SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY::PUTTUR
(AUTONOMOUS)

Bachelor of Technology

Department of Electronics and Communications Engineering

S.No.	Course Name	Category	L-T-P-C
1	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2	Career Counselling	MC	2-0-2-0
3	Orientation to all branches -- career options, tools, etc.	MC	3-0-0-0
4	Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	2-0-3-0
5	Proficiency Modules & Productivity Tools	ES	2-1-2-0
6	Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7	Remedial Training in Foundation Courses	MC	2-1-2-0
8	Human Values & Professional Ethics	MC	3-0-0-0
9	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2-1-2-0
10	Concepts of Programming	ES	2-0-2-0

INDUCTION PROGRAMME

INDUCTION PROGRAM (MANDATORY)	3 WEEKS DURATION
Induction program for students to be offered right at the start of the first year.	• Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch & Innovations

B. Tech. – I Year I Semester

S.No.	Course Code	Subject	L/D	T	P	C
1.	23HS0840	Engineering Physics	3	-	-	3
2.	23HS0830	Linear Algebra & Calculus	3	-	-	3
3.	23EE0201	Basic Electrical & Electronics Engineering	3	-	-	3
4.	23ME0302	Engineering Graphics	1	-	4	3
5.	23CS0501	Introduction to Programming	3	-	-	3
6.	23CS0503	IT Workshop	-	-	2	1
7.	23HS0841	Engineering Physics Lab	-	-	2	1
8.	23EE0202	Electrical & Electronics Engineering Workshop	-	-	3	1.5
9.	23CS0502	Computer Programming Lab	-	-	3	1.5
10.	23HS0812	NSS/NCC/Scouts & Guides/Community Service	-	-	1	0.5
		Total	**13**	**-**	**15**	**20.5**

B. Tech. – I Year II Semester

S.No.	Course Code	Subject	L/D	T	P	C
1.	23HS0810	Communicative English	2	-	-	2
2.	23HS0801	Chemistry	3	-	-	3
3.	23HS0831	Differential Equations & Vector Calculus	3	-	-	3
4.	23CE0101	Basic Civil & Mechanical Engineering	3	-	-	3
5.	23EE0205	Network Analysis	3	-	-	3
6.	23HS0811	Communicative English Lab	-	-	2	1
7.	23HS0802	Chemistry Lab	-	-	2	1
8.	23ME0301	Engineering Workshop	-	-	3	1.5
9.	23EE0206	Network Analysis Lab	-	-	3	1.5
10.	23HS0813	Health and wellness, Yoga and Sports	-	-	1	0.5
		Total	**14**	**-**	**11**	**19.5**

B. Tech. – II Year I Semester

S.No.	Course Code	Subject	L/D	T	P	C
1.	23HS0835	Probability and Complex Variables	3	-	-	3
2.	23HS0814	Universal Human Values– Understanding Harmony and Ethical Human Conduct	2	1	-	3
3.	23EC0401	Signals, Systems and Stochastic Processes	3	-	-	3
4.	23EC0402	Electronic Devices and Circuits	3	-	-	3
5.	23EC0403	Digital Circuits Design	3	-	-	3
6.	23EC0404	Electronic Devices and Circuits Lab	-	-	3	1.5
7.	23EC0405	Digital Circuits & Signal Simulation Lab	-	-	3	1.5
8.	23CS0549	Python Programming	-	1	2	2
9.	23HS0805	Environmental Science (Audit Course)	2	-	-	-
		Total	**16**	**02**	**08**	**20**

B. Tech. –II Year II Semester

S.No.	Course Code	Subject	L/D	T	P	C
1.	23HS0848 23HS0850 23HS0851	Managerial Economics and FinancialAnalysis Organizational Behavior Business Environment	2	-	-	2
2.	23EE0212	Linear Control Systems	3	-	-	3
3.	23EC0407	EM Waves and Transmission Lines	3	-	-	3
4.	23EC0408	Electronic Circuits Analysis	3	-	-	3
5.	23EC0409	Analog and Digital Communications	3	-	-	3
6.	23EC0410	Electronic Circuits Analysis Lab	-	-	3	1.5
7.	23EC0411	Analog and Digital Communications Lab	-	-	3	1.5
8.	23HS0818	Soft Skills	-	1	2	2
9.	23HS0815	Design Thinking and Innovation	1	-	2	2
		Total	**15**	**1**	**10**	**21**
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation						

