Sale or Process						
Module 3	Budget and Budgetary Control					12
Meaning of Budget and Budgetary Control, Advantages and Limitations of Budgetary Control System. , Concept of Zero Based Budgeting , Master Budget, Functional Budgets: a. Flexible Budget - Meaning, Importance of Flexible Budget, Problems b. Cash Budget - Meaning, Importance of Cash Budget, Problems c. Production Budget - Meaning, Importance of Production Budget, Problems d. Sales Budget - Meaning, Importance of Sales Budget, Problems						

Module 4	Standard Costing and Variance Analysis	12
Meaning of Standard , Definition of Standard Costing , Need of setting Standard, Concept of Variance Types of Variances: a. Material Variances – Meaning, Importance, Problems b. Labour Variances – Meaning, Importance, Problems c. Variable Overhead Variances – Meaning, Importance, Problems d. Fixed Overhead Variances – Meaning, Importance, Problems		
Module 5	**Reporting to Management**	**08**
Objectives of Reporting, Reporting needs at different levels on management , Types of Reports , Modes of Reports		
Module 6	**Introduction to Audit**	**08**
Meaning and Objectives of Auditing, Types of Audit- Financial Audit, Internal Audit, Cost Audit, Management Audit, Difference in above Audit.		
Problems should be covered on: • Decision making based on CVP analysis - Make or Buy decision, Shutdown, Dropping the Plant & Sale or Process • Functional Budgets- Flexible, Cash, Production and Sales Budgets • Variance Analysis- Material, Labour and Overheads Variances		
Recommended Books	1. Theory and Problems of Management and Cost Accounting – M.Y. Khan and P. K. Jain –Tata McGraw Hill Publication Co. Ltd. 2. Cost Accounting – Jawahar Lal and Seema Srivastav – McGraw Hills Co. 3. Management Accounting – Horngreen, Sundem, Stratton – PHI- Latest Edition 4. Management Control System – Robert N. Anthony & Vijay Govindrajan, TMG Hills 5. Cost & Management Accounting – M.N. Arora – Himalaya Publishing House. 6. Management Accounting – M. P. Pandilkumar – Excel Books 7. Management and Cost accounting – Colin Drury Sheth Publishers	

Semester : III	Hard Core	Semester Exam			L/W	Credits
Code: 303	Project Report & Viva	Theory	I A	Total		
Subject Title		50	50	100	-	4

Course Objectives:	1. To expose students to the working of any organization and managers. 2. To relate the concepts learnt by the students to the working of the organization. 3. To work on a problem identified by the organization / student and thus understand the practical aspects of the working of an organization
Course Outcome	• Ability to undertake problems for study and analyse for appropriate inferences and conclusions or suggest solutions for the same.
Guidelines:	1. The project work shall be for a minimum period of 30 days immediately after IInd semester examinations. 2. Students should join the organization within 15 days from the last day of examination. 3. No two Students shall work on the same topic in the same organization. 4. The student should collect a Certificate of Minimum 30 Days Project Work Completion mentioning the period (*From* ____ *to* ____) on the Company's letter Head. 5. The student shall submit the Final Project Report as per following.

Project Report 'Table of Contents'

Chapter 1	**Introduction of the Study**

1.1 Introduction – Overview of the sector, organization and the Study

1.2 Objectives of the study. This should give a clear picture of the project. Objective should be clearly specified. There should be minimum 4 to 5 objectives of the project report. What the project intends to find out should be clearly specified.

1.3 Scope and limitations of the study

1.4 Research Methodology The methodology comprises of Research Design, Hypothesis, Types of data, Data collection techniques, sampling techniques, Sample size, etc.

1.5 Significance of the study. : What the project intends to find out and how it would be helpful to the organization.

Chapter 2	**Company Profile**

2.1 Introductions to Organization.

2.1.1 Background and Inception of the Organization

2.1.2 Ownership Pattern

2.1.3 Nature of the Business

2.1.4 Vision, Mission and Quality Policy

2.1.5 Types of Products and Services

2.2 Market Scenario

2.2.1 Area of Operation – Global / National / Regional 2.2.2 Competitors' Information 2.2.3 Achievement/Award if any 2.3 Various departments in the organization. 2.4 Organization chart.	
Chapter 3	**Theoretical Background**
3.1 Brief Review of Literature 3.2 Conceptual framework	
Chapter 4	**Data Analysis and Interpretation**
Should include Tables, Graphs / Diagrams, Mean, Median, Mode, Std. Deviation as Applicable.	
Chapter 5	**Findings**
Chapter 6	**Suggestions OR Conclusion.**
Annexure	Should contain a copy of Questionnaire if used for Data Collection
Bibliography	Students should refer and mention at least 5 reference books, 3 National and 3 International journals and websites referred.
Format for Writing and presenting the summer project:	1. Font type – Times New Roman, Font size – Headings – 14 pts., Normal Text – 12 pts. 2. Spacing – Line - 1.5 lines, Paragraph – 12 pts. 3. Page margins – Left - 1.5 inch Right - 1.0 inch Top - 1.0 inch Bottom - 1.0 inch 4. Header – (College Name/Abbrn.) - MBA Dept (Left Side), PAH Solapur University, Solapur. (Right Align) 5. Footer – Page No. (Center). "MBA Program (yyyy - yy)" (Right side) 6. Use of colour fonts, Company Logos, Photographs is not allowed. 7. Information Brochures/leaflets, etc. can be inserted as part of Annexure. 8. Only graphs can be inserted in colour. 9. The report should contain Certificate, Guide Certificate and Student Declaration (formats should be provided by the college). 10. Project should be of minimum 40 pages.

Semester : III	Elective Core: Marketing Management	Semester Exam			L/W	Credits
Code: 304 I	Brand Management	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. The objective is to make students understand Branding, role of brands, elements and components of brands, brand equity etc. 2. To make sure that students understand implications of Branding Strategies. 3. To know role of brand knowledge in building brand equity.					
Course Outcomes	• Develop a consumer-centric approach to building, measuring and evaluating strategies that build brand equity for new and existing brands. • Learn how to identify brand meaning and to measure brand strength for any particular market offering.					
Module 1	**Brand Management**					**08**
Brand, Brand Management, Importance, What can be branded, Types of Branding, Choosing Brand Elements, Challenges, Opportunities, and Strategic Brand Management Process.						
Module 2	**Brand Equity**					**12**
Customer Based Brand Equity (CBBE) , Four Steps of Brand Building, Managing Brand Equity – Brand Reinforcement, Brand Revitalization, Adjustment to Brand Portfolio.						
Module 3	**Brand Positioning**					**10**
Identifying and establishing Brand Positioning, Positioning Guidelines, Core Brand Associations, Brand Mantras, Internal Branding, Brand Audit- Brand Inventory and Brand Exploratory, Brand Element to build brand equity.						
Module 4	**Brand Equity Measurement**					**12**
Brand Value Chain, Methods for measuring Brand Equity- Quantitative Techniques & Quantitative Techniques, Comprehensive Models, Comparative methods, Holistic methods.						
Module 5	**Branding Strategies**					**09**
Brand- Product Matrix, Brand Hierarchy, Cause Marketing, Green Marketing, Brand Extensions, New Product and Brand Extensions, Leveraging Process – Company, Country of Origin, Channels, Co-branding, Licensing, Celebrity Endorsement, events						
Module 6	**Brand Architecture and Global Brand Strategy**					**09**
Brand Architecture, Brand Portfolios, Corporate Branding, Global Marketing Programs, Global Brand Strategy, Building Global Customer Based Brand Equity.						

Recommended Books	1. Strategic Brand Management – Kavin Keller, M.G. Parameswaran, Issac Jacob, Pearson Publication 2. Brand Management – Harsh Verma – Excel Books 3. Brand Management – Moorthi Y.L.R. – Vikas Publication 4. Product and Brand Management – U.C. Mathur, Excel Books India 5. Marketing Management – Kotler, Keller, Koshy , Jha , Pearson Publication

Semester: III	Elective Core: Marketing Management	Semester Exam			L/W	Credits
Code: 304 II	Sales And Distribution Management	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To understand to importance of sales and distribution in marketing. 2. To provide knowledge various elements involved in the sales and distribution. 3. To make aware about various techniques used in sales and distribution.					
Course Outcomes	• Ability to undertake sales as per the products types and customer segment • Ability to set up appropriate distribution setup based on variety of the products					
Module 1	**Introduction to Sales and Distribution Management**					**12**
Meaning of Sales and Distribution Management, Objectives of Sales Management and importance of SDM, Role of Sales Management in Marketing, Specific Characteristics of a Successful salesman, Sales Manager Roles & Responsibility, The Personal Selling Process, New trends in sales Management Social and Ethical Concerns in SDM.						
Module 2	**Sales Forecasting**					**08**
Concept of Forecasting, Sales Forecasting methods, Quantitative and Qualitative methods, planning for major customers and Sales Budget- purpose and budgetary procedure, Sales Quota- objectives, types, procedure of quota setting& Sales Territory- reasons, procedure and revising sales territories						
Module 3	**Sales Organization**					**08**
Need for Sales Organizations, Types of Sales Organization, Memory, Learning, Perception, Motivation & Involvement, Attitude - sources functions, theories & models						
Module 4	**Managing the Sales Force**					**12**
Profiling and recruiting salespersons, Selecting and hiring applicants, Developing, delivering and reinforcing a sales training program, Leadership of the sales force, Sales force compensation, Evaluation of Sales Performance.						
Module 5	**Distribution Channel management**					**14**
Introduction, Marketing Channels- Definition and Importance and functions of marketing channels, channel Intermediaries-concept of wholesaling and retailing, Decisions in channel management- Designing Channels, Selection and Recruitment of Channel Partners, Channel Motivation ,Channel Relationships Management, Channel conflict, channel Evaluation, Information Systems for Channels- Introduction, Indian Distribution Scenario at Present, Vertical Marketing System, Horizontal and Multi- Channel Marketing Systems, International Marketing Channels						

Module 6	Basics of supply chain Management	06
Definition of Supply Chain Management, Evolution of the Concept of Supply Chain Management, Key Drivers of Supply Chain Management, Typology of Supply Chains, Cycle View of Supply Chain Problems in SCM and Suggested Solutions.		
Recommended Books	1. Still, R. R., Cudiff, E. W., Govoni. N. A. P. and Puri, S. Sales and Distribution Management, 6th edition, 2017, Pearson India Education Services. 2. Havaldar, K. K. and Cavale V. M., Sales and Distribution Management: Text and Cases, 3rd Edition, 2017, McGraw Hill Education (India) Private Limited. 3. Sales and Distribution Management- Dr. Matin Khan, Excel Books- First Edition 4. Marketing Management- Philip Kotler & Kevin Lane Keller, Pearson, 15th Edition.	

Semester : III	Elective Core: Financial Management	Semester Exam			L/W	Credits
Code: 305 I	Corporate Tax Management	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To make understand various components of Corporate Tax Management. 2. To provide knowledge about exemptions and deductions from taxation 3. To provide knowledge about the current reform of Taxation i.e. GST.					
Course Outcomes	• Understanding various factors contribution towards various types of Taxation • Ability to ensure appropriate computation and Tax liability for the corporate					
Module 1	**Introduction**					**12**
1.1: Definition and Features of Taxes 1.2: Basis of Taxation 1.3: Canons of Taxation 1.4: Objectives of Taxation						
Module 2	**Income Tax**					
2.1 Concepts and basic concepts in income tax- Assessment Year, Previous Year, Person, Assessee 2.2 Income, Gross Total Income and Total Income, Capital and Revenue 2.3 Concept of PAN and Residential Status and tax Liability.						
Module 3	**Exemptions and Deductions**					**10**
3.1: Exempted Incomes u/s 10 2.2: Deductions of Chapter VI A applicable to Individuals						
Module 4	**Heads of Income**					**12**
4.1: Income from Salary: Basis of Charge, permissible deductions and computation of salary Income. 4.2: Income from House Property: Basis of Charge, permissible deductions and computation of Income from House Property 4.3: Income from Capital Gains: Basis of Charge, permissible deductions and computation of Income from capital gains. 4.4: Income from Profits and Gains of Business and Profession: Basis of Charge, permissible deductions and computation of Income from PGBP. 4.5: Income from Other Sources: Basis of Charge, permissible deductions.						

Module 5	Computation of Total Taxable Income of an Individual	14
5.1: Income Tax Rebates and Reliefs 5.2: Computation of Taxable Income and Income Tax		
Module 6	**Goods and Service Tax**	**12**
6.1: Introduction and Overview of GST: - Definition and features of GST, Evolution of GST in India, Need and framework of GST, Benefits of GST and challenges in implementing GST. 6.2: Basic Concepts in GST:- Concept of supply, Time of Supply, Place of supply, Levy and exemption of supply 6.3: Input Tax Credit: - Mechanism of Input Tax Credit- CGST, SGST, IGST		
Practical Problems should be covered on • Computation of Gross Total Income and Total Income of an Individual Assessee • Computation of GST including Input Tax Credit		
Recommended Books	1. A Simple approach to Income Tax: Dr.P.M.Herekar, Phadake Prakashan 2. Student's Guide to Income Tax - Singhania V.K., Taxman, Delhi. 3. Income Tax Laws & Accounts - Prasad Dhagwani , Sahitya Bhavan Agra 4. Income Tax Law & Practice - Mehrotra H.C., Sultan Chand & Sons, New Delhi. 5. Systematic Approach to Income Tax - Girish Ahuja and Ravi Gupta: Sahitya Bhavan, New Delhi. 6. Income Tax Law and Practice - T N Manoharan, Snow White India 7. A Complete Guide to Goods and Service Tax - Bimal Jain, Isha Bansal & Sanjiv Agarwal, Young Global's 8. Basics of GST - Nitya Tax Associates, Taxmann's	

Semester :III	Elective Core: Financial Management	Semester Exam			L/W	Credits
Code: 305 II	Financial Decision Analysis	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To make understand various factors related Financial Decision making. 2. To provide knowledge about various financial terms, statements, and funding elements 3. To provide knowledge about capital structure and dividend policy of organisations					
Course Outcomes	• Ability to evaluate and analyse financial statements to understand proper funds flow and tale related decisions.					
Module 1	**Financial Statement Analysis:**					**10**
1.1 Introduction to Financial Statement Analysis 1.2 Importance of Financial Statement Analysis 1.3 Techniques of Financial Statement Analysis: Trend Analysis, Comparative Statement Analysis, Common-size Statement Analysis.						
Module 2	**Funds Flow Statement analysis and Cash Flow Statements analysis**					**12**
2.1 Funds Flow Statement: Meaning, Sources and Application of fund , Funds from Operation, Preparation of Funds Flow Statement 2.2 Cash Flow Statement: Meaning , Classification of Cash Flow, Preparation of Cash Flow Statement						
Module 3	**Cost of Capital**					**10**
3.1 Concept of Cost of Capital 3.2 Significance of Cost of Capital 3.3 Determining of Component of Cost of Capital: Cost of Debt, Cost of Preference Capital, Cost of Equity Capital, Cost of Retained Earnings, and Weighted Average Cost of Capital.						
Module 4	**Capital Structure Decision**:					**10**
4.1 Introduction to Capital Structure 4.2 Objectives of Capital Structure 4.3 Factors Effecting Capital Structure 4.4 EBIT-EPS Analysis 4.5 Indifference Point 4.6 Leverage Analysis - Operating leverage, Financial leverage, Combined leverage.						