B.Tech. – III Year I Semester

S.No.	Course Code	Subject	L/D	T	P	C
1	23EC0412	Analog and Digital IC Applications	3	-	-	3
2	23EC0413	Antennas and Wave Propagation	3	-	-	3
3	23EC0414	Microprocessors and Microcontrollers	3	-	-	3
4	23CS0519	Introduction to Quantum Technologies and Applications	3	-	-	3
5		**Professional Elective – I**				
	23EC0427	Computer Architecture & Organization	3	-	-	3
	23EC0428	Information Theory and Coding				
	23EC0429	Detection and Estimation Theory				
6		**Open Elective – I**	3	-	-	3
7	23EC0415	Analog & Digital IC Applications Lab	-	-	3	1.5
8	23EC0416	Microprocessors and Microcontrollers Lab	-	-	3	1.5
9	23EC0443	**Skill Enhancement course** PCB Design and Prototype Development	-	1	2	2
10	23EC0417	Tinkering Lab	-	-	2	1
11	23EC0418	Evaluation of Community Service Internship	-	-	-	2
		Total	**18**	**01**	**10**	**26**

Open Elective–I

S.No.	Course Code	Course Name	Offered by the Department
1.	23CE0150	Green Buildings	CIVIL
2.	23CE0151	Construction Technology and Management	
3.	23EE0261	Electrical Safety Practices and Standards	EEE
4.	23ME0356	Sustainable Energy Technologies	ME
5.	23CS0553	Java Programming	CSE & Allied / IT
6.	23CS0554	Fundamentals of Artificial Intelligence	
7.	23CS0555	Quantum Technologies and Applications	
8.	23HS0855	Mathematics for Machine Learning and AI	Mathematics
9.	23HS0842	Materials Characterization Techniques	Physics
10.	23HS0806	Chemistry of Energy Systems	Chemistry
11.	23HS0821	English for Competitive Examinations	Humanities
12.	23HS0822	Entrepreneurship and New Venture Creation	

B.Tech. – III Year II Semester

S.No.	Course Code	Subject	L/D	T	P	C
1	23EC0419	Digital Signal Processing	3	-	-	3
2	23EC0420	Microwave and Optical Communications	3	-	-	3
3	23EC0421	VLSI Design	3	-	-	3
4	**Professional Elective – II**					
	23EC0430	Electronic Measurements and Instrumentation	3	-	-	3
	23EC0431	Embedded systems & IOT				
	23EC0432	Speech Processing				
5	**Professional Elective – III**					
	23EC0433	Digital Image Processing	3	-	-	3
	23EC0455	Artificial Intelligence & Machine learning				
	23EC0434	Satellite Communications				
6		**Open Elective – II**	3	-	-	3
7	23EC0422	Microwave and Optical Communications Lab	-	-	3	1.5
8	23EC0423	VLSI Design Lab	-	-	3	1.5
9	23EC0444	**Skill Enhancement course** Machine Learning and DSP	-	1	2	2
10	23HS0816	Technical Paper Writing & IPR	2	-	-	-
		Total	**20**	**01**	**08**	**23**
Mandatory Industry Internship of 08 weeks duration during summer vacation						

Open Elective–II

S.No.	Course Code	Course Name	Offered by the Department
1.	23CE0152	Disaster Management	CIVIL
2.	23CE0153	Sustainability In Engineering Practices	
3.	23EE0262	Renewable Energy Sources	EEE
4.	23ME0349	Automation and Robotics	ME
5.	23CS0511	Operating Systems	CSE & Allied / IT
6.	23CS0556	Introduction to Machine Learning	
7.	23HS0853	Optimization Techniques for Engineers	Mathematics
8.	23HS0858	Mathematical Foundation of Quantum Technologies	
9.	23HS0843	Physics of Electronic Materials and Devices	Physics
10.	23HS0807	Chemistry of Polymers and Applications	Chemistry
11.	23HS0823	Academic Writing and Public Speaking	Humanities

B.Tech. – IV Year I Semester

S.No.	Course Code	Subject	L/D	T	P	C
1	23EC0424	Data Communications and Networking	3	-	-	3
2		**Management Course – II**				
	23HS0861	Business Ethics and Corporate Governance	2	-	-	2
	23HS0862	E-Business				
	23HS0863	Management Science				
3		**Professional Elective – IV**				
	23EC0435	Radar Engineering	3	-	-	3
	23EC0436	DSP Processors & Architectures				
	23EC0437	Cellular & Mobile Communications				
4		**Professional Elective – V**				
	23EC0438	Low Power VLSI Design	3	-	-	3
	23EC0439	Wireless Sensor Networks				
	23EC0440	5G Communications				
5		**Open Elective – III**	3	-	-	3
6		**Open Elective – IV**	3	-	-	3
7	23EC0445 23EC0446	**Skill Enhancement course** 1. RF System Design tools 2. Industrial IOT & Automation	-	1	2	2
8	23HS0820	**Audit Course** Gender Sensitization	2	-	-	-
9	23EC0425	Evaluation of Industry Internship	-	-	-	2
		Total	**19**	**01**	**02**	**21**

Open Elective–III

S.No.	Course Code	Course Name	Offered by the Department
1.	23CE0154	Building Materials and Services	CIVIL
2.	23CE0155	Environmental Impact Assessment	
3.	23EE0263	Smart Grid Technologies	EEE
4.	23ME0357	3D Printing Technologies	ME
5.	23CS0512	Data Base Management Systems	CSE & Allied / IT
6.	23CS0536	Cyber Security	
7.	23HS0856	Wavelet transforms and its applications	Mathematics
8.	23HS0844	Smart Materials And Devices	Physics
9.	23HS0846	Introduction to Quantum Mechanics	Physics
10.	23HS0808	Green Chemistry And Catalysis for Sustainable Environment	Chemistry
11.	23HS0824	Employability Skills	Humanities

Open Elective–IV

S.No.	Course Code	Course Name	Offered by the Department
1.	23CE0156	Geo-Spatial Technologies	CIVIL
2.	23CE0157	Solid Waste Management	
3.	23EE0264	Electric Vehicles	EEE
4.	23ME0351	Total Quality Management	ME
5.	23CS0558	Introduction to Computer Networks	CSE & Allied / IT
6.	23CS0545	Internet of Things	
7.	23CS0557	Introduction to Quantum Computing	
8.	23HS0857	Financial Mathematics	Mathematics
9.	23HS0845	Sensors And Actuators for Engineering Applications	Physics
10.	23HS0809	Chemistry of Nanomaterials and Applications	Chemistry
11.	23HS0825	Literary Vibes	Humanities

B.Tech. – IV Year II Semester

S.No.	Course Code	Subject	L/D	T	P	C
1	23EC0426	Internship	**-**	**-**	**-**	**4**
2	23EC0454	Project	**-**	**-**	**-**	**8**
						12

NOTE: L-Lecture, T- Tutorial, P-Practical, Drg-Drawing, C-Credit

Year	I Year		II Year		III Year		IV Year		Total
Semester	I Sem	II Sem	I Sem	II Sem	I Sem	II Sem	I Sem	II Sem	
Credits	20.5	19.5	20	21	26	23	21	12	163