Module 5	Dividend Decisions:-	8

5.1 Concept of Dividend

5.2 Types of dividend

5.3 Legal and Procedural Aspects of Dividend

5.4 Determinants of Dividend Policy

5.5 Purpose of Dividend Payout Ratio

5.6 Stability in Dividend Policy

5.7 Bonus Shares

5.8 Stock splits.

Module 6	Corporate Restructuring	10

6.1 Forms of Corporate Structuring

6.2 Merger and Acquisition: Reasons for merger

6.3 Mechanics of Merger

6.4 Cost Benefits of Merger

6.5 Legal and Procedural Aspects of Merger

6.6 Examples of recent Mergers

6.7 Portfolio Restructuring, Financial Restructuring & Organizational Restructuring

Practical Problems should be covered on:

- Calculation of Trend Analysis, Comparative Statement Analysis and Common-size Statement Analysis.
- Funds Flow Statement analysis and Cash Flow Statements analysis
- Computation of Specific cost (debt, Preference shares, Equity Shares and R&S) and Weighted Average Cost of Capital
- EBIT-EPS Analysis, Indifference Point and Leverage Analysis
- Corporate Restructuring

Recommended Books	1. Financial Management- Khan and Jain, Prentice Hall 2. Principles of Financial Management-R. P. Rustagi- Taxman's 3. Financial Management – G. Sudarshan Reddy - Himalaya Publishing 4. Financial Management- I. M. Pandey, Prentice Hall 5. Financial Management- Fifth Edition- Prasanna Chandra, Tata McGraw Hills 6. Financial Management- Van Horne, James C., Prentice Hall 7. Fundamentals of Financial Management – Brigham & Houston - Cengage Learning 8. Financial Management – Paresh Shah – Biztantra 9. Mergers, Acquisitions and Corporate Restructuring – Prasad

Semester :III	Elective Core : Tourism and Hospitality Management	Semester Exam			L/W	Credits
Code : 306 I	Fundamentals of Hospitality Management	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To understand the nature and scope of Hospitality Management. 2. To Figure out the different types of hotels and restaurants. 3. To Understand and analyse the hospitality industry from various perspectives of hotel, tourism, travel and transport.					
Course Outcomes	• Appreciate the scope of Hospitality industry and ability					
Module 1	**Introduction**					**10**
The Hospitality Industry – Origin and Growth – Tourism Industry – Importance of Tourism – Industries related to Tourism – Evolution and Growth of the Hotel – Evolution of Tourism – Factors Affecting Hospitality and Tourism Industry – Employment Opportunities in Hospitality.						
Module 2	**Tourism Industry**					**10**
Introduction, concept, definition, types and characteristics Relation of hospitality industry with Tourism Definition of Tourism – Features – Types of Tourists – Tourism Activities – Components of Tourism Infrastructure – Elements and Characteristics of Tourism Products- Scope of Tourism – Motivation for Tourism – Relation of hospitality industry with Tourism.						
Module 3	**Hotel Industry**					**10**
Organization of Hotels, ownership structure: Sole Proprietorship, partnership, Franchisees, Management Contract – concept, their advantages and disadvantages. Classification of Hotels – Major Departments of Hotel -Star Ratings of Hotels – Global Standards for Hotels.						
Module 4	**Resorts Management**					**10**
Historical Perspective, Basic Characteristics, Basic Elements of Resort – Lodging, Dining, Drinking, Shopping, Entertainment, recreation., Resort types – Mountain based, beach, health, forest. External and internal challenges for Resort management						
Module 5	**Travel and Transport**					**10**
History growth and present status of travel agency – Travel formalities – Linkages and arrangements with hotels, airlines and transport agencies – Transport system – Different types of transport – Impact of Science and Technology.						

Module 6	Recent Trends in Hospitality and related sectors	10
Future of Hospitality Industry, Changing trends, issue and challenges Importance of Hospitality industry in India. Government regulations and support related to Travel, Tourism and hotel industries. Role of E- commerce in Hospitality sector.		
Recommended Books	1. Tourism Development and Principles & Practices, Bhatia A.K Sterling Publishers. 2. Strategic Management (13th ed.). David, F. R, Prentice Hall Oxford University Press. 3. Strategic Management for Hospitality and Tourism (1st ed.). Okumus, F., Altinay, L., & Chathoth, P., Butterworth-Heinemann. 4. Hospitality Strategic Management: Concepts and Cases (2nd ed.). Enz, C. A Wiley. 5. Resort Management and operations, Robert Christie Mill, Wiley 6. Hotel, Resort and Restaurants : Planning, Designing and Construction – Jagmohan Negi – Kanishka Publication	

Semester: III	Elective Core : Tourism and Hospitality Management	Semester Exam			L/W	Credits
Code : 306 II	Tourism and Travel Management	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To prepare the learners with knowledge and skills essential know what tourism is. 2. To prepare the learners with its types and the Nations contribution to the industry.					
Course Outcomes	• Understanding various factors related to Tourism and travel management • Ability to properly plan and execute travel and tour of customer as per requirement					
Module 1	**Introduction**					
Tourism - Definitions and Concepts – Components of tourism, Geographic components of tourism - Types of Tourists, Visitor, Traveler, and Excursionist – Differentiation Tourism, Recreation and leisure, adventure tourism, their inter–relationships – Tourism organization / Institutions –Role and functions of International agencies in Hospitality industry. Case Studies.						
Module 2	**Travel Management**					
Travel Agency and Tour Operation Business - Functions of Travel Agency - Setting up a full-fledged Travel Agency - Sources of Income of a travel agency - Diversification of Business -Travel and Health Insurance, Forex, Cargo & MICE – Documentation - IATA Accreditation -Recognition from Government.						
Module 3	**Tour Planning**					
Tour Packaging & Costing - Importance of Tour Packaging – Classifications of Tour Packages - Components of Package Tours - Concept of costing - Types of costs - Components of tour cost - Preparation of cost sheet - Tour pricing - Calculation of tour price - Pricing strategies.						
Module 4	**Tourism Management**					
Tourism Management: Tourism infrastructure- Tourism organizations-Travel motivators-Leisure or holiday Tourism- Visiting friends and Relatives (VFR)- Cultural Tourism-Adventure Tourism-Sports Tourism- Religious Tourism-Business Tourism-Medical Tourism-Alternative Forms of tourism-Tourism Products and types.						
Module 5	**Eco Tourism**					
Evolution, Principles, Trends and Functions of Ecotourism-Themes - Eco-tel and Eco resorts - Fundamentals of Ecology- Basic Laws & ideas in Ecology- Function and Management of Ecosystem-Biodiversity and its Conservation-Pollution-Ecological Foot Prints -Mass Tourism Vs Ecotourism -Typology of Eco-tourists - Ecotourism Activities & Impacts –Western and Eastern Views of Ecotourism.						

Module 6	Tourism Entrepreneurship	
Meaning, Perspective, Tourism Enterprise, and Policy measures in India, Scope of Tourism Entrepreneurship – Eco, Nature, and Rural.		
Recommended Books	1. Tourism Operations and Management, Sunetra Roday, Archana Biwal & Vandana Joshi, Oxford University Press 2. Tourism and Hospitality Management by Neha Publishers and Distributors. 3. The Business Of Travel Agency Operations and Administration, Foster Dennis L., Macmillan/ McGraw, Singapore 4. Entreprenrial Development, Dr. S. S. Khanka, S. Chand Publications.	

Semester : III	Specialization : Production And Materials Management	Semester Exam			L/W	Credits
Code: 307 I	Purchasing and Inventory Management	Theory	I A	Total		
Subject Title		80	20	100	04	04

Course Objectives	1. To make students understand how to use basic concepts, strategies and techniques to analyze a variety of inventory systems and make optimal decisions for the improvement of these systems. 2. In addition, we emphasize the practical implementation of the strategies and techniques that are taught in this course.	
Course Outcomes	• Identify, study, compare, and evaluate alternatives, select and relate with a good supplier. • Apply various purchasing method and inventory controlling techniques into practice. • Analyzing the materials in storage, handling, packaging, shipping distributing and standardizing.	
Module 1	**Introduction**	**10**
Meaning and Scope, Objectives and Significance of Materials Management; Material Management other Areas of Management Functions		
Module 2	**Purchasing Management**	**10**
Objectives and Functions of Purchasing Department; Purchase Policy and Procedure; Negotiations; Purchase of high Capital Equipment and there Feasibilities. Supply Chain Management. Implementation of Supply Chain Principles within a Company, Value Analysis, Purchasing Research, Price Forecasting, Forward Buying, Make or Buy Decision		
Module 3	**Suppliers Selection**	**10**
Vendor Rating and Vendor Rating Techniques, Vendors Development and Vendors' Relationship.		
Module 4	**Inventory Management**	**12**
Different Costs of Inventory, Optimal Order Quantity, EOQ, Inventory Models with Purchase Discounts, Buffer Stocks, Fixed Order Period Model, Safety Stocks, Optimum level of Safety Stock, Inventory Control, Elements of Effective Inventory Control, Advantages, Procedure for setting up an Efficient Inventory Control System; V.E.D. Analysis, S.D.E. Classification; F.S.N. Analysis; X.Y.Z. Analysis, Logistics Management and its link with Inventory Control and other Areas, ABC Analysis: Meaning, Simple Numerical of ABC Analysis		

Module 5	Stores Management	10
Purpose of Store Management, Location and Layout, Cost Aspects and Productivity. Problems and Developments .New Developments in Storing. Evaluation of Materials Management: Organization, Difficulties, Process and Criteria, Reporting and Purchasing		
Module 6	**Codification, Standardization and Computers in Material Management**	**08**
Basis of Codification, Characteristics of Good Coding System, Types of Coding, Standardization and its Benefits. Computers in Material Management: Electronic Computer, Integrated Computer System for Materials Management, Material Planning		

Recommended Books	1. Production and Operations Management – S.A. Chunawala and D. R. Patel, Himalaya Publishing House 2. Production and Operations Management – K. Ashwathappa and K. Shridhar Bhat, Himalaya Publishing House 3. Industrial Engineering and Management – O. P. Khanna, Dhanpat Rai Publications 4. Purchasing and Supply Chain Management – Leanders Johnson 5. Purchasing and Supply Management - Dobler and Burt 6. Sourcing and supply chain management- Handfield, Moncza, Gunipero, Cenage Learning 7. Handbook of Materials Management – Gopalkrishnan

Semester : III	Specialization : Production And Materials Management	Semester Exam			L/W	Credits
Code: 307 II	Logistics and Supply Chain Management	Theory	I A	Total		
Subject Title		80	20	100	04	04

Course Objectives	1. To make students understand how the knowledge of materials management can be an advantage to logistics and supply chain operations. 2. To sensitize the students on the materials management functions – Planning, Purchase, Controlling, Storing, Handling, Packaging, Shipping and Distributing, and Standardizing. 3. To realize the importance of materials both in product and service.
Course Outcomes	• Identifying the scope for integrating materials management function over the logistics and supply chain operations. • Integrate the organization wide materials requirement to develop an overall plan (MRP).

Module 1	**Logistics and Supply Chain Management**	**10**
Meaning and Objectives, Role and importance of logistics and supply chain in business. Activities of logistics. Principles of supply chain management, Logistics interfaces with other functional areas, Service driven logistics systems, Supply chain as a competitive advantage, Collaborative buyer-seller relationships		
Module 2	**Inventory Management in Global Supply Chain Management**	**10**
Supply Chain Security, Critical tasks of logistics and supply chain managers.		
Module 3	**Warehousing**	**10**
Importance of warehousing, warehousing decisions, layout and design principles of ware house, packaging and its importance, packaging materials, material handling equipments used in warehouses		
Module 4	**Technology in SCM**	**12**
Role of information in supply chain, managing supply chain information, technology used to implement supply chain, role and importance of IT in supply chain, Ecommerce as a tool to world class supply chains		
Module 5	**Transportation**	**10**
Logistical Objectives of Transport, Transportation strategy, transport documentation, Transportation Economics and pricing, transport cost considerations. Lean Supply Chain Management: Characteristics of lean supply system, inventory investment, MRP as tool to control dependent demand inventory		

Module 6	Outsourcing	08
Need for outsourcing logistics, 3 PL and 4 PL service providers, considerations for hiring 3PL and 4 PL service providers		
Recommended Books	1. Logistics Management – S.K.Bhattacharaya 2. Business Optimisation through Supply Chain Management – Anand Sharma 3. SCM in 21st Century – B.S.Sahay 4. Supply Chain Management - K.Sridhar Bhat - Himalaya Publishing House 5. A Logistics approach to Supply Chain Management – John Coyle, Langley– Cenage Learning 6. Manufacturing Planning and control for Supply Chain Management – Vollmann, Berry 7. Designing and Managing the supply chain - David Simchi, Levi & Philip Kaminski, McGraw-Hill Companies Inc., 2000.	

Semester : III	Specialization : Human Resource Management	Semester Exam			L/W	Credits
Code: 308 I	Strategic Human Resource Management	Theory	I A	Total		
Subject Title		80	20	100	04	04
Course Objectives	1. The objective of the course is to give knowledge to the students in the field of Human Resource Management with strategic perspective					
Course Outcomes	• Students will understand the strategic issues which arise in the functions of HRM. • Students will be able to learn and apply good techniques in the HR practices to increase efficiency.					
Module 1	**Strategic Human resource Management**					**10**
Introduction to Strategic HRM - concept; Challenges for HRM; Traditional HR Vs Strategic HR, Role of Strategic Human Resource Management; Linking Company & HR Strategy – HR and corporate strategy; HR and Business Strategy; Barriers to SHRM.						
Module 2	**Strategic Approach to Job Design & work System**					**10**
Job Design- Concept, Approaches to Job Design; Designing Work Systems- Approaches to work system design; Elements in redesigning work systems; Organizational Design Process; Factors affecting design process						
Module 3	**Strategic Acquisition of Human Resources**					**12**
Strategic Recruitment- Concepts under recruitment & Selection; Strategic Staffing- staffing as a process, Organization and Job analysis, Person-job Fit, Person-organization Fit; Strategic approach on Staffing; Strategic issues in Staffing						
Module 4	**Compensation & SHRM**					**12**
Difference between traditional pay & strategic pay; Compensating Individual Employees; Compensating Groups; Executive Compensation; Employee Motivation through pay; ESOPs.						
Module 5	**Strategic Perspectives in Training and Performance Appraisal**					**10**
Strategic Issues in training & development; Competency Mapping; Use of technology in training; Future of IBT Strategic dimension of Performance appraisal, Moving from Performance Appraisal to Performance Management, Organizational Appraisal- Balance Scorecard, EVA						
Module 6	**Employee Separation & Downsizing**					**06**
Concept; Types of Separation; concept of downsizing; Areas affected by downsizing; Concept of Turnover; Downsizing Versus Outsourcing.						

Recommended Books	1. Strategic Human Resource Management – Rajesh Vishwanathan - Himalaya Publishing. 2. Personnel and Human Resource Management – by P. Subba Rao - Himalaya Publishing. 3. Competency- Based Human Resource Management – Srinivas R. Kandula -PHI Learning 4. Strategic Human Resource Management – V S P Rao -Excel Books 5. Strategic Human Resource Management – Jeffrey Mello

Semester III	Specialization : Human Resource Management	Semester Exam			L/W	Credits
Code: 308 II		Theory	I A	Total		
Subject Title	Human Resource Initiatives	80	20	100	04	04
Course Objectives	1. To make students understand HR initiatives in talent and knowledge management 2. To teach framing of HR policies in the organization according to nature of business 3. To make students understand all the recent trends in HRM used by the organizations					
Course Outcomes	• Appreciate importance of employee engagement, their commitment and loyalty towards organization. • Ability to frame HR policies to improve excellence in Human Resource					

Module 1	Talent Management	10
Concept, Definition, Objectives of talent Management - Talent attraction, Engagement, Development and talent retention, Talent Management framework, Managing demand for talent – 6 ways, Becoming an employer of choice		

Module 2	Knowledge Management	10
Architecture, Difference between Information Management and Knowledge Management, Knowledge conversion, APO Knowledge Management Framework, Knowledge Management process		

Module 3	Human Resource Policies	10
Defining HR policies, Difference between policy and procedure, Characteristics of policies, Process of designing policies, Measuring HR policies		

Module 4	Managing High Potential Employees	10
Defining High potential employees, Category of potential employees, Characteristics, Identification of potential employee approach – Buddy, Tenure , Manager appraisal, Decision Makers, Criteria based., Development of high potentials, Retention of High potentials		

Module 5	Recent trends in HRM	10
Competency Mapping – Meaning, Objectives, Advantages, Identification of competency, Requirement for Competency based HRM; HR Metrics Management; Rightsizing of Workforce – Factors, Consequences, Need; Emotional Intelligence – Need, Methods, Use for Career Development, EI & Managerial effectiveness, EI & Team effectiveness; HR Six Sigma Process		

Module 6	Employee Engagement	10
Definition, Benefits. Degree of employee engagement – Gallup Model, White model, Mercer model. Drivers of Engagement, Measurement of employee engagement.		

Recommended Books
1. Human Resource Management by Sharon Pande & Swapnalekha Basak. (Vikas Publication).
2. Human Resource Management by Biswajeet Pattanayak (PHI)
3. Human Resource Management, by Snell, Bohlander, Vohra (Cengage Learning)
4. Essentials of Human Resource Management and Industrial Relations by P. Subba Rao (HPH)
5. Human Resource Management by K Ashwathapa (Tata McGraw Hill)
6. HR Analytics by Dipak Kumar Bhattacharya – SAGE Publications

Semester : III	Specialization : International Business Management	Semester Exam			L/W	Credits
Code: 309 I	International Business Environment	Theory	I A	Total		
Subject Title		80	20	100	04	04
Course Objectives	1. To make students aware of international business environment concept 2. To introduce factors that affect international trade					
Course Outcomes	• Ability to adapt to international environment and corporate world • Ability to evaluate Global Competition and international economic cooperation					
Module 1	International Business Environment					10
Importance, nature and scope of International business, An overview of business environment, Economic, Political and Legal environments, Social and Cultural environments, demographic environment in International Business. Framework for analyzing international business environment.						
Module 2	Globalization:					10
Globalization of business features of current globalization, essential conditions of globalization, Modes of entry into International Business, Pros and Cons of globalization, globalization of Indian Business and some social issues in international business.						
Module 3	International Economic Institutions and Liquidity					10
IMF, World Bank, UNCTAD, UNIDO, Asian Development Bank, International Trade Centre, International Development Association, International Liquidity and SDRs.						
Module 4	International Economic Co-operation and Agreements					12
SAARC, SAPTA, Indo-Lanka Free Trade agreements, India's Recent Regional Cooperation Moves, International Commodity Agreements.						
Module 5	Balance of Payment Account and BoP of India:					10
Meaning, nature of balance of payments accounting, components of balance of payments, balance of payments disequilibrium, correction of balance of payments, financing of BoP deficit, Comparative trade performance of India, trend in major exports, trends in major imports. Direction of trade, service trade, major problems of India's export sector.						
Module 6	Global Competitiveness and e-business in regard to International Business					08
Competitive advantage of nations, technology and global competitiveness, new information technologies, reengineering the International business process, e-business-conceptual analysis, advantages and disadvantages of e-commerce.						

Recommended Books	1. International Business, P Subba Rao, - Himalaya Publishing House, 3rd Edition, 2013. 2. International Business Environment, Francis Cherunilam, - Himalaya Publishing House, 7th edition, 2018. 3. International Business, K. Aswathappa, 5th Edition - Tata McGraw Hill, New Delhi, 2012. 4. International Business, Michael R. Czinkota, Ilkka

Semester : III	Specialization : International Business Management	Semester Exam			L/W	Credits
Code: 309 II	Export Policy, Procedures and Documents	Theory	I A	Total		
Subject Title		80	20	100	04	04
Course Objectives	1. To familiarize the participants basic concepts of import/export formalities. 2. To familiarize the participants on important international trade terms. 3. To familiarize the participants processing of an import/export order.					
Course Outcomes	• Ability to understand various terms and documentation related to international trade • Ability to undertake various registrations processes related to international trade successfully					

Module 1	Registration formalities for Exports/Import	10
IEC Code, DGFT, CB, Regional Licensing authorities, export Promotion Councils, Tax, Excise Authorities. Various types of Exports: Merchant/Manufacture, Government regulation on Export/Import - Banned, prohibited, canalized, restricted items; status house holders-benefits.		
Module 2	**International Trade Terms**	**10**
INCOTERMS 2010-FOB, CIF, EXW etc; UCPDC-UCP 600; Trade contract and trade elements; Export Payment Terms: Credit risk management and payment terms; Main features of payment terms - Advance payment, open account, documentary credit; Letter of credit and parties involved; Types of LC; – Documentary bills for collection –DP and DA; Marine and Credit insurance; Export finance – pre-shipment and post-shipment; Price computation-FOB, CFR & CIF.		
Module 3	**Import**	**10**
Preliminaries, Procedures & Policies, Government regulations on import- Negative lists; Categories of importers- Actual/Non-actual user license, Special schemes for importers-EPCG, Duty exemption and remission, DFIA,DBK,EOUs, SEZ,STPs etc; Import Documentation-transport documents, bill of entry, airway bill, certificate of inspection, certificate of measurement, freight declarations.		
Module 4	**Packing and Labeling of Export Consignments**	**12**
Central Excise Rules, Cargo Insurance and Claim Procedures, Declaration of Exports and forms GR/SDF/PP/SOFTEX, Custom Clearance of Export Cargo; Quality Control and Pre-shipment Inspection; EIA/EIC ;ISO 9000/BIS 14000.		
Module 5	**Processing of an Export order**	**10**
Documents – ADS-commercial and regulatory documents; Transport Documents, Invoices, Bill of exchange, B/L, Shipping bill, certificate of origin-GSP, customs house agent; Pre-shipment Export Documents, Letter of Credit, Documents relating to it, Export Incentives, Export Houses Basics.		

Module 6	Credit Risk Management: Export Credit Insurance	08
Concept and importance; Role of Export Credit Guarantee Corporation (ECGC); Covers issued by ECGC; Financial guarantees; Coverage of commercial and political risks – procedures and documentary requirements		
Recommended Books	1. J. S. Rathor & B. S. Rathor, Export Marketing, Himalaya Publishing House, Mumbai, 2016. 2. Khushpat S. Jain, Export Import Procedures & Documentation, Himalaya Publishing House, Mumbai, 2015. 3. Ministry of Commerce, Handbook of Procedures, Volumes I and II, Government of India, New Delhi. 4. Ram Paras, Exports: What, Where and How?, Anupam Publications, New Delhi. 5. Francis Cherunilam, International Marketing -Himalaya Publication House 6. M.I. Mahajan - Export policy, procedure and documents- Snow White Publication.	

Semester : III	Specialization : Banking Management	Semester Exam			L/W	Credits
Code: 3010 I	Banking Operations Management	Theory	I A	Total		
Subject Title		80	20	100	04	04
Course Objectives	1. To understand the basics of Banking and the emergence of Banking in India. 2. To get acquainted with the functionality of the Banks. 3. To know the meaning and use of commonly used technologies in Banking. 4. To make the students understand Banking accounts.					
Course Outcomes	• Ability to know the various functions of the bank • Ability to undertake the responsibilities of daily working of the bank					
Module 1	Introduction					10
Banking Basic Concepts, Emergence of Banks – Global and Indian Perspective, Journey of Banking in India, Role of Banks as important Aids to Trade, Functions of Banks, Contribution in GDP and effect on Indian Economy, Role Banking in India pre and post-independence, Banking in post 1991 Reforms, Role of foreign players in Indian Banking. Types of Banks & Banking: Nationalized & Co- Operative Banks, Regional Rural Banks, Scheduled Banks, Private Banks, Foreign Banks, Wholesale and Retail Banking.						
Module 2	Regulatory Framework					10
Banking Regulation Act, RBI Act, SEBI, IRDA, RBI regulations with regard to Nationalized & Cooperative Banks, Private Banks, Foreign Banks, Commercial Laws with reference to Indian Banks, Security Norms, Core Banking Environment. Standard Books and registers to be maintained for different accounts. Funding & Recovery: Sector Specific funding, short term and long term loans, MSME funding, Mortgage, Pledge & Hypothecation, Recovery of loans, Non- Performing Assets, Effect of NPA on bank's profitability, Provision for NPAs.						
Module 3	Banking and Accounting of transactions					10
Concepts in Banking and Accounting of transactions: Accounting in banks, Electronic Banking, RTGS, ATM, MICR, OCR, OMR, DATANET Bank Reconciliation Statement - Need for Bank Reconciliation; Causes of Differences; Preparation of Bank Reconciliation Statement; How to prepare a Bank Reconciliation Statement when Extracts of Cash Book and Pass Book are given;						

Module 4	Final Accounts of Banking Companies	12
Final Accounts of Banking Companies: Requirements of Banking Companies as to Accounts and Audit; Principal Books of Accounts; Preparation of Vouchers, Cash receipt and payment entries, Preparation and Presentation of Financial Statements of Banks according to schedules in prescribed format. KYC, Different documents to satisfy KYC.		
Module 5	**Interest Computation**	**10**
Calculation of Simple Interest and Compound Interest -Fixed and Floating interest rates - Calculation of EMIs - Calculation of front end and back end interest -Calculation of Annuities - Interest calculation using products /balances, Amortization and Sinking Funds Bonds - Calculation of YTM - Duration - Bond Pricing - Premium and Discount - Bond valuation rules preliminary method, definition of debt, rules on compounding in respect of loan accounts, penal interest etc		
Module 6	**Negotiable Instruments**	**08**
Meaning of negotiable instruments, Parties to Negotiable instruments, Promissory Note, Bills of Exchange - Types of Instruments of Credit; Term and Due Date of a Bill, Cheques - Types of Cheques, , Collection of cheques and other instruments, handling dishonoured cheques.		

Recommended Books	1. Banking Concepts & Operations by Dr. E B Khedkar & Dr. D. B. Bharati Himalaya 2. The Indian Financial System and Development – Vasant Desai – Himalaya Publishing House. 3. Banking - E. Dharmaraj – SciTech Publications 4. Management of Banking & Financial Services, 3e, Padmalatha Suresh, Pearson Publication 5. Fundamentals of Banking & Finance- Dr. K. M. Bhattacharya- Himalaya Publications 6. Development Banking & Financial Intermediaries –Dr Vasant Desai- Himalaya Publications 7. Indian Financial System – M Y Khan – Tata McGraw Hill 8. Accounting and Finance for Bankers – Indian Institute of Banking & Finance – Macmillan. 9. Mudra Banking evamlok with (Money banking & Public Finance)1/e –Dr. S. N. Singh 10. Indian Financial System-A. A. Avadhani. 11. Modern Banking Theory & Practices, D. Muraleedharan , PHI Learning Pvt. Ltd. New Delhi.

Semester : III	Speculation : Banking Management	Semester Exam			L/W	Credits
Code : 3010 II	Indian Banking structure	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To introduce concept of Indian Banking structure to student. 2. To deal with practical case studies and prepare students to gain knowledge about banking industry.					
Course Outcomes	• Students will be able to gain insight into structure of Indian banking system • Students will become familiar with international Banking environment • Students will be in a position to gain favorable placements.					
Module 1	**Introduction to Banking System**					**10**
Origin of Banks, Indigenous Bankers & Money Lenders, Co-operative Banking Institutions, Regional Rural Bank, Foreign Banks, Developmental Financial Institutions (DFI), National Level Banks,						
Module 2	**Types of Banks**					**10**
Central Banks, Commercial Banks, Development Banks, Co-operative Banks, Specialized Banks, RBI as Central Bank						
Module 3	**Structure of Commercial Banking**					**10**
Public sector banks, private sector banks, Foreign Banks, Functions of Commercial Banks, Acceptance of deposits, Granting loans and advances, Agency services, Payment & Collection of Cheques, Bill of exchange and promissory note, Trustee Business, Safe Custody, Performance of Government Transactions						
Module 4	**International Banking**					**10**
Introduction – Foreign exchange markets, Factors determining exchange rate, Forward margins, Premium & Discounts, Risk Management in International Banking, Facilities for Exports & Imports, Banking & NRI Accounts, EXIM Bank & ECGC						
Module 5	**Rural Banking**					**10**
Role of Financial Institutions in Rural Banking, Structure and Functions of NABARD, Agricultural Finance, Self-Help Group financing, Government Sponsored Schemes, Financial Inclusion of Rural economy						
Module 6	**Modern Trends**					**10**
Social Banking, Lead Bank Scheme, Priority Sector Lending, Micro-credit & micro-finance, Banking Sector Reforms, Asset classification, Securitization, Capital Adequacy Norms, Universal Banking						

Recommended Books	1. R. Bhaskaran(Indian Institute of Banking & Finance) - General Bank Management, MACMILLAN Publication 2. D. M. Mithani – Money Banking & Public Finance - Himalaya Publishing House 3. D. Muraleedharan - Modern Banking Theory & Practices, PHI Learning Pvt. Ltd. New Delhi. 4. Principles and Practices of Banking – Indian Institute of Banking & Finance – Macmillan (ISBN : 023-063-611-X / 978-0230-63611-8) 5. Banking Theory and Practice – K. C. Shekhar, Lwekshmy Shekhar – S. Chand Publishing

Semester : III	Specialization : Systems Management	Semester Exam			L/W	Credits
Code: 3011 I	Management Information System	Theory	I A	Total		
Subject Title		80	20	100	4	4

Course Objectives	1. To make the students understand the working at different levels of management and use of different information system at these levels. 2. To make students capable of understanding implementation of management information systems in different functional areas 3. To make students understand the importance and strategic use and advantage of MIS. 4. To make students understand reasons of success and failure of MIS and how change of work processes should be made successful during implementation of MIS..	
Course Outcomes	• Understanding of functional requirements MIS • Ability to coordinate between business and technology elements of the organization • Efficiency in smooth and successful implementation of MIS in any organization	
Module 1	**Scope and Objectives of MIS:**	**08**
The role and importance of Information Systems, The place of Information Systems in the organization, The power of MIS, Uses of MIS.		
Module 2	**The Challenge of Information System:**	**12**
Computer literacy, Information system literacy. Information needs of different organization levels. Major types of information system in organization and relationship between them, enhancing management decision making. Decision, Support Systems (DSS) – understanding DSS, characteristics components, major DSS applications. Group decision support systems (GDSS), - elements, characteristics, enhancing group decision making using GDSS. Executive support systems (ESS) – role of ESS in the organization, developing ESS, benefits of ESS.		
Module 3	**Strategic Role of Information Systems:**	**10**
Strategic role of information systems, Information as a strategic resource, Concept of strategic information system. Contribution of information systems to pursue competitive strategies		
Module 4	**Information System Success and Failure:**	**08**
Major problem areas in information system, Principle causes of information system failure, Evolution of success of information systems. Appropriate strategies to implement the process.		

Module 5	Application of MIS in Various Functional Areas:	12
Marketing Information Systems, Financial Information Systems, Human Resource Information Systems, Production Information Systems.		
Module 6	**Knowledge Management**	**10**
Introduction and difference between the terms data, Information and Knowledge, Need of Knowledge Management, Types of Knowledge, Impact of IT on Knowledge Management, Role of ICT in Knowledge Management.		
Recommended Books	1. Management of Information systems – Gordon B. Davis & Margreth H. Olson 2. Management of Information systems – Jawadekar W.S. 3. Information Systems Management in Practice – Ralph H. Sprague Jr. & Barbara C. McNurlin 4. Management of Information Systems – James A. O'Brien 5. Information System Concepts for Management – 4th Edition Lucas 6. Management of Information Systems – 2nd edition – Kroenke David. 7. Management of Information Systems – Organization and Technology by Kenenth C. Laudon, Jane P. Laudon.	

Semester : III	Specialization : Systems Management	Semester Exam			L/W	Credits
Code: 3011 II	ERP and SPD	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To make the students understand the components and interrelations of ERP. 2. To make students capable of implementation of ERP 3. To make students understand the various elements and stages of System analysis and designing. 4. To make students understand the role of Project Manager and the skills required to become successful in the role.					
Course Outcomes	• Understanding of technologies and interrelations of ERP • Ability to analyse the business system and design ERP modules effectively • Develop required skills to become successful Project Manager					
Module 1	Enterprise Resource Planning					06
Introduction to ERP, Need of ERP, Advantages and Growth of ERP, Common ERP Myths, the Role of CIO.						
Module 2	ERP and Related Technologies					12
ERP and Related Technologies – Business Process Reengineering (BPR)- Business Process, Process Model of Organization, Reasons for Delay in Business Processes, Relevance of IT. BPR, ERP and IT. Supply Chain Management (SCM)- Concept, Supply Chain Performance: Achieving Strategic Fit and Scope. Introduction to Customer Relationship Management (CRM).						
Module 3	ERP Implementation In Detail					10
Implementation Basics, Implementation Cycle, Package Selection, Implementation Process, Project Team and other Stakeholders.						
Module 4	Introduction to System Development					08
Characters of a Software, SDLC, Role And Skills Required for Software Engineer and Software Project Manager						
Module 5	System Analysis					12
Problem Definition, Requirement Gathering (Fact Finding Methods), Requirement Modeling-Meaning And Tools (DFD, ERD, Decision Trees, Decision Tables)						
Module 6	System Design					12
Design of Input & Control, Design of Output, User Interface Design: Good Design, Design Issues, Features of Modern GUI, Design of Program Specification, Code Design						

Recommended Books	1. Enterprise Resource Planning -Alexis Leon 2. ERP Ware : ERP Implementation Framework -V.K. Garg & N.K. Venkatkrishnan 3. ERP –Leon 4. ERP Concepts and Planning -Garg & Venkatkrishnan 5. ERP - Dr. Milind Oka 6. Modern System Analysis and Design -Jeffrey A. Hoffer, Joey F. George, Goseph S. Valacich 7. System Analysis & Design -Elias Awad 8. System Analysis & Design methods -Whiten, Bentley

Semester : III	Specialization : Agriculture & Co-operative Management	Semester Exam			L/W	Credits
Code: 3012 I	Fundamentals of Agriculture & Co-Operative Management	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To make students understand about Agriculture sector 2. To make students understand about the cooperative institutions 3. To make students understand the importance of cooperatives in the economy					
Course Outcomes	• Students will be able to appreciate the role of Agriculture sector and cooperative organisations in the economy					

Module1	Utilization of Land and Cropping pattern Natural Environment	10

Geographical situation, Physical features. Problems of soil Erosion: - Types of soil Erosion, water erosion, wind erosion. Land resources, Classification of land, Cultivated Area, Cropping Pattern

Module2	Agriculture Input Technology	10

Irrigation: - need, role, development. Manures and Fertilizers: Soils and Losses of Nutrients, Nature and Function of Manures, Chemical fertilizers: - Types, time of application

Improved seeds and plant protection measures. Improved seeds - Importance, varieties. National Seeds Corporation. Plant protection measures: - causes of plant diseases, Measures

Module3	Agricultural Labour	10

Definition of Agricultural labour, Characteristics, Special Programs for agriculture labour, Lines of improvement of landless labour

Module4	Introduction of Co-operation	10

Co-operation concept, definition and principal of co-operation. Relevance and significance of Co-operative Law. Growth of co-operative movement in India. Co-operative Management - Introduction of co-operative management. General Body of Members. Requisite of meeting. Board meetings/managing committee meetings. Committees of the Board. Power and duties of the chairman. Board of Directors and the executives. Successful functioning of Board of directors. Unique features of co-operative Management.