LIST OF SUBJECTS

S.No.	Course Code	Subject
Program Core Courses		
1.	23EC0401	Signals, Systems and Stochastic Processes
2.	23EC0402	Electronic Devices and Circuits
3.	23EC0403	Digital Circuits Design
4.	23EC0404	Electronic Devices and Circuits Lab
5.	23EC0405	Digital Circuits & Signal Simulation Lab
6.	23EC0407	EM Waves and Transmission Lines
7.	23EC0408	Electronic Circuits Analysis
8.	23EC0409	Analog and Digital Communications
9.	23EC0410	Electronic Circuits Analysis Lab
10.	23EC0411	Analog and Digital Communications Lab
11.	23EC0412	Analog and Digital IC Applications
12.	23EC0413	Antennas and Wave Propagation
13.	23EC0414	Microprocessors and Microcontrollers
14.	23EC0415	Analog & Digital IC Applications Lab
15.	23EC0416	Microprocessors and Microcontrollers Lab
16.	23EC0417	Tinkering Lab
17.	23EC0418	Evaluation of Community Service Internship
18.	23EC0419	Digital Signal Processing
19.	23EC0420	Microwave and Optical Communications
20.	23EC0421	VLSI Design
21.	23EC0422	Microwave and Optical Communications Lab
22.	23EC0423	VLSI Design Lab
23.	23EC0424	Data Communications and Networking
24.	23EC0425	Evaluation of Industry Internship
25.	23EC0426	Internship
26.	23EC0454	Project
Professional Elective Courses		
27.	23EC0427	Computer Architecture & Organization
28.	23EC0428	Information Theory and Coding
29.	23EC0429	Detection and Estimation Theory
30.	23EC0430	Electronic Measurements and Instrumentation
31.	23EC0431	Embedded Systems & IoT
32.	23EC0432	Speech Processing
33.	23EC0433	Digital Image Processing
34.	23EC0455	Artificial Intelligence & Machine Learning
35.	23EC0434	Satellite Communications
36.	23EC0435	Radar Engineering
37.	23EC0436	DSP Processors & Architectures
38.	23EC0437	Cellular & Mobile Communications
39.	23EC0438	Low Power VLSI Design
40.	23EC0439	Wireless Sensor Networks
41.	23EC0440	5G Communications

Open Elective Courses		
42.	23EC0406	Electronic Circuits
43.	23EC0441	Digital Electronics
44.	23EC0414	Microprocessors and Microcontrollers
45.	23EC0442	Transducers & Sensors
Skill oriented courses		
46.	23EC0443	PCB Design and Prototype Development
47.	23EC0444	Machine Learning and DSP
48.	23EC0445	RF System Design tools
49.	23EC0446	Industrial IOT & Automation
Subjects offered to other branches		
50.	23EC0447	Digital Circuits
51.	23EC0448	Signals & Systems
52.	23EC0449	Analog & Digital Circuits Lab
53.	23EC0414	Microprocessors and Microcontrollers
54.	23EC0416	Microprocessors and Microcontrollers Lab
55.	23EC0450	Communications Systems
56.	23EC0451	Embedded System Design
57.	23EC0452	Designing the IOT
58.	23EC0453	Internet of Things Lab
59.	23EC0457	Microprocessors and Microcontrollers
60.	23EC0458	Microprocessor and Microcontroller Lab
61.	23EC0459	Analog Circuits
62.	23EC0419	Digital Signal Processing

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I B.Tech – I Sem.	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

(23HS0840) ENGINEERING PHYSICS
(Common to All Branches of Engineering)

COURSE OBJECTIVES

The objectives of this course

To bridge the gap between the Physics in school at 10+2 level and UG level engineering coursesby identifying the importance of the optical phenomenon like interference, diffraction etc, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Analyze the intensity variation of light due to polarization, interference and diffraction.*
2. *Familiarize with the basics of crystals and their structures.*
3. *Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles.*
4. *Summarize various types of polarization of dielectrics and classify the magneticmaterials.*
5. *Explain the basic concepts of Quantum Mechanics and the band theory of solids.*
6. *Identify the type of semiconductor using Hall effect.*

UNIT-I

Wave Optics

Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colours in thin films- Newton's Rings, Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative).

Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

UNIT-II

Crystallography and X-ray diffraction

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

X- ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods

UNIT-III Dielectric and Magnetic Materials

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

UNIT-IV

Quantum Mechanics and Free electron Theory

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy

UNIT-V

Semiconductors

Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation – Hall effectand its applications.

TEXTBOOKS

1. M. N. Avadhanulu, P.G.Kshirsagar & TVS ArunMurthy, *A Text book of Engineering Physics*, S. Chand Publications, 11th Edition 2019..
2. D.K.Bhattacharya and Poonam Tandon, *Engineering Physics*, Oxford press (2015).

REFERENCES

1. B.K. Pandey and S. Chaturvedi, *Engineering Physics,* Cengage Learning 2021.
2. Shatendra Sharma, Jyotsna Sharma, *Engineering Physics*, Pearson Education, 2018.
3. M.R. Srinivasan, *Engineering Physics*, New Age international publishers (2009).