Module 5	Agri. and Non-Agricultural Co-operatives in India	10

Self Help Groups. Consumers Cooperatives. Marketing Co-operatives. Co-operative Housing.

Module 6	Co-operative Banks at Different Levels in Maharashtra	10

State co-operative Bank (SCB), Land Development Bank (LDB), District Central Cooperative Bank (DCCB), Primary Cooperative credit societies (PCCS),Maharashtra State Co-operative Bank, National Housing Bank, Regional Rural Banks

Recommended Books	1. Co-operative Management Pattern. - Ansari A.A.- 2. New Dimensions of Co-operative Management.- Akrnat J.S.- 3. Co-operative Management and Administration. - Goel B.B.- 4. Professional Management for Co-operatives. - Sah A.K.- 5. Rural Development and Banking in India. - Ajit Singh- 6. Financing Small and Marginal Farmers through Co-operative Credit Structure. – Dandekar V.M. 7. Bank Finance Rural Development - Naidu L.K. 8. Agriculture problems of India - Mamoria

Semester : III	Specialization : Agriculture & Co-operative Management	Semester Exam			L/W	Credits
Code: 3012 II	Agricultural Marketing	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To make students understand the factors involved in Agriculture produce marketing 2. To make students understand the marketing agencies with respect to agricultural products 3. To make students understand the role of Government in Agricultural marketing and Rural marketing					
Course Outcomes	• Appreciate the unique approach expected to market the agricultural products • Ability to set marketing environment for agriculture products and undertake rural marketing					

Module1	Agricultural Marketing and Market Structure:	10

Introduction: Concept and Definition, Need and Scope, Need Differences in Marketing of agricultural and manufactured goods

Market - Meaning, Components of market, Classification of Market, Growth of Markets. Market Structure -Meaning, Components of Market Structure.

Module2	Agricultural Marketing Functions	10

Marketing function:-Meaning and Classification. Packaging:-Meaning, Types, Packaging Materials and New inventions, IIP (Indian Institute of Packaging). Transportation: Advantages, Means of transportation, Transportation cost. Grading, Standardization and Quality Control:-AGMARK. Storage:-Meaning, Need, Risk in Storage, Storage Structure. Warehousing:-Meaning, Functions, Types. Processing and Value addition: Meaning, advantages. Market Information: Meaning, Importance, Types.

Module3	Marketing Agencies, Institutions and Channels	10

Introduction. Marketing Agencies. Marketing Institutions. Marketing channels: Definition, Marketing channels for:-cereals, Oilseeds, Pulses. Innovative marketing Channel:-farmers Markets. Contract Marketing:-Meaning, Advantages, types.

Module4	Marketing of Farm Inputs:	10

Theory of determination of input Price. Supply, demand, distribution, Marketing Pattern and Price policy of important farm inputs: Chemical fertilizers, seeds, Plant Protection chemicals (Pesticides), Electricity, Farm Machinery.

Module 5	Government Intervention and Role in Agricultural Marketing	10
Characteristics of Traditional Agricultural Marketing System. Directorate of marketing and Inspection. Regulation of Agricultural Marketing: Definition, Features, Classification. State Trading: Objectives, Types.		
Module 6	**Rural Marketing:**	**10**
Introduction, Classification, Characteristics, Rural Consumer, Segmentation, Rural Product, Rural Price, Rural Distribution, Rural Communication.		
Recommended Books	1. Integrated Rural Development - Arora R.C. 2. Politics and Society in Rural India - Mishra S.N. 3. Competitive Strategy - Porter, Michael E 4. Marketing Management - Philip Kotler 5. Indian Agricultural Economics -Myths and Realities - Rudra Ashok 6. Competing Against Time - Stalk George 7. Export Management - Prof. Laxmi Narayan	

Semester : III	Open Elective	Semester Exam			L/W	Credits
Code: 3013	Entrepreneurship Development	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To make the students understand the importance of Entrepreneurship. 2. To make students understand various traits, competencies of entrepreneurship and ways of developing them 3. To embed into students an inspiration to opt Entrepreneurship as Career. 4. To make students know about the supportive environment for Entrepreneurship					
Course Outcomes	• Motivation to become Entrepreneurs • Capability to explore the scope of Entrepreneurial career • Approaching market needs with innovative enterprising solutions.					
Module 1	**Foundations of Entrepreneurship Development:**					**14**
Concepts of Entrepreneur & Entrepreneurship. Entrepreneurial Traits and competencies, Developing Entrepreneurial competencies, Entrepreneurship as a career, Concept and Need of Entrepreneurship Development, Theories of Entrepreneurship: Innovation Theory by Schumpeter, Theory of High Achievement by McClelland, X-Efficiency Theory by Leibenstein, Theory of Profit by Knight, Theory of Social change by Everett Hagen.						
Module 2	**Influences on Entrepreneurship Development**					**06**
External Influences on Entrepreneurship Development: Socio- Cultural, Political, Economical, Personal. Intrapreneurship / Corporate Entrepreneurship, Entrepreneurial culture with special reference to Intrapreneurship / Corporate Entrepreneurship. Entrepreneurial Success and Failure: Reasons and Remedies. Entrepreneurship Development Cycle.						
Module 3	**Innovation and Entrepreneur**					**04**
Innovation – Concept and Meaning, Difference with Invention and Creativity, Role of innovation in entrepreneurship, Sources of Innovation, Principles, Barriers and essential conditions for Innovation						
Module 4	**Women, Rural & Social Entrepreneurship**					**10**
Women Entrepreneurs – Meaning and concept, Problems/Challenges and Remedies to Woman Entrepreneurship Rural Entrepreneurship – Meaning, Need, Problems. Social Entrepreneurship – Meaning and Concept, examples of Social Entrepreneurship and its features.						

Module 5	Creating Entrepreneurial Venture	12
Start-ups - Trends Imperatives, benefits; players involved in the ecosystem. Business Plan – An Entrepreneurial Tool. Elements of Business Plan - Objectives, Market Analysis, Development of product / idea, Marketing, Finance, Organization & Management, Ownership, Critical risk contingencies of the proposal, Scheduling and milestones. Feasibility Reports - Technical, Financial, Marketing, Personnel.		
Module 6	**Entrepreneurship Development Environment & Financial Support**	**12**
Role of the following agencies in the Entrepreneurship Development i. DIC – District Industrial Center ii. NSIC – National Small Industries Corporation iii. NEDB – National Entrepreneurship Development Board Financial Support: Role of Central Government and State Government in promoting Entrepreneurship - various incentives, subsidies, grants etc. – with special reference to 'Export oriented units'. Financial schemes offered by various financial institutions, Role of Venture Capitalist, Angel Capitalist.		
Recommended Books	1. Fundamentals of Entrepreneurship Development and Project Management – Lipika K. Guliani & R. K. Gupta – Himalaya Publishing House (ISBN : 978-93-5142-684-4) 2. The Dynamics of Entrepreneurial Development and Management – Vasant Desai. – Himalaya Publishing House (ISBN : 978-93-5024-454-8) 3. Fundamentals of Entrepreneurship – G. S. Sudha – R. B. D. Publishing House (ISBN : 81-8142-120-5) 4. Entrepreneurial Development – S. S. Khanka – S. Chand & Co. (ISBN : 978-81-219-1801-5) 5. Entrepreneurship Development – E. Gordon & K. Natarajan – Himalaya Publishing House (ISBN : 978-93-5202-540-4)	

Semester – IV

<table>
<tr><td>Semester: IV</td><td>Hard Core</td><td colspan="3">Semester Exam</td><td rowspan="2">L/W</td><td rowspan="2">Credits</td></tr>
<tr><td>Code : 401</td><td rowspan="2">Business Ethics & Corporate Governance</td><td>Theory</td><td>I A</td><td>Total</td></tr>
<tr><td>Subject Title</td><td>80</td><td>20</td><td>100</td><td>4</td><td>4</td></tr>
<tr><td>Course Objectives</td><td colspan="6">1. To introduce Business Ethics and corporate governance concepts to student Managers.
2. To teach students practical application of Ethical practices in life situations.
3. To deal with case studies and deal with practical problem solving ethical approach.</td></tr>
<tr><td>Course Outcomes</td><td colspan="6">• Students will be able to take appropriate ethical decisions after learning corporate Governance.
• Students will become familiar with international ethical environment and know concepts of Indian ethics and governance.
• Students will be ready with corporate ethical and governance knowledge and will be ready for attractive placements</td></tr>
<tr><td>Module 1</td><td colspan="5">Introduction to Business Ethics</td><td>10</td></tr>
<tr><td colspan="7">An overview of Ethics – Business Ethics – Concepts – Nature, Objectives, Need and benefits –Ethical theories – Values & Value based Management .Importance of Ethics in business. Stages of Ethical Consciousness. principles of business ethics</td></tr>
<tr><td>Module 2</td><td colspan="5">Theories of Business Ethics</td><td>10</td></tr>
<tr><td colspan="7">Introduction of values, characteristics of values, importance of values, business values, corporate values. Relationship of values, norms, belief and standard

Ethical theories- Metaethics, Normative Ethics, Teleological ethical theory, Deontological Ethical Theory– Ethical Decision Making – Ethical Dilemma –</td></tr>
<tr><td>Module 3</td><td colspan="5">Ethics in Functional Areas.</td><td>10</td></tr>
<tr><td colspan="7">Ethical issues in Finance – Ethical issues in Marketing – Ethical issues in HR – Ethical Issues in Operations – Ethics in Information Technology – Trans-cultural issues.</td></tr>
<tr><td>Module 4</td><td colspan="5">Corporate Social Responsibility</td><td>10</td></tr>
<tr><td colspan="7">Corporate Social Responsibility & its Significance in Business – Concept of Social Audit & its Relevance Corporate Social Responsibility and corporate citizenship – Forms of CSR, Dimensions of CRS – Stakeholder theory of corporation.</td></tr>
</table>

Module 5	**Corporate Governance.**	**10**
Introduction Definition of Corporate Governance Evolution of Corporate Governance Difference between Corporate Governance and Corporate Management Theories of Corporate Governance Models of Corporate Governance		
Module 6	**Roles and Responsibilities of Directors in Corporate Governance.**	**10**
Role of Directors, Responsibilities of Directors, Duties of Directors, Functions of the Board Committees of the Board, Corporate codes - Self-regulatory codes - Reports of committees on Corporate Governance - Kumara Mangalam Birla Committee Report , CII Report		
Recommended Books	9. Business Ethics- Andrew Crane & Dirk Matten. 10. Business Environment - Francis Cherunilam, Himalaya 11. Business Ethics – C. S. V. Murthy. 12. Entrepreneurial Development. Dr. S.S. Khanka , S Chand Publication. 13. Business Ethics, Manisha Paliwal –New Age International Press, New Delhi. 14. Management Ethics, Patyrick J. A. & Quinn J. F. – Response Publishing, New Delhi. 15. Ethics in Management, Sherlekar – Himalaya Publishing, New Delhi.	

Semester : IV	Hard Core	Semester Exam			L/W	Credits
Code : 402	Total Quality Management	Theory	I A	Total		
Subject Title		80	20	100	04	04

Course Objectives	1. To teach students about importance of Quality and Total Quality Management 2. To make students familiar with the tools and techniques of Quality Management 3. To provide knowledge to the students regarding the essential quality standards	
Course Outcomes	• Students will be able to apply the Quality Concepts to improve work performance • Students can find the relevance of the quality concepts while implementing in the organization	
Module 1	**Introduction to Quality and Total Quality Management (TQM):**	**10**
Concept, importance, Quality movement in India, Dimensions of Quality, types of quality, benefits of quality, quality and competitive advantage, total quality, fundamentals of total quality, major process components of TQM, key elements of total quality management		
Module 2	**Quality Philosophies and Quality Circle:**	**08**
Quality Gurus - W Edward Deming, Joseph M. Juran, Philip B. Crosby and Vilfredo Pareto, Quality circles (QC)- concept, implementation of QCs, quality circles in India		
Module 3	**Total Quality Control and Continuous Improvement:**	**12**
Just-In-Time- JIT Philosophy, objectives, JIT methods, elements of JIT, Kanban System, implementation of JIT, benefits of JIT, Six Sigma -Concept, Implementation, Analysis of Six Sigma, KAIZEN - Concept, steps in continuous improvement process, requirements for a successful Kaizen program and benefits.		
Module 4	**Benchmarking and 5-S:**	**08**
Concept, Rationale of benchmarking, objectives, process, Benefits of benchmarking, Obstacles to successful benchmarking, types of benchmarking, concept, implementing of 5-S and benefits.		
Module 5	**Cost of Quality and Statistical Quality Control (SQC):**	**10**
Cost of Quality- Concept, purpose, profile, categories, benefits, problems in quality cost measurement, Statistical Quality Control concept, SQC for process control, acceptance sampling and advantages.		
Module 6	**TQM Models, QM System & Audit:**	**12**
Malcolm Baldridge national quality award, Demings Award, European quality award, Confederation of Indian Industries award, Quality Systems, Quality management principles, ISO 9001: 2000, ISO 14000, Quality audit concept, Audit tools & techniques.		
Recommended Books	1. Total Quality Management, Dr. D. D. Sharma, Sultan Chand & Sons 2. Total Quality Management, K. Shridhar Bhat, Himalaya Publishing House 3. . Total Quality Management, Shailendra Nigam, Excel Biiks 4. Production and Operations Management, K. Aswathappa	

Semester : IV	Specialization : Marketing Management	Semester Exam			L/W	Credits
Code: 403 III	Integrated Marketing Communication and digital Marketing	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To teach different promotion tools. 2. To train students on importance and combination of various promotional tools 3. To acquaint the students to learn and apply the concept of digital marketing.					
Course Outcomes	• Understanding importance and application of different promotional tool • Learn and apply the importance of digital marketing					
Module 1	**Introduction to integrated Marketing Communication**					08
Concept, Tools for IMC-Advertising, sales promotion, personal selling, public relations, direct marketing, IMC planning process, Fundamentals of advertising, advertising appeal in various stages of PLC, types of advertising including corporate advertising.						
Module 2	**Advertising Agency & Media Planning:**					10
Functions of advertising agencies, Client-Agency-Relationship, agency compensation, Future of Advertising Agency, Campaign Planning and Creativity in Advertising, Media planning: Developing Media plan, Problems encountered, Media Evaluation-Print, Broadcast media, Support media in advertising.						
Module 3	**Promotional mix elements**					12
Concept of sales promotion, growth of sales promotion, types of sales promotion, Concept of Direct Marketing, advantages/disadvantages and direct marketing strategies, e-commerce, event management, trade fairs and exhibitions, Public relations- Meaning, developing and executing public relations program, Personal selling- role of personal selling in IMC program, advantages and disadvantages						
Module 4	**International Advertising and promotion**					08
Importance of International markets, the role of international advertising and promotion, International environment in advertising, global v/s Localized advertising, the roles of other promotional mix elements in international marketing						
Module 5	**Digital Marketing**					10
Introduction to digital marketing, concept of search engine optimization (SEO), the operating mechanisms, introduction to search engine marketing (SEM), types of SEM, Social media marketing- Face book, You Tube, Twitter, LinkedIn,						

Module 6	Google tools for digital marketer & Digital display advertising:	12
Introduction to Google tools- Google search console; Google keyword planner, Google AdWord Editor, Google conversion optimizer, Google alerts, Google maps, Google blogger, introduction to digital display advertisement, banner ads		
Reference Books:	1. Advertising and Promotion, George E Belch and Michel A Belch and Keyoor Purani, Tata McGraw Hill, 9th edition, 2010. 2. Foundations of Advertising, S. A. Chunawalla and K. C. Sethia, Himalaya Publishing House, 7th edition, 2009 3. Digital Marketing 2.0, Dr. Rushen Chahal & Prof. Jayanta Chakraborti, Himalaya Publishing House Advertising Management, Rajeev Batra, John G. Myers and David A. Aaker, Pearson Education, 5th edition, 2009. 4. Advertising & Sales Promotion, S. H. H. Kazmi and Satish K Batra, Excel Books, New Delhi, 2001.	