WEB RESOURCES: https://www.loc.gov/rr/scitech/selected-internet/physics.html

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	L	T	P	C
I B. Tech. – I Sem.	**3**	**-**	**-**	**3**

(23HS0830) LINEAR ALGEBRA & CALCULUS
(Common to All Branches of Engineering)

COURSE OBJECTIVES

The objectives of this course

To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Develop and use of matrix algebra techniques that are needed by engineers for practical applications.*
2. *Identify different matrix techniques to find the inverse and powers of the matrix.*
3. *Understanding the concepts of continuity and differentiability of functions defined on intervals*
4. *Estimate the series expansions of algebraic and transcendental functions.*
5. *Analyze the functions of several variables which is useful in optimization.*
6. *Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.*

UNIT-I

Matrices

Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of Non- singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

UNIT-II

Eigenvalues, Eigenvectors and Orthogonal Transformation

Eigenvalues, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT-III

Calculus

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.

UNIT-IV

Partial differentiation and Applications (Multi variable calculus)

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Directional derivative, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT-V

Multiple Integrals (Multi variable Calculus)

Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

TEXT BOOKS

1. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 2017, 44th Edition
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons, 2018, 10th Edition.

REFERENCES

1. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas, *Calculus*, PearsonPublishers, 2018, 14th Edition.
2. R. K. Jain and S. R. K. Iyengar, *Advanced Engineering Mathematics*, Alpha ScienceInternational Ltd., 2021 5th Edition(9th reprint).
3. Glyn James, *Advanced Modern Engineering Mathematics*, Pearson publishers, 2018, 5th Edition.
4. Micheael Greenberg, *Advanced Engineering Mathematics*, Pearson publishers, 9th edition
5. H. K Das, Er. Rajnish Verma, *Higher Engineering Mathematics*, S. Chand Publications,2014, Third Edition (Reprint 2021)

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	L	T	P	C
I B. Tech. – I Sem.	**3**	**-**	**-**	**3**

(23EE0201) BASIC ELECTRICAL & ELECTRONICS ENGINEERING
(Common to All Branches of Engineering)

COURSE OBJECTIVES

The objectives of this course

1. *To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field.*
2. *This course provides the student with the fundamental skills to understand the principles of digital electronics, basics of semiconductor devices like diodes & transistors, characteristics and its applications.*

COURSE OUTCOMES (COs)

On successful completion of this course, studens will be able to

1. *Understand the fundamental laws, operating principles of motors, generators, MC and MI instruments.*
2. *Understand the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations. working of diodes, transistors, and their applications, working mechanism of different combinational, sequential circuits and their role in the digital systems.*
3. *Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.*
4. *Analyze different electrical and electronic circuits, performance of machines and measuring instruments.*
5. *Evaluate different circuit configurations, Machine performance and Power systems operation.*
6. *Familiarize with the number systems, codes, Boolean algebra and logic gates.*

PART A: BASIC ELECTRICAL ENGINEERING

UNIT-I

DC & AC Circuits

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance,

Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

UNIT-II

Machines and Measuring Instruments

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

UNIT-III

Energy Resources, Electricity Bill & Safety Measures

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

TEXTBOOKS

1. D. C. Kulshreshtha, *Basic Electrical Engineering*, Tata McGraw Hill, 2019, First Edition.
2. P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, *Power System Engineering*, Dhanpat Rai & Co, 2013.
3. Rajendra Prasad, *Fundamentals of Electrical Engineering*, PHI publishers, 2014, Third Edition.

REFERENCES

1. D. P. Kothari and I. J. Nagrath, *Basic Electrical Engineering*, Mc Graw Hill, 2019, Fourth Edition
2. V.K. Mehtha, *Principles of Power Systems*, S.Chand Technical Publishers, 2020
3. T. K. Nagsarkar and M. S. Sukhija, *Basic Electrical Engineering*, Oxford University Press, 2017
4. S. K. Bhatacharya, *Basic Electrical and Electronics Engineering*, Person Publications, 2018, Second Edition.

WEB RESOURCES:

1. https://nptel.ac.in/courses/108105053.
2. https://nptel.ac.in/courses/108108076.