Semester : IV	Specialization : Marketing Management	Semester Exam			L/W	Credits
Code: 403 IV	Services and Retail Marketing	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	9. To acquaint students with Business Services and Service Industry. 10. To equip students with the basic knowledge about retail management. 11. To make students understand scope and opportunities in Service as well as Retail industry					
Course Outcomes	• Insights about service industry. • Training in key management skills needed to streamline the retail process. • With growth opportunities in organized retail, it attracts towards well-paid jobs and good career opportunities.					
Module 1	**Service Marketing**					**10**
Meaning, definition, Need & Importance of services, Distinction between services & goods, characteristics of services, Classification of services, Reasons for growth of the service economy.						
Module 2	**Marketing Mix for Service**					**12**
The seven P's –Product decisions, Pricing strategies, Promotion of services, Placing or Distribution methods of services, People, Physical Evidence and Process, Service Demand & Supply.						
Module 3	**Marketing strategies for different services**					**08**
Financial, Insurance, Consultancy Services, Healthcare, Educational, Roadways, Railways Airline, Hospitality-Hotel, Travel, Tourism.						
Module 4	**Introduction to Retail**					**10**
Concept, Functions of retailer, Classification, Organized Retail, Types of retail formats – Store and Non-store, Franchising, Retail as a career, Drivers of retail change in India, Retailing scenario – Indian v/s Global Prospects of Retailing in India.						
Module 5	**Store Design**					**10**
Site Selection, Store Design – concepts, Exterior and Interior design elements, Store Front, Location of Departments, Feature Areas, Fixture Types, Layouts- Objectives, Factors, Types, Visual Merchandising						
Module 6	**Merchandise Management**					**10**
Retail Merchandising - Buying Function- The Merchandiser- role and responsibilities, Buyer – Role and responsibilities, Buying for different types of organizations, Process of Merchandise planning, Category Management, Private Labels.						

Recommended Books	1. Service Marketing – Dr. S. Shahjahan 2. Service Marketing – S. M. Jha 3. Service Marketing – Vasanti Venugopal, Raghu V.N 4. Service Marketing & Management –Dr. B. Balaji 5. Retailing Management – Swapna Pradhan 6. Retail Management – Gibson Vedmani 7. Retail Management – Suja Nair

Semester : IV	Specialization : Marketing Management	Semester Exam			L/W	Credits
Code: 403 V	International Marketing	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. The aim of the course is for the student to develop their knowledge and understanding of the field of international marketing, which includes strategies for internationalization and the structural changes of markets. 2. The course also aims to allow students to develop in-depth knowledge of internationalization in the retail sector in relation to the companies' social responsibility.					
Course Outcomes	• Be capable of identifying international customers through conducting marketing research and developing cross-border segmentation and positioning strategies. • Be capable of developing a global marketing strategy by applying the basic concepts of product, pricing, promotion, and channels of distribution in international settings.					
Module 1	**Introduction to Marketing**					**10**
Marketing: Meaning, Nature & Scope as the key business function in Organizations – Marketing for New Realities – Holistic Marketing Concept – Extended Marketing Mix – Key Customer Markets: Consumer, Business, Global, Non-profit & Government – Market Space – Meta Markets. Concept of Value chain – Marketing Environment – Internal and External environment – Introduction to Marketing Research & Modern Marketing Information System – Concept of Big Data – Marketing Intelligence Market Strategic Planning – Elements of Marketing Plan						
Module 2	**International Buying Behaviour**					**10**
Customer Relationship Management – Loyalty Programs. Types of Consumer Buying Behaviour – Factors affecting Buyer Behaviour - Buyer Roles – Consumer Buying Decision Process: The 5 Stage Model. Organizational Buying Decisions – Buying Center – Tapping Global Markets. Segmentation, Targeting & Positioning – Strategies. Competitor Analysis – Competitive Market Strategies – Leaders, Challengers, Followers & Niches.						
Module 3	**International Product Planning and Pricing Decisions:**					**10**
International Product Planning and Pricing Decisions: Major Product decisions-product design, labeling, packaging, branding and product support services; Product standardization vs. adaptation; managing product line. Pricing decisions for International Markets: Factors affecting international price determination; International pricing process and policies; Delivery terms and currency for export price quotations; Transfer pricing						

Module 4	International Distribution Decisions	10
Distribution channel- from traditional to modern channel structures, Intermediaries for international markets-their roles and functions; Alternative middlemen choices, Factors affecting choice of channels; Locating, selecting and motivating channel members; International distribution logistics- Issues and Planning.		
Module 5	**International Promotion Strategies**	**10**
Communications across countries-complexities and issues; Country-of-origin effect; Sales promotions in international markets, trade fairs and exhibitions, International public relations, International Advertising decisions, Personal selling and sales management; Developing international promotion campaign.		
Module 6	**Policy Framework And Procedural Aspects & Global e-marketing**	**10**
India's Export – Import policy – EXIM Policy –promotional measures - Export oriented Units – Deemed Exports - Export- Import Documentation – Kinds of Documents – Principal Export Documents – Auxiliary documents –Documents in Import Trade Global e-marketing – The death of distance, Mobile marketing, The development of E- Commerce – B2B, E-marketing on social media sites		
Recommended Books :	1. International Marketing, Francis Cherunilam ,Himalaya Publication House (ISBN :978-93-5367-055-9.) 2. International Marketing - Onkvisit, Sak., and John J. Shaw - Tata McGraw Hill 3. Global Marketing - Keegan, Warran J. and Mark C. Pearson. 4. International Marketing Management , M.V. Kulkarni, Everest Publishing House 5. International Business – P. Subha Rao - Himalaya Publication House 6. Global Marketing Management – Warren J Keegan, Naval K. Bhargava	

Semester : IV	Specialization : Financial Management	Semester Exam			L/W	Credits
Code: 404 III	Financial System of India. Markets and services	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	3. To introduce financial concepts to student Managers. 4. To teach students application of Components Financial system					
Course Outcomes	• Students will be able to take appropriate financial decisions after learning the subject. • Students will become familiar with Financial Business Environment and know concepts of Indian Financial system • Students will be ready with corporate requirements and attract favorable placements					
Module 1	Introduction to Indian financial system					10
Overview of the Indian Financial System, Formal and Informal financial Sectors Pre and Post 1991 period, Recent developments in last five years, functions of Financial System, Components of the formal financial system, Organizational structure of the Indian Financial System. Interaction amongst financial system components.						
Module 2	Capital Market – Primary Market:					10
Introduction to capital markets-functions primary market Public Issue, Right Issue and Private Placement, eligibility criteria for Company to issue IPO, Steps in Public Issue, Role of various agencies in public issue-Merchant Bankers, Underwriters, Brokers, Bankers to the Issue, Registrar to the Issue, Promotional agencies. Concept of Book Building. Prospectus and types of prospectus						
Module 3	Capital Market - Secondary Market					10
:Constituents of Secondary Market – Brokers, Sub Brokers, Depository, Custodians, Stock Exchange : Definition, Overview of Stock Exchanges in India, Trading on stock exchanges, Order types, cash/margin trading, Rolling Settlement, Role of Clearing House, Introduction to E-Trading. BSE Sensitive Index and NSE Nifty. OTCEI, Functions of SEBI						
Module 4	Introduction to Derivatives					10
Introduction to Derivatives: Introduction to derivative market, history of derivative market - need for derivative market, Types of derivative market- Forward, Futures, Options & Swap. Economic Benefits of derivative Markets. Distinct features of derivative markets.						

Module 5	Commodity Market, Money Market	10
Introduction, Types of Commodity Market, Participants in commodity futures, Order Types on commodity market, Concept of money market, money market Instruments and its features Money Market Intermediaries.		
Module 6	**Mutual Fund and Financial Services.**	**10**
Mutual Fund: History, Concept and role of MF, Fund structure and constituents, Types of Mutual fund Schemes Concept of SIP, STP, SWP, NAV. Overview of MF industry at present. Investment Services- Fund Raising Services, Advisory services		
Recommended Books	1. Financial Institutions and Markets- Bhole, Tata McGraw Hills 2. Indian Financial System- Khan M.Y. Tata McGraw Hills 3. Financial Markets and Services- E. Gorden and K. Natarajan, Himalaya Publications 4. Indian Financial System – Bharati V. Pathak Himalaya Publications 5. Indian Financial System – H. R. Machiraju, Vikas Publication 6. Indian Financial System – Dr. G. Ramesh Babu, Himalaya Publications 7. Financial Markets and Institutions – Jeff Madure (Cengage) 8. Indian Financial Market- Naliniprava Tripathy, PHI	

Semester : IV	Specialization : Financial Management	Semester Exam			L/W	Credits
Code: 404 IV	Investment Management	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To make students aware of various investment avenues and evaluate their benefits in terms of returns and risks 2. To make students knowledgeable of techniques to analyse various capital generating models and their benefits and limitations.					
Course Outcomes	• Ability to undertake investment decisions on the basis of appropriate analysis and evaluation in respect of Risk, Returns, Liquidity, etc.					
Module1	**Introduction to Investment and its Avenues:-**					12

1.1: Investment: - Meaning, nature and Objectives of Investment, Investment v/s speculation & Gambling, Investment Process, Characteristics of Investment and Investment attributes.

1.2:Avenues of Investment:-Non-marketable Fixed Income Avenues- Bank Deposit, Fixed Deposit with companies, PPF scheme, Post Office Schemes, National Savings scheme, National Savings Certificates schemes.

1.3 Marketable Fixed Income Avenues- Shares, FCD, NCD, Bonds, Gilt-edged securities.

1.4 Other Avenues- Units of MF, Life Insurance, Real Estate

Module2	**Risk and Return Analysis**	06

2.1: Risk and Return Analysis:- Meaning of Risk, Elements of Risk- Systematic Risk and Unsystematic Risk, Measurement of Risk- Expected Return- mean-variance approach, Measurement of systematic risk, Risk- returns trade off and precautions to minimize the risk.

Module3	**Investment Management Framework**	06

3.1:Investment Management Framework:- Review of investment avenues, Specification of Investment objectives, Formulation investment strategy, Selection of securities/assets, Performance Evaluation

Module4	**Analytical Framework for investment in Shares**	14

4.1: Valuation of shares:- Fundamental Analysis-Economic Analysis, Industry Analysis and Company Analysis. Technical Analysis- Trends, Indicators, Indices and moving averages applied in Technical analysis

4.2: Portfolio Analysis: Meaning, Markowitz Portfolio Selection Model -Portfolio Selection, Feasible set of portfolios, Efficient set of portfolios- The Efficient Frontier, Selection of optimal portfolio.

4.3: Capital Asset Pricing Model-Meaning and components

4.4: Random Walk Theory: Assumptions of Random Walk Theory, Random Walk and Efficient Market, Hypothesis- Weak, semi-strong, strong market and its testing techniques.

4.5: Factors Models and Arbitrage Pricing Theory:- Arbitrage Pricing Theory and its principles

Module5	Bond Valuation	12
5.1: Types and Features of Bond 5.2 : Introduction to concept of Bond Valuation 5.3: Bond Yields- Current Yield, Yield to Maturity 5.4: Risk in Debt 5.5: Bond Portfolio Management 5.6: Equity Valuation:- Meaning, concept of Present Value, Share Valuation Models, Multiplier approach to Share Valuation		
Module6	**Investment plans for individuals at various life cycle stages**	**10**
6.1 : Meaning and Rewards of Financial Planning 6.2 :- Steps in Financial Planning Process, 6.3 : Financial Planning for Life time 6.4: Planning Environment and Determinants of Personal Income 6.5: Preparation of financial plan considering different investment avenues		
Practical Problems should be covered on • Risk and Return • Valuation of Bonds and • Preparation of Investment plans for Individuals at various stages of life cycle.		
Recommended Books	1. Investment Analysis and Portfolio Management – Prasanna Chandra- TMG Hills. 2. Security Analysis and Portfolio Management – Punithavathy Pandian, Vikas Pub. 3. Investment Management - V. A. Avadhani, Himalaya 4. Portfolio Management – Samir Barua, J. R. Varma, V. Raghunathan Himalaya Publication 5. Personal Financial Planning Guide - Ernst and Young's Cennage 6. Investment Management – Preeti Singh - Himalaya Publication 7. Security Analysis and Portfolio Management – Donald E. Fischer and Ronald J. Jordon Prentice Hall. 8. Modern Investments and Security Analysis – Russell J. Fuller & James L. Farrell, Jr. 9. Investment Analysis and Portfolio Management- M. Ranganathan and R. Madhumathi Pearson	

Semester : IV	Specialization : Financial Management	Semester Exam			L/W	Credits
Code: 404 V	International Finance	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To make the students understand the foreign exchange market and the policies regarding the same. 2. To make students knowledgeable in respect of international financial markets and various terminologies and mechanisms adapted in operating the same					
Course Outcomes	• Ability to consider global financial markets and deal in foreign exchange appreciating the policies and the rate mechanism in force at the time of dealing in the same.					

Module1	International Business Environment	06
Concept of International Finance, Scope of International Finance, Importance of International Finance, Nature and characteristics of International Business, Globalization and India's financial sector reforms		
Module2	**World Financial Markets and Institutions**	**10**
International Banking, International Bond Market, International Equity Market, Introduction to NASDAQ, NYSE, Tokyo Stock Exchange, London Stock Exchange, Introduction to ADR and GDR		
Module3	**Foreign Exchange Market & Rate Mechanism**	**08**
Structure of Foreign Exchange Market, Types of Transactions, Exchange Rate quotations and arbitrage, Interrelationship between Exchange and Interest Rate, Exchange rate quotations, Determination of exchange rate in spot market and forward market, Factors influencing exchange rate, Theories of Exchange Rate, Behavior– Purchasing Power Parity, Interest Rate Parity		
Module4	**Risks in International Operations**	**06**
Exchange rate risk, Interest rate risk and political risk., Techniques of covering risks- Internal and External.		
Module 5	**Balance of Payment**	**(08)**
Introduction, Presentation of Balance of Payments, Importance of BOP, Limitations of BOP, Methods to correct adverse Balance of payment, BOP position of India in recent years		
Module 6	**Financial Management of the Multinational Firm**	**12**
Foreign Direct Investment , Cost of Capital and Capital Structure of a Multinational Firm , Multinational Capital Budgeting , Multinational Cash Management , Country Risk Analysis, International Taxation, Double Taxation Avoidance Agreements		

Practical Problems should be covered on: • Exchange Rate quotations and arbitrage • Determination of exchange rate in spot market and forward market. • Techniques of covering risks • Multinational Capital Budgeting	
Recommended Books	1. International Financial Management- P.K Jain & others.- TMG Hills 2. International Finance – P. G. Apte TMG Hills 3. International Financial Management- Cheol Eun & Burce Resnick, Tata McGraw Hills 4. Finance of International Trade – Alastair Watson, Paul Cowdell (Cengage) 5. International Corporate Finance- Madura (Cengage Learning) 6. International Finance – Mihir Desai (Wiley India Edition) 7. Exchange Control Regulations – Nabhi, Nabhi Publications New Delhi 8. Global Business Finance- V. A. Avadhani Himalaya Pub.

Semester : IV	Specialization : Tourism and Hospitality Management	Semester Exam			L/W	Credits
Code: 405 III	Accommodation Management	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. The syllabus of Accommodation Management seeks to enhance the skills of students in the Rooms Division Management of hotels. 2. To make the learner to understand about the operation and the management of Housekeeping department in hotel. 3. The learner shall be competent for handling Accommodation management processes and procedures in hospitality Industry.					
Course Outcomes	• Ability to undertake front office activities in accommodation efficiently and ensure excellent hospitality towards customers					

Module1	Introduction	08

Role of Housekeeping in Hospitality Operations: Housekeeping-Layout of Housekeeping Department-Hierarchy of Room divisions-Team work in Housekeeping department. - Scope of Housekeeping in Lodging Industry: Overview. Housekeeping as a business. Housekeeping for different institutions - Airlines, Hospitals, Hostels, Corporate, Industry etc.

Introduction To Facility Management: Scope and meaning of facilities management - Importance of Facility management in Hotels - Growth of Facilitate management.

Module2	Housekeeping Functions	12

Duties & Responsibilities of Housekeeping department: Executive Housekeeper, Asst. Executive Housekeeper-Middle level Management-Skill based employee's responsibilities-Communication responsibilities-Total quality innovations-tariffs.

Module3	Infrastructure Management	12

Interior decoration & design: Elements and Purpose-Fixtures & Furniture's-Carpets: Curtains & draperies, valances, swag- Window cleaning – Equipment and Agents.

Floor Lighting: Classification / type - Lighting for the guest rooms & public areas. Different types of windows

Colours-Managing Inventories: Colour Wheel - Colour Schemes - Psychological effects of colour. Linen & Uniforms-Cleaning equipment's & Agents Budget Process-Safety & Security-pest control-Safety and security.

Soft furnishing & Accessories: Types, use & care of soft furnishing.

Role of accessories: Floor, Floor finishes &wall carving- Classification / types - Characteristics - Selection criteria - Cleaning Procedures – care & maintenance - Agents used, polishing / buffing-Floor seals.

Module4	Hospitality Personnel Management	10

Managing Human Resources:-Induction and Training-Recruiting, Selecting-Skill Training & Coordination-Motivation & Employee Discipline.		
Module5	**Green Hospitality**	**08**
Eco housekeeping-Horticulture-Contemporary spas-Conservation practices and methods- Eco hotels and recent trends- Emerging trends- Practices at private and public sector Legal Concerns for Front Office Operations - Guest Safety - Guest Privacy - Guest Removal - Guest property - Guest Non-payment - Illness and death of a guest.		
Module 6	**Practical**	**10**
Preparing training modules for entry level (GRA) employees. Designing a customer feedback form. Implementation of time and motion study (study of a given area) Conducting a market research for identifying customer needs.		
Recommended Books	1. Managing facility by Christine Jones - Hotel facility planning by Tarun Bansal Hotel housekeeping Operations and Management - by G. Raghubalan. 2. Hotel housekeeping Operations and Management by G Raghubalan The Professional Housekeeper by Georgina Tucker 3. Sudhir Andrews, Hotel House Keeping Training Manual, Tata Mc Graw Hill Publishers, New Delhi, Edition 2, 2005. 4. Hotel Front office & Operations management, Oxford University Press, Jatashankar R.Tiwari 5. Managing the Lodging Operations by Robert Christie Mil 6. Commercial Housekeeping & Professional Front Office management by Robert H. Woods	

Semester : IV	Specialization : Tourism and Hospitality Management	Semester Exam			L/W	Credits
Code: 405 IV	Facility and Security Management	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. Describe the theoretical aspects of utility systems, energy conservation, mechanical equipment and building design 2. Organization and Management of Maintenance department 3. Describe the basics of HVAC, electrical, water, sewer, refrigeration and illumination system and safety and security systems in the hotel. 4. Explain how Green Management practices can contribute to the overall sustainability of the hotel area.					
Course Outcomes	• Ability to manage all the facilities of the hospitability industry and ensure safe, secured and well maintained services provided to the customers					

Module1	Introduction to Facility Management	10

Role of facilities – Cost associated with facilities- Design considerations- Impact of facility design on facility management- Planning considerations- Planning of office area, food & beverage service outlet areas and service support areas- Management's responsibilities towards facility management- Responsibilities of facility manager and facility department.

Module2	Maintenance Management System	10

Goals – Organization in star rated hotels- Types of maintenance and repair- Contract maintenance services- Computerized and internet based services-Budgeting for POM and utilities- Capital expenditure management.

Module3	Heating, Electrical, Lighting and Laundry Systems	10

Heating system: Heating sources and equipment- Cooling sources and equipment- HVAC system: types, maintenance and control. Electrical system: components- billing methods of electric utilities- telecommunications system. Lighting system: light sources- lighting system design and maintenance- energy conservation opportunities. Laundry system: equipment design factors- maintenance- emerging trends.

Module4	Environment and Sustainability Management	10

Motivations for environmental concern- Pollution and control: air, water and noise- Water and sanitation- Land use planning and management- Involving staff, customers, communities and partnerships.

Module 5	Safety and Security Systems	10

Building design, maintenance and safety- Safety in the guest bath- Fire safety: prevention, detection, notification, suppression and control- Evacuation plans-Security: key controls, electronic locks- Terrorism, anti-social and extra ordinary events		
Module 6	**The Security Department**	**10**
Role and functions of the Security Department, Traditional Responsibility, Court Mandated Standards – Physical or property related, Personnel Related, Administrative or procedure related.		
Recommended Books	1. Managing facility by Christine Jones - Hotel facility Planning by Tarun Bansal Hotel housekeeping Operations and Management - by G Raghubalan 2. Hotel Housekeeping Operations and Management by G Raghubalan The Professional Housekeeper by Georgina Tucker 3. Bernard Davis, Andrew Lockwood and Sally Stone. Food and Beverage Management. Third Edition. Elsevier. 1998 4. John A. Cousins, David Foskett, Cailein Gillespie. Food and Beverage Management. Prentice Hall. 2002 5. Parvinder S. Bali. Food Production Operations. Oxford. 2009 6. Denney G. Rutherford and Michael J. O'Fallon. Hotel and Management Operations. Fourth edition. John Wiley & Sons, Inc. 2007 7. Krishna Arora. Theory of Cooking. Frank Bros. & Co. 2010. 8. Managing the Lodging Operation – Robert Christie Mill, Pearson Education	

Semester : IV	Specialization : Tourism and Hospitality Management	Semester Exam			L/W	Credits
Code: 405 V	Hospitality and tourism Marketing.	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To educate concepts of Hospitality and Tourism Marketing 2. To teach importance of Customer service in Hospitality and Tourism industry					
Course Outcomes	• Knowledge about Recent marketing Trends in Hospitality and Tourism industry • Application of marketing Mix for Hospitality and Tourism Businesses					

Module1	Marketing Concepts	10

Concept and definition and its significance in tourism industry. Significance of service and characteristics of service marketing, Characteristics with Special Emphasis on Tourism Services, differentiation of product marketing and service marketing, Defining marketing mix, the 7 P's of marketing mix

Module2	Developing Marketing Opportunities and Strategies	10

Marketing Information Systems and Marketing Research, Consumer Markets and Consumer Behaviour, Business Markets and Buyer Behaviour, Market Segmentation - Targeting and Positioning for competitive Advantage

Module3	Marketing Mix in Tourism Industry	10

Product: Definition and levels, nature of tourism product, Product life cycle (PLC) . Branding concept and need of branding of a product for a tourism company.

Pricing: Definition and influencing factors; Major pricing strategies for products of tourism industry

Module4	Promotion	10

Major tools of Promotion Mix- Word-of-Mouth Information, Advertising, Sales Promotion, Public Relation, Personal Selling; Importance of Advertising in Tourism, Selection of message and media, Media timing. Role of Digital Marketing in Hospitality and Tourism Role of Travel Agency and Tour Operator as intermediaries of Tourism Industry

Module 5	Managing Customer Service	10

Factors affecting Customer Service, Service Gaps, Tangibles and physical facilities in Customer service in Hospitality Industry – Reliability, Responsiveness, Assurance, Empathy, Upward Communication, Standardization of Services, Managing Quality in Customer service

Module 6	Destination Marketing	10
Necessary attributes for an ideal tourist destination, Destination life cycle, Marketing strategy for promotion and development of a tourist destination. Destination planning and product diversification, marketing strategy in the new digital age —E business, E commerce and e marketing. Role of media in promotion of destination marketing.		
Recommended Books	1. Kotler, P, Bowen, J & Makens, J : Marketing for Hospitality and Tourism, Prentice Hall 2. Bisht, S.S. : Tourism Marketing, Market Practices in Tourism Industry, Sarup Book Publishers Pvt. Ltd. 3. Holloway, J.C., Plant, P.V. (1988): Marketing for Tourism, Pitman Publishing, London 4. Jha, S.M.: Tourism Marketing 5. Stephan, F. et al (): Tourism Marketing and Management Handbook, Prentice Hall 6. Wahab, S. G. : Tourism Marketing, Tourism International Press 7. Woodruffe, H. : Service Marketing, Macmillan India Ltd. 8. Managing the Lodging Operation – Robert Christie Mill – Pearson Education	

Semester : IV	Specialization : Production and Materials Management	Semester Exam			L/W	Credits
Code: 406 III	Industrial Engineering	Theory	I A	Total		
Subject Title		80	20	100	04	04
Course Objectives	1. To teach work study and method study 2. To make students familiar with standard time and work measurement in manufacturing environment					
Course Outcomes	• Ability to measure the outcome of work in respect of utilization of resources and evaluate productivity • Ability to indentify processes that can be undertaken for BPR to improve productivity					
Module 1	Productivity					10
Production System. Definition of Productivity, Factors affecting productivity, Kinds of Productivity Measures, Increasing Productivity of Resources						
Module 2	Work Study & Method Study					10
Definition and Concept, Objectives and need, Basic Procedure. Method Study: Need for method study, Procedure, Principles of motion Economy. Recording of Method Study: Use of various charts, Outline charts. Flow process chart for Worker and Materials and Equipment. Man-machine chart, SIMO Chart, Multiple Chart, Multiple Activity Chart, Travel Chart, String diagram.						
Module 3	Work Measurement					10
Technique of work Measurement including estimating, Stop Watch time study, Pre-determined time standards, Synthetic estimate of work times, Activity Sampling.						
Module 4	Computation of Standard Time					12
Elements, Types of Elements, Performance Rating, Allowances, Need for Allowances, Types of Allowances.						
Module 5	Ergonomics					10
Nature of Ergonomics, Factors in ergonomics, Socio-technical System.						
Module 6	Business Process Reengineering					08
Concept of BPR, process of BPR, prerequisites for effective BPR implementation, application of BPR in productivity improvement.						
Recommended Books	1. Work Study – I.L.O. 2. Work study of Ergonomics – L. C. Jhamb 3. Work Study – Curie and Faraday 4. Industrial Engineering and Management – O. P. Khanna					

Semester : IV	Specialization : Production and Materials Management	Semester Exam			L/W	Credits
Code: 406 IV	Quality Management	Theory	I A	Total		
Subject Title		80	20	100	04	04
Course Objectives	1. To teach importance of quality in manufacturing concern 2. To teach various methods and techniques to improve and control quality of production					
Course Outcomes	• Appreciate the importance the quality methods and techniques to ensure accuracy in quality output.					

Module 1	Introduction to Quality Management	10
Evolution of Quality Management Concepts of Product and Service Quality Dimensions of Quality Deming's, Juran's, Crosby's Quality Philosophy Quality Cost, importance of Quality in modern business		
Module 2	**Product Quality Improvement**	**10**
Quality Function Deployment Robust Design and Taguchi Method Design Failure Mode &Effect Analysis Product Reliability Analysis Six Sigma in Product Development.		
Module 3	**Quality Tools and Techniques**	**10**
Problem solving techniques of Quality, Root cause analysis, Quality tools, decision matrix, Benchmarking as a Quality Control Tool		
Module 4	**Statistical Quality Control**	**12**
Statistical Quality Control (SQC) Concepts, Acceptance Sampling by variables and attributes Control Charts for variables, fraction defectives and defects. Seven Tools of Analysis –Control Chart, Pareto Diagram, Ishikawa Diagram, Histogram, Flow Charts, Scatter Diagram, and Stratification – New Seven Analysis tools.		
Module 5	**Quality Control management**	**10**
Quality Assurance/ Quality Control, Consequences of poor-quality management, Tolerances, over control and under control, standard operating procedures of quality management.		
Module 6	**Quality Management systems and quality Awards**	**08**
Service Quality Six sigma for Process Improvement ISO 9001 and QS 9000 Quality Audit, Quality Circles. Quality awards in different sectors: Malcolm Baldrige National Quality Award, Deming Prize-categories-criteria-committee, Rajiv Gandhi National Quality Award- Eligibility requirements- Award categories- Assessment criteria, IMC Ramakrishna Bajaj National Quality Awards, Award categories, Award criteria, Quality Bodies in India, EFQM award		

Recommended	1. Total Quality Management, Dr. D. D. Sharma, Sultan Chand & Sons

Books	2. Total Quality Management, K. Shridhar Bhat, Himalaya Publishing House 3. Total Quality Management, Shailendra Nigam, Excel Books 4. Production and Operations Management, K. Ashwathapa & K. Shridhara Bhatt, Himalaya Publishing House 5. Fundamentals of Quality Control and Improvement, Mitra A., PHI, 2nd Ed. 6. The Management and Control of Quality, J Evans and W. Linsay, 6'th Edition. 7. Total Quality Management, Dale H Besterfield, Pearson Education, New Delhi 8. Total Quality Management, Juran Joseph M, McGraw Hill. 9. Quality Control and Total Quality Management, Jain, Tata McGraw Hill.

Semester : IV	Specialization : Production and Materials Management	Semester Exam			L/W	Credits
Code: 406 V	World Class Manufacturing	Theory	I A	Total		
Subject Title		80	20	100	04	04
Course Objectives	1. To make students aware about importance of world class manufacturing with respect to domestic and international businesses 2. To make students knowledgeable regarding social responsibility of manufacturing in respect of environment, human resource, etc.					
Course Outcomes	• Appreciate the importance of maintaining excellent manufacturing environment and practices for establishing global presence					
Module 1	**World Class Manufacturing Environment**					10
Imperatives for success, System approach and change in mindset, Strategic decisions in Manufacturing Management. Choice of technology, Capacity and layouts, Automation in Material handling system.						
Module 2	**Globalization and Manufacturing**					10
State of international business Excellence, Globalization and Global Companies. Managerial attitude towards globalization of business, entering the International Area, Managerial challenges for the future, Experience of Indian Companies in World Class Manufacturing ,Characteristics of WCM companies, what is world class Performance – Six Sigma philosophy, Concepts of benchmarking and best practices						
Module 3	**Human Resource Management in WCM**					10
Adding value to the organization. Organizational learning, People as problem solvers, New organizational structures. Associates and Facilitators, Motivation and reward in the age of continuous improvement.						
Module 4	**Production Process Reliability**					12
Total productive maintain concept of reliability, reliability improvement, concept of maintainability and maintainability improvement.						
Module 5	**Automation in design and Manufacturing**					10
Role of IT in World class Manufacturing, Concept of Flexible Manufacturing System, Group technology, Cellular Manufacturing Systems.						
Module 6	**Environment Pollution**					08
Factors causing Pollution, Effect on human health, Control of environment Pollution.						

Recommended Books	1. World Class Manufacturing – K. Shirdhar Bhat 2. Management today- Burton and Thakur. 3. Operation Management- Hughes, Chris. 4. Supply Chain Management for competitive advantage – R. Raghavan 5. World Class Manufacturing - Strategic Perspective - B.S. Sahay, KBC Saxena, Ashish Kumar. (Mac Milan) 6. Making Common Sense Common Practice – Models for manufacturing excellence –Ron Moore (Butter worth Heinmann) 7. The Toyota Way - Jeffrey K. Liker – (Tata McGraw Hill) 8. Just In Time Manufacturing – M. G. Korgaonkar

Semester : IV___	Specialization : Human Resource Management	Semester Exam			L/W	Credits
Code: 407 III	Industrial Relations and Labour Laws	Theory	I A	Total		
Subject Title		80	20	100	04	04
Course Objectives	1. To provide knowledge regarding the legislative framework in respect of workforce and industrial relations. 2. To provide knowledge regarding terms and conditions related to compensation and employee welfare					
Course Outcomes	• Ability to operate within the legislative framework applicable to various levels of employees and types of industries. • Ability to handle grievance and disputes as per the legal procedures					
Module 1	**Industrial Relations**					**10**
Concepts, Definition, Actors to Industrial relations, Approaches to Industrial Relations, Collective bargaining- meaning, definition, importance, types. Workers participation: Concept & meaning, Aims & objective, Forms & levels of participation						
Module 2	**Industrial Disputes**					**8**
Definition, Causes of Industrial Disputes, Types of disputes, Prevention of disputes, Settlement of Industrial Disputes. Provisions related to Industrial Disputes Act, 1947.						
Module 3	**Grievance & Disciplinary Procedure**					**12**
Characteristics of grievance, Need for Grievance procedure, Causes, Grievance procedure, Meaning and significance of employee discipline, service rules and standing orders, misconduct, suspension and subsistence allowance, show cause notice, investigation, enquiry and charge sheet, principles of natural justice and enquiry procedure.						
Module 4	**Legislations to Factory**					**10**
1. Factories Act 1948. 2. Industrial Employment standing order Act 1946 3. The Trade Unions Act 1926,						
Module 5	**Wage Legislation**					**12**
1. Minimum wages Act 1948 2. Payment Of wages Act 1936 3. Payment of Bonus Act 1965						

Module 6	Social Security Legislations	10
1. Provident Fund Act 1952 2. Payment of Gratuity Act 1972 3. The Employees Pension Scheme 1995 4. The Maternity Benefit Act, 1961		
Recommended Books	1. Arun Monappa, Industrial Relations, Tata McGraw Hill Publishing Company Ltd. 2. Mamoria C.B, Dynamics of Industrial relations, Himalaya Publishing House 3. Michael R Carrel and Christina Heavrin, Labour Relations and Collective Bargaining- Private and Public Sectors, Merrill. 4. PRN Sinha, Industrial Relation, Trade Union, Labour Legislations, Person Education. 5. Pramod Verma, Management of Industrial relations, Reading and Cases, Oxford and IBH Publications. 6. Sharma AM, Industrial Jurisprudence and Labour Legislation, HPH. 7. Singh B.D, Industrial Relations – Emerging Paradigms, Excel Books. 8. Srivastava S.C. Industrial Relations and Labour Laws, Vikas Publishing House Pvt. Ltd 9. V. S. P. Rao.- Human Resource Management, HPH.	

Semester : IV	Specialization : Human Resource Management	Semester Exam			L/W	Credits
Code: 407 IV	Competence Based HRM.	Theory	I A	Total		
Subject Title		80	20	100	04	04
Course Objectives	1. The objective of the course is to enable the students to understand the competency framework, competency based management system					
Course Outcomes	• Students will understand the competency based HR practices and its impact on individual and organization's performance • Students will be able to analyze, and implement the competency concepts at various levels in the organization					
Module 1	**Competency Management**					**08**
Introduction to Competency Management; Competency Model-Types of competencies; Competency framework- Competency Dictionary, Competency Band Matrix, Job Competency Profile, Competency Assessment Tools; Competency based HR Processes; Assessment and Development Centers						
Module 2	**Human Resource Development**					**08**
Definition, Objectives, Principles, Dynamics factors around HRD, Aligning HRD functions to business goals, Challenges to HRD.						
Module 3	**Competency based Training and Development**					**10**
Analyzing Organisational Needs; Training Objectives; Right Conditions for Training; Selection of right type of training methodology; New Trends in Training.- Orientation, Basic skills, Team training and Cross training, Diversity Training						
Module 4	**Performance Appraisal**					**12**
Purpose, developing effective appraisal program – Performance standards, Compliance with law, who should appraise Feedback training, Training appraisals. Appraisal Interviews, Potential Appraisals-Concepts, Steps, Indian companies appraising potential.						
Module 5	**Base Compensation and Competency based compensation**					**12**
Concept, Objectives, Components of Remuneration – Financial & Non-financial. Factors influencing compensation levels, wage policy in India – Minimum wage, Fair wage and living wage; Incentives-Concept, Incentives for professional employees; Types of Fringe Benefits. Linkage between competencies and Rewards						

Module 6	Information Technology in Human Resources	10
HR Transformation in the digital age; Goals of implementing an HRMS; Types of HRMS; Choosing the right HRMS Solution; Components of HRMS; HRMS Modules; Implementation of an HRMS; HR Portals; Current Trends- Information technology in Human Resources		
Recommended Books	1. Competency based HRM: A strategic resource for competency mapping, assessment and development centres --- Ganesh Shermon (McGraw Hill Education) 2. Human Resource Management--- Sharon Pande, Swapnalekha Basak (Vikas Publishing House Pvt. Ltd) 3. Essentials of Human Resource Management--- P. Subba Rao (Himalaya Publication) 4. Advanced Human Resource Management--- S.C Gupta (Ane's Books Pvt. Ltd.) 5. Training and Development - G. Pandu Naik (Excel Books) 6. Human Resource Management, - Snell, Bohlander, Vohra (Cengage Learning) 7. Human Resource Management - V. S. P. Rao (Excel Books)	

Semester : IV	Specialization : Human Resource Management	Semester Exam			L/W	Credits
Code: 407 V	International Human Resource Management	Theory	I A	Total		
Subject Title		80	20	100	04	04
Course Objectives	1. The objective of the course is to provide more information towards HR practices in the global context					
Course Outcomes	• Students will understand the HR practices followed in the global context • Students will be able to analyze systematically and understand the differences in the HR functions according to the nationality, nature of business and strategy adopted.					
Module 1	**Introduction to IHRM & Culture**					**10**
Concept of Expatriate; IHRM concept & IHRM Model; Domestic Vs International HRM; What is culture; Cultural Sensitivity; Hofstede's Model of four cultural dimensions						
Module 2	**International Recruitment and Selection**					**10**
Recruitment- Recruitment at Macro Level- (International staffing approaches); Recruitment at Micro Level; Recruitment Techniques; Selection- Selection Techniques; Causes of Expatriate failure						
Module 3	**International Training and Development**					**10**
Why Global training?, Areas of Global Training; Expatriate Training (Cross Cultural Training); Language Training; Global Mindset Training; Pre-Departure Training; Training for Expatriate; International Team Training						
Module 4	**International Compensation Management**					**12**
Objectives of International Compensation; Complexities in International Compensation Management; Factors affecting International Compensation; Components of International Compensation; Approaches to International Compensation Management; Compensation approach in various countries						
Module 5	**Strategic Perspectives in Training and Performance Appraisal**					**10**
Challenges of International Performance Management; Areas to be appraised; Organizational Role Expectations; Systems of Performance Appraisals; Making Performance Appraisal effective.						
Module 6	**International Industrial Relations**					**08**
Concerns of Trade union in Multinational Companies; Quality Circles and Participative Management; Shifts in Industrial Relations in the global context						

Recommended Books	1. International Human Resource Management--- P. Subba Rao (Himalaya Publication) 2. International Human Resource Management--- K. Ashwathappa, Sadhna Dash (Tata McGraw Hill Education) 3. International Human Resource Management--- Peter J. Dowling, Marion Festing, Allen D. Engle (Cenage Learning) 4. International Human Resource Management--- Dr. Nilanjan Sengupta, Dr. Mousumi Bhattacharya (Excel Books) 5. International Human Resource Management--- Peter Dowling, Denice E. Welch (Cenage Learning)

Semester: IV	Specialization : International Business Management	Semester Exam			L/W	Credits
Code: 409 III	International Marketing	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To make students aware regarding recent trends in international marketing 2. To make students know factors affecting global product decisions					
Course Outcomes	• Ability to undertake marketing activities for international markets • Ability to apply international marketing concepts in international business					
Module1	Introduction to International Marketing					10
Concept, Importance of global marketing, driving and restraining forces affecting global integration and global marketing, global marketing environment-economic, social and cultural, political and legal						
Module2	Analyzing and Targeting Global Marketing Opportunities					10
Global customers- regional market characteristics, global buyers, the global marketing plan, global marketing information systems and research, segmentation, targeting and positioning.						
Module3	Global Product Decisions					10
Definition, classification, new products in global marketing development, product adoption, branding decisions, brand characteristics, packaging functions and criteria, international product life cycle, Marketing strategy: global brand and mega brands, marketing of services.						
Module4	International Pricing Decisions					10
Basic pricing concepts, environmental influences on pricing decisions, global pricing objectives and strategies, global pricing- three policy alternatives, transfer pricing, gray market goods, dumping.						
Module 5	International Marketing Communication & Social Networking					10
Marketing environment and promotion strategies, international promotion mix, global advertising and branding, global advertising content: the extension v/s adaptation, Media structure, planning media strategy, corporate advertising, personal selling, sales promotion, direct marketing, trade shows and exhibitions, sponsorship promotion, public relations. Social Media, Marketing dimensions of social media, social media and international communication, social media around the world, social media success strategies in international marketing.						
Module 6	Global Marketing Channels and Physical distribution					10
Channel objectives and constraints, distribution channel: terminology and structure, international channel and innovation, channel strategy for new market entry						

Recommended Books	1. Global Marketing Management – Keegan and Bhargava-Pearson 2. International Marketing – Francis Cherunilam – Himalaya Publication House 3. International Marketing - Onkvisit, Sak., and John J. Shaw- Tata McGraw Hill 4. International Marketing-Czinkota & Ronkainen-Cengage Learning 5. International Business – P. Subha Rao - Himalaya Publication house

Semester : IV	Specialization : International Business Management	Semester Exam			L/W	Credits
Code: 409 IV	EXIM Management	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To make students aware regarding Foreign Trade policy and its impact on Export and import activities. 2. To teach students the trends in India's Foreign Trade and government schemes for foreign trade					
Course Outcomes	• Appreciate Government's policies and schemes in respect of EXIM Trade • Appreciate the role of Financial institutions to support EXIM trade					

Module1	Foreign Trade Policy	10

Introduction, objectives of new foreign trade policy, The Action Plan - special focus imitative, market diversification, technological up gradation, Highlights of Trade Policy – stable policy environment, EPCG scheme, different sectors, EOU's, wavier of incentives recovery on RBI

Module2	Trends In India's Foreign Trade	10

Introduction, parameters of Indian foreign trade, foreign trade strategy, trade scenario, import of principal commodities, export of India, Indo-US, Indo-China trade, Indo-Japan, trade with ASEAN, impact of recession on Indian export.

Module3	Foreign Exchange Management in India	10

Introduction, FEMA & FERA, objectives and scope of FEMA, powers of RBI, important provisions of foreign exchange management act, directorate of enforcement, recent measures of manage foreign investment, FDI, FPI, ECB, power of central government.

Module4	Export Promotion Scheme	10

Introduction, Duty Drawback (DBK) Scheme- Scheme for AIR, brand rate of duty drawback scheme, procedure for claiming drawback, Duty Exemption Scheme – Advance Authorization & DFIA, Duty Remission Scheme- DEFB & DBK, Export Promotion Capital Goods (EPCG) Scheme , Export Infrastructure and Allied Activities, served from India scheme.

Module 5	Export Oriented Government Institutions	10

Introduction, Export Development Authority (APEDA), functions, composition, Marine Products Export Development Authority (MPEDA) – structure, activities, work program, foreign policy regarding marine products, focus market scheme, international shows, export promotion council, handlooms (HEPC) and Appeal (AEPC), ITPO activities, Indian institute of foreign trade.

Module 6	Role of Financial Institution	10

Introduction, RBI – working group to review the scheme of export credit, recommendation, RBI action, RBI and global slow-down, EXIM bank of India – objectives, functions, role, The Export Guarantee Corporation of India (ECGC) – functions, help to exporters, policies & guarantees, commercial banks

Recommended Books	1. EXIM Management – S. Soundain – MJP Publishers 2. Export policy, procedure and documents- M.I. Mahajan- Snow White Publication. 3. International Marketing Management – M.V. Kulkarni – Everest Publishing house 4. International Business- P. Subba Rao- Himalaya Publication 5. International Marketing – Francis Cherunilam – Himalaya Publication house 6. International Marketing - Onkvisit, Sak., and John J. Shaw- Tata McGraw Hill

Semester : IV	Specialization : International Business Management	Semester Exam			L/W	Credits
Code: 409 V	International Logistics	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To make students understand the rile of logistics companies for smooth conduct of international business 2. To make students learn various modes of transport supporting international trade 3. To make students aware of importance of inventory, packaging and warehousing in international logistics system.					
Course Outcomes	• Ability to decide appropriately regarding all elements of logistics in respect of foreign trade					

Module1	Logistics Overview & Marketing	10

Definition, Evolution, Concept, Components, Importance, Objectives; Logistic Subsystem; The work of Logistics; Integrated Logistics; Barrier to Internal Integration

International Marketing: Introduction, Definition, Basis for International Trade, Process, Importance; International Marketing Channel: Role of Clearing Agent, Various Modes of Transport, Choice and Issues for Each Mode, Transport Cost Characteristics

Module2	Transportation Functionality And Principles	10

Multimodal Transport: Modal Characteristics; Modal Comparisons; Legal Classifications; International Air Transport; Air Cargo Tariff Structure; Freight: Definition, Rate; Freight Structure and Practice

Module3	Containerization And Chartering Containerization	10

Genesis, Concept, Classification, Benefits and Constraints; Inland Container Depot (ICD): Roles and Functions, CFS, Export Clearance at ICD; CONCOR; ICDs under CONCOR; Chartering: Kinds of Charter, Charter Party, and Arbitration.

Module4	Inventory Management And Packaging	10

Introduction, Characteristics, Functionality, Components, Planning; Packaging and Packing: Labels, Functions of Packaging, Designs, Kinds of Packaging; Packing for Transportation and Marking: Types of Boxes, Container, Procedure, Cost, Types of Marking, Features of Marking

Module 5	Inventory Flow And Warehousing	10

Approaches to Inventory Management in Global Supply Chain Management; Distribution Resource Planning; Symptoms of poor Inventory Management, Modeling in Supply chain: inventory models, safety stock determination for service level, Objectives and functions of warehousing; Warehousing evaluation and requirements; Warehousing location strategies

Module 6	Performance Measurement And Trends	10
Dimensions of Performance Metrics, Approaches/tools for Performance Measurement, Measuring logistics cost and performance. Benchmarking the supply chain, Performance measurement and evaluation in global supply chains, Impediments to improve Performance, Trends in International supply chain management.		
Recommended Books	1. International Marketing - Sak Onkvisit & John J. Shaw,- Prentice Hall of India 2. International Marketing - Gupta and Varshing, - Sultan Chand and Sons 3. Logistic Management and World Sea Borne Trade - Multiah Krishnaveni, - Himalaya Publication 4. Logistic and Supply Chain Management - Donald J. Bowerson, - Prentice Hall of India	

Semester : IV	Specialization : Banking Management	Semester Exam			L/W	Credits
Code: 410 III	E-Banking	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To make the students conversant with e-banking products in terms of delivery, security and controls with reference to India					
Course Outcomes	• Capability to explain and operate all types of E-Banking products and services safely and efficiently.					
Module 1	Introduction to Banking Technology					8
Introduction to E-Banking-, Need for Bank computerization. Impact of Information Technology on Banking- Changing Financial Environment and IT as a strategic response , Centralized Banking System / Core Banking System						
Module 2	Introduction to Electronic Banking					10
Concept and Meaning, Evolution of E-Banking, Advantages, Disadvantages , barriers and Risks in e-Banking, Infrastructure components of E-banking						
Module 3	Delivery Channels & Payment Systems					12
Delivery Channels-ATM, EFT, POS, Phone Banking, Internet Banking, SMS Banking, Mobile Banking, Credit/Debit Cards, Smart Cards, E-Commerce-Secure Electronic Transfer(SET), Payment Gateways (Credit card/Debit cards), Authentication of payments, etc.						
Module 4	Security, Controls and Guidelines					10
Security, Controls and Guidelines- Threats to Information System: i)Physical (Insiders/outsiders) ii) Viruses, Worms, Trojan horse, Malwares, Software bombs, Phishing, Spoofing, Spamming, denial of service attacks, etc., Information System Security Measures, policy, controls.						
Module 5	RBI Committee Reports					10
Basel guidelines for E-Banking, various RBI Committee Reports on Information Systems.						
Module 6	Managerial View of e-Banking					10
Management Challenges –Customer Expectations, Security problems, Technological Challenges. Change Management, Managing relationship with customers, Problematic issues in E-banking Management						

Recommended Books	1. Internet Banking & Shopping by G Chapman 2. E Banking & emerging multidisciplinary processes – Mohommad Ali Sarla 3. Indian Banking-Nature and Problems, Vasantha Desai, Himalaya Publishing House, Mumbai. 4. Banking with Technology, Uppal RK, New Century Publications, New Delhi 5. Information System for Modern Management Murdick RG, Ross JHE and Clagget JR Prentice Hall of India, New Delhi. 6. E-Banking Management, Mahmood Shah & Steve Clarke, Information Science Reference, (ISBN - 978-1-60566-252-7) 7. Principles and Practices of Banking – Indian Institute of Banking & Finance – Macmillan (ISBN : 023-063-611-X / 978-0230-63611-8)

Semester : IV	Specialization : Banking Management	Semester Exam			L/W	Credits
Code: 410 IV	Marketing of Financial Services	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To know financial services. 2. To understand marketing of financial services.					
Course Outcomes	• Ability to implement marketing strategies in financial services • Ability to appreciate emerging trends in financial services marketing.					
Module1	Financial Service					10
Evolution of Financial Services – Meaning of Financial Services – Various types of Financial Services, Fund based and Non-fund based – Significance of Financial Services – Growth of Financial Services in India – Emerging Trends in Financial Services – Constraints to the growth of Financial Services						
Module2	Market Segmentation for Banks					10
Introduction – Concept of Market Segmentation, Purpose of Market Segmentation of Banks, Importance of segmentation of banks, segmentation strategy, criteria of segmentation, stages of segmentation effective segmentation.						
Module3	Merchant Banking					10
Merchant Banking – Facets of Merchant Banking - Functions – Legal and Regulatory Frameworks – Relevant Provisions of Companies Act – SEBI Guidelines – Role in Issue Management, Appraisal of Projects, Designing Capital Structure and Instruments – Issue Pricing.						
Module4	Other Financial Services					10
Other Financial Services – Leasing and Hire Purchase – Factoring and Forfeiting – consumer Finance – Securitization – Venture Capital – Loan Syndication – Custodial and Depository Services – Credit rating.						
Module 5	Marketing of Financial Services					10
Marketing of Financial Services – Categories of Financial Products – Insurance, Banks, Stocks, Mutual Funds, Pension Plans, other Savings Products – Financial Services Marketing Environment – Micro and Macro Environmental Forces – Marketing Mix for Financial Services – Promotional Strategies – Customer Relations and Servicing.						
Module 6	Marketing of International Banking Services					10
Introduction – Concept of International Marketing, salient features of International Bank Marketing, the International Marketing of services, letters of credit, sale and purchase of foreign currency, strategic marketing for international banking services.						

Recommended Books	1. Financial Services, M. Y. Khan Tata McGraw Hill. 2. Indian Financial System Machiraju, Vikas Publishing House 3. Emerging Scenario of Financial Services E. Gordon and K. Natarajan Himalaya Publishing House, Mumbai. 4. Merchant banking and Financial Services S. Gurusamy, Cengage South – Western. 5. Mutual Funds in India, Sadhale H., Sage, New Delhi 6. Financial Markets and financial services, Vasant Desai Himalaya Publishing house. 7. Bank Marketing - S. M. Jha Himalaya Publishing House 8. General Bank Management, Indian Institute of Banking & Finance - Macmillan Publication

Semester : IV	Specialization : Banking Management	Semester Exam			L/W	Credits
Code: 410 V	Retail & Universal Banking	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To enable the students familiarizing with operational aspects of retail Banking products and developing suitable strategies to broaden the retail client base.					
Course Outcomes	• Appreciate to role of Retail banking and ability to undertake the challenges and activities of retail banking.					

Module1	Retail Banking	10

Concept of Retail Banking-Distinction between Retail and Corporate/Wholesale Banking; Retail Products Overview: Customer requirements, products development process, Liabilities and Assets Products, Approval process for retail loans, credit scoring.

Module2	Types of Products	10

Important Retail asset products: Home loans, Auto/vehicle loans, Personal loans, Educational loans - Study of these products in terms of Eligibility, Purpose, Amounts, Margin, Security, Disbursement, Moratorium, Prepayment issues, Repayments/Collection; Credit/Debit Cards-Eligibility, Purpose, Amounts, Margin, Security, Process of using the cards, Billing Cycle, Credit Points; Other Products / Remittances/Funds Transfer.

Module3	Retail Strategies	10

Retail Strategies: Tie-up with institutions for retail loans; Delivery Channels- Branch, Extension counters, ATMs, POS, Internet Banking-Banking; Selling process in retail products; Customer Relationship Management-Role and impact of customer relationship management, stages in CRM process; Technology for retail banking.

Module4	Trends in Retailing	10

Trends in Retailing-New products like insurance, Demat services, online/phone banking, property services, investment advisory/wealth management, Reverse Mortgage-Growth of e-banking, Cross selling opportunities.

Module 5	Recovery of Retail Loans	10

Recovery of Retail Loans-Defaults, Rescheduling, recovery process-SARAFAESI, Act, DRT Act, use of Lok Adalat forum, Recovery Agents-RBI guidelines.

Module 6	Universal Banking	10

Introduction, Definition, Evolution, Importance and Scope of Universal Banking. Comparison of Commercial Banking and Development banking, Universal banking and consumer finance. Universal banking and future of business lending.

Recommended Books	1. Fundamentals of Retail Banking Agarwal, O.P., Himalaya Publishing House, Mumbai. 2. Banking Marketing Jha, SM, Himalaya Publishing House, Mumbai 3. Indian Financial System, Khan, MY, Tata McGraw Hill Publishing Company Ltd., New Delhi 4. Modern Banking in India, Uppal;, R. K, & Bishnupriya N, New Century Publications, New Delhi 5. Indian Institute of Banking & Finance, Retail Banking, Mumbai 6. Banking Services and IT, Uppal, RK, New Century Publications, New Delhi 7. Introduction to financial Planning by Taxmann. 8. Elements of Banking and Insurance, by Sethi, Jyotsna, Bhatia. 9. Banking Theory and Practice – K. C. Shekhar, Lwekshmy Shekhar – S. Chand Publishing

Semester : IV	Specialization : Systems Management	Semester Exam			L/W	Credits
Code: 411 III	Relational Database Management System	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To make the students understand the working at RDBMS as Back End Software. 2. To make students understand elements of Database Designing 3. To make students understand SQL commands 4. To make students understand use of Report writing interface to extract data from database in required format.					
Course Outcomes	• Understanding of overall working and capability of RDBMS software • Ability to design appropriate database for any organization after proper study of the organization • Efficiency in guiding database building and query handling for an organization					
Module 1	RDBMS Introduction					10
History, Advantages and limitations of RDBMS; Users of RDBMS, Software Modules in RDBMS; Architecture of RDBMS.						
Module 2	Modeling Techniques					10
Different Types of Models, Hierarchical Database, Network Database, Relational Database Introduction, Comparison between HDB-NDB-RDB, ERD in detail, Codd's Rules;						
Module 3	Relational Database Design					10
Database Design – ER to Relational Functional dependencies, Normalization- Normal forms based on primary keys (1 NF, 2 NF, 3 NF, BCNF, 4 NF, 5 NF), Advantages and Disadvantages of Normalization, Anomalies						
Module 4	SQL Basics					10
Basic Structure, Data Types, Operators- Arithmetic, Logical, Comparison. Functions- Date- Sys_date, next_day, Add_months, last_day, months_between, Numeric- round, trunc, abs, ceil, cos, exp, floor Character- initcap, lower, upper, ltrim, rtrim, translate, length, lpad, rpad, replace Conversion- to_char, to_date, to_number. Miscellaneous- Uid, User, nvl, vsize, decode, rownum Group function- avg, max, min, sum, count						
Module 5	SQL Commands					10
DDL commands-Create, Alter, Drop, Truncate, Rename, Constraints DML Commands- Insert, Update, Delete with where clause. Queries- SELECT Statement with all clauses, Sub-queries and joins						

Module 6	Report Writing	10

Title, Btitle. Skip, set, pause, column, sql.pno, Break on, computer sum, set server output on.	
Recommended Books	1. An Introduction to Database 2. Mastering SQL- Martine Gruber-BPB 3. Database System Concept 4. Database System-Connollytm-Pearson 5. Database Management System-P K Gupta-PHI 6. An Introduction to Database System-Date C J-Pearson 7. An Introduction to Database System-Bipin Desai-Galgotia

Semester : IV	Specialization : Systems Management	Semester Exam			L/W	Credits
Code: 411 IV	Security and Control Information System	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To make the students understand the concept of information security and importance of controlling the same in an organizational system, 2. To make students understand the need, importance, elements and features of Information Security 3. To make students understand different types of information security and control mechanism against unauthorized tampering of information.					
Course Outcomes	• Understanding of information security and its challenges • Ability to design an appropriate information security policy for information system of an organization					
Module 1	Security Concepts					12
Introduction, Need for security and control, risks to information system data and resources, Confidentiality, Integrity, Availability, Security policies, security mechanisms, assurance, Types of Security Introduction						
Module 2	Cryptography					14
Introduction, Historical background, Transposition/ Substitution, Caesar Cipher, Introduction to Symmetric crypto primitives, Asymmetric crypto primitives, and Hash functions, Secret Key Cryptography, Data Encryption Standard (DES), Advanced Encryption Standard (AES)						
Module 3	Authentication					8
Introduction, Basic concepts of identification and authentication, Password authentication, Authentication protocols						
Module 4	Trusted Intermediaries					8
Introduction, Public Key infrastructures, Certification authorities and key distribution centers.						
Module 5	Access Control					10
Introduction, Basic concepts of access control, Discretionary access control and mandatory access control, Lattice-based Models, Covert Channels, Role based Access Control						

Module 6	Security Audit	8
Introduction, Assurance and Evaluation of Secure Information Systems, Database Security (Security requirements in databases, Access control and authorization in databases, Inference control), Malicious software, Administrating Security (Risk Analysis, Security Planning, Organizational, Security Policies		
Recommended Books	1. Network Security: Private Communication in a Public World - Charlie Kaufman, Radia Perlman, and Mike Speciner, 2nd Edition, Prentice Hall, 2002 2. EDP Auditing by Ron Weber 3. PC and LAN security by Stephan Cobb 4. Enterprise Security- protecting information assets by Michael E. Kabey 5. Enterprise Disaster Recovery Planning by Miora 6. Computer Security for Dummies 7. Internet Security by Derek Atkins et al 8. Systems Audit - Revati Shriram	

<table>
<tr><td>Semester : IV</td><td colspan="2">Specialization :
Systems Management</td><td colspan="3">Semester Exam</td><td>L/W</td><td>Credits</td></tr>
<tr><td>Code: 411 V</td><td colspan="2" rowspan="2">Programming Concepts & Practices</td><td>Theory</td><td>I A</td><td>Total</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>Subject Title</td><td>80</td><td>20</td><td>100</td><td>4</td><td>4</td></tr>
<tr><td>Course Objectives</td><td colspan="7">1. To make the students understand the concepts and elements of computer programming.
2. To make students capable of building and presenting logic for any organizational problem and decision making situations
3. To make students understand the use of programming constructs in a computer program</td></tr>
<tr><td>Course Outcomes</td><td colspan="7">• Understanding of computer Programming elements and constructs
• Ability to decide proper flow of program and present the logic using standards</td></tr>
<tr><td>Module 1</td><td colspan="6">Introduction to Programming</td><td>8</td></tr>
<tr><td colspan="8">Structured Programming, Object Oriented Programming, Difference between Structured & OOP.</td></tr>
<tr><td>Module 2</td><td colspan="6">Programming Logic</td><td>12</td></tr>
<tr><td colspan="8">Algorithm, Flowchart, Identifiers, Data Types, Character Codes (ASCII).</td></tr>
<tr><td>Module 3</td><td colspan="6">Programming Components</td><td>12</td></tr>
<tr><td colspan="8">Variable, Constant, Variable Declaration & Initialization, Expressions, Array (single, Two-Dimensional)</td></tr>
<tr><td>Module 4</td><td colspan="6">Operators</td><td>8</td></tr>
<tr><td colspan="8">Arithmetic, Relational, Logical, Unary-Binary, Increment-Decrement, Assignment, Conditional. Operator Precedence</td></tr>
<tr><td>Module 5</td><td colspan="6">Branching & Looping Constructs</td><td>10</td></tr>
<tr><td colspan="8">Purpose, IF, IF-ELSE, Nested IF, SWITCH-CASE, FOR -NEXT, WHILE, DO-WHILE, Jump Statements – Break, Continue.</td></tr>
<tr><td>Module 6</td><td colspan="6">Functions</td><td>10</td></tr>
<tr><td colspan="8">Definition and Purpose, Inbuilt functions, User-defined, with and without Parameters, RETURN Statement, Local-Global variables, Recursion.</td></tr>
</table>

Recommended Books	1. Concepts, Techniques, and Models of Computer Programming - Peter Van Roy and SeifHari di- MIT Press 2. Computer Today - Suresh K Basendra - Galgotia Publications Pvt. Ltd. 3. Computer Programming in C - V. Rajaraman- PHI Learning 4. Computer Concepts and Programming in C - J. B. Dixit

Semester : IV	Specialization : Agriculture & Co-operative Management	Semester Exam			L/W	Credits
Code: 412 III	Agricultural Production Management	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To make students aware of the apicultural production system & its management 2. To make students knowledgeable regarding agricultural economics and farm technology					
Course Outcomes	• Ability to appreciate the nature of farm produce, its economy and technology and capability to manage Agricultural production					
Module1	Agriculture and Productivity Trends					10
Occupational Structure, Agricultural Production and productivity trends, Causes for low productivity						
Module2	Fundamentals of Farm Management					10
Scope of modern agriculture, special features of agricultural and industrial production, difference between farm and non-farm business management						
Module3	Farm Production Systems and Management Functions					10
Peasants, proprietorship, co-operative farming. Capital farming, corporate farming. Land tenure systems and agricultural production management						
Module4	Farm Economics					10
Demand for agricultural products, Production and supply of farm product- Production function and its type, Law of Diminishing Returns Input combinations; Production management decision-Factor factor decisions, factor-products decision, product-product decision, relationship between outputs.						
Module 5	Farm Technology					10
Effects of new technology, management and technology change, gains from technological improvement to producers and consumers, mechanism and automation. Green houses						
Module 6	Cost of Production & Other Issues in Farm Management					10
Farm records, Farm Accountancy, Farm Inventory, Depreciation, Farm Efficiency and measures. Problems on cost estimation Size-Productivity debate, Measurement of farm efficiently, Irrigation Management, Production Planning -Specialization and diversification						

Recommended Books	1. An Introduction to Agricultural Production Economics and Farm Management – Robertson C.A.- Tata McGraw Hill. 2. Farm Management Economics - Heady, Earl O and Jensen Herald R- Prentice Hall 3. Farm Planning and Control - Barnard C.S. and Nix J.S. 4. Fundamentals of Modern Agriculture - Blake C.D. 5. Fundamentals of Agriculture- Sandhu and Singh 6. Indian Agriculture - Agrawal A.N. 7. Elements of Farm Management.- Sharma A.N. and Sharma V.K.

Semester : IV	Specialization : Agriculture & Co-operative Management	Semester Exam			L/W	Credits
Code: 412 IV	Agro- Processing Industries & Rural Industrialization	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To make students aware regarding Rural industrialization and agro processing industry 2. To make students aware of various corporations supporting Agro processing and rural industrialization					
Course Outcomes	• Ability to understand the uniqueness of Agri processing and rural industries and accordingly manage them by taking support from various corporations and government schemes					

Module1	Rural Industrialization & Industries	10

Meaning of Rural Industrialization, Role of Agriculture in Rural Industrialization, Dependence on Agriculture, Policies for Agro development, Socio- Eco benefits of Rural Industries, Promotional measures, Need, Opportunities & Constraints Cottage & Small Scale Industries, genesis of Development of their Industries, Classification: Village & cottage of SSI, SSI: Role of SSI, Problems of SSI, Performance: Production, Employment, Export.

Module2	Khadi and Village Industry Corporation & Agro Processing Cooperatives	10

Introduction of KVIC, Organization & Administration of KVIC, Promotional measures of KVIC, Subsidies, Incentives, Financial Inputs.

Importance & Functions, Pattern of Organization & Management, Growth & Development, Recent positions, Difficulties & problems, role of Agriculture cooperative.

Module3	Agriculture Produce Pricing	10

Market forces: - Demand, Supply. Simple market model and Price Determination:-Tabular Approach, Graphical Approach. Fluctuations in Agriculture Prices, causes & Impact, Price Stabilization, trends in Agricultural Prices.

Module4	WTO & Its impact on Agro-based Industries	10

External trade in Agriculture Products, Share in export, Challenges, AOA, Role of Reserve Bank of India In the Agriculture Credit National Bank for agriculture and Rural Development (NABARD)

Module 5	Agro Processing Cooperatives in Maharashtra	10

Cooperative Sugar Industries, Cooperative Spinning Mills, Dairy Cooperatives, Fishery Cooperatives, Industrial Cooperative Management, Problems & Prospects for agro processing cooperatives.

Module 6	Rural Credit	10
Need, Objectives, Sources of Agricultural Finance, Rural indebtness, Factor analysis and implications, systems of rural and agricultural credits in India. Non Agricultural Credit Sector Urban Co-operative Banks: - objects, working of the society Urban Credit societies:- objects, working ,Employees credit societies: -objects, working		
Recommended Books	1. Agricultural Marketing in India - Acharya S. S & Agarwal N. L 2. Diffusion of Agricultural Innovation in village India - Dasgupta S 3. Rural Development - Desai Vasant 4. Planning for rural Development Issues & Case Studies - Dholkia R. H & Iyengar 5. Technological Change & Distribution of Gains in Indian Agriculture. - Hanumantha Rao C. H.- 6. Agriculture Problems in India, - Mamoria.	

Semester : IV	Specialization : Agriculture & Co-operative Management	Semester Exam			L/W	Credits
Code: 412 V	International Trade And Agriculture	Theory	I A	Total		
Subject Title		80	20	100	4	4
Course Objectives	1. To teach students the role of agriculture in international trade 2. To make students knowledgeable regarding the complexities of international trade of agricultural produce.					
Course Outcomes	• Ability to understand the policies regarding international trade of agricultural products and accordingly take decisions regarding the same.					

Module1	Scope, Gains and Policies from International trade	10

Theory of comparative advantages ; trade and welfare; factor mobility ; International capital flows; transfer of technology; Terms of credit comparative cost.

Tariffs & Quota, Effects of Tariff Monopoly and price discrimination, state Trading; Bilateral Trade; Multilateral Trade.

Module2	International Organizations to support Agricultural Trade	10

Organization and Objectives of International Organization like IMF, IBRD, IDA, IFC, & their Affiliates; The SDR Mechanism and its working; international liquidity problem; international monetary system & trade, GATT, UNCTAD. WTO - Organization & their functions.

Module3	World Trade Agreements,	10

trade liberalization, Regional Integration & Economic Growth; Import -Export Procedure; Strategies of Exports for agro based industries.

Module4	India's position in the Global market	10

Loading Agriculture Produces/products for Export Earnings; importing countries of these products; Competing Countries; Strategies to Boost Exports

Module 5	Quality Factors	10

Processing; AGMARK Grading & Quality Control Packaging, Brand Names; Labeling; Sales Promotion within the country & outside the country.

Module 6	Commodity SWOT Analysis	10
SWOT Analysis for each of the commodities mentioned below from the point of the view of exports: a. Cereals--Important crops like Wheat, Rice, etc. b. Pulses--Important crops like Grams, Moong, Urad, etc. c. Oil seeds -- Important crops like Soybean, Mustard, Ground Nuts, Linseed etc… d. Commercial Crops --Important crops Cotton, Jute, Sugarcane, Textiles, Chillies, Onion, Potato, etc. e. Horticulture crops--Important fruits like Apple, Banana, Mango, Grapes, Pomegranates, etc. f. Vegetables--Important crops like Tomato, Brinjal, Cauliflower, Cabbage, etc.		
Recommended Books	1. Agricultural Research Through International Co-operatives - Ravi Shrivastav & G. C. Shrivastav 2. International Economics-- Dominik Salvatore 3. Export Management --Prof. Laxmi Narayan 4. Changing Prospective in Indian Agriculture-Bhanushali S.G. & Pujari A.G.	