PART B: BASIC ELECTRONICS ENGINEERING

UNIT-I

Semiconductor Devices

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

UNIT-II

Basic Electronic Circuits and Instrumenttaion

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. **Amplifiers:** Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT-III

Digital Electronics

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adder, Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

TEXTBOOKS

1. R. L. Boylestad & Louis Nashlesky, *Electronic Devices & Circuit Theory*, Pearson Education, 2021.
2. R. P. Jain, *Modern Digital Electronics*, 4th Edition, Tata Mc Graw Hill, 2009.

REFERENCES

1. R. S. Sedha, *A Textbook of Electronic Devices and Circuits*, S. Chand & Co, 2010.
2. Santiram Kal, *Basic Electronics- Devices, Circuits and IT Fundamentals*, Prentice Hall, India, 2002.
3. R. T. Paynter, *Introductory Electronic Devices & Circuits* – Conventional Flow Version, Pearson Education,2009.

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(23ME0302) ENGINEERING GRAPHICS
(Common to All Branches of Engineering)

COURSE OBJECTIVES

The objectives of this course is to

1. *Enable the students with various concepts like dimensioning, conventions andstandards relate to Engineering Drawing*
2. *Impart knowledge on the projection of points, lines and plane surfaces.*
3. *Improve the visualization skills for better understanding of projection of solids.*
4. *Develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.*
5. *Make the students understand the viewing perception of a solid object in Isometric and Perspective projections.*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.*
2. *Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.*
3. *Understand and draw projection of solids in various positions in first quadrant.*
4. *Elucidate the basic principles of sections of solids and true shapes*
5. *Explain principles behind development of surfaces.*
6. *Prepare isometric and perspective sections of simple solids.*

UNIT-I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods. Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves. Scales: Plain scales, diagonal scales and vernier scales.

UNIT- II

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference

plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes

Projections of Planes: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

UNIT- III

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in **simple positions:** Axis perpendicular to horizontal plane, Axis perpendicular to vertical planeand Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT- IV

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNIT-V

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformationsusing Auto CAD (*Not for end examination*).

TEXTBOOKS

1. N. D. Bhatt, *Engineering Drawing*, Charotar Publishing House, 2016.

REFERENCES

1. K.L. Narayana and P. Kannaiah, *Engineering Drawing*, Tata McGraw Hill, 2013.
2. M.B.Shah and B.C. Rana, *Engineering Drawing*, Pearson Education Inc,2009.
3. Dhananjay Jolhe, *Engineering Drawing with an Introduction to AutoCAD*, Tata Mc Graw Hill, 2017.

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(23CS0501) INTRODUCTION TO PROGRAMMING
(Common to All Branches of Engineering)

COURSE OBJECTIVES

The objectives of this course

1. *To introduce students to the fundamentals of computer programming.*
2. *To provide hands-on experience with coding and debugging.*
3. *To foster logical thinking and problem-solving skills using programming.*
4. *To familiarize students with programming concepts such as data types, control structures, functions, and arrays.*
5. *To encourage collaborative learning and teamwork in coding projects.*

COURSE OUTCOMES (COs)

On successful completion of this course, studens will be able to:

1. *Understand basics of computers, the concept of algorithm and algorithmic thinking.*
2. *Analyse a problem and develop an algorithm using control structures & arrays*
3. *Analyse a problem and develop an algorithm to solve it using strings*
4. *Understand and implement the problems using pointers*
5. *Apply modular approach for solving the problem*
6. *Design and implement problem-solving using structures, unions and files.*

UNIT - I

Introduction to Programming and Problem Solving: History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer ProgramAlgorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting. Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

UNIT - II

Control Structures: Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, dowhile) Break and Continue.

UNIT - III

Arrays and Strings: Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings.

UNIT - IV

Pointers & User Defined Data types: Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions.

UNIT - V

Functions & File Handling: Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Basics of File Handling.

Note: The syllabus is designed with C Language as the fundamental language of implementation.

TEXTBOOKS

1. Brian W. Kernighan and Dennis M. Ritchie, *The C Programming Language*, , Prentice Hall, 1988
2. Byron S Gottfried, *Schaum's Outline of Programming with C*, McGraw-Hill Education, 1996

REFERENCES

1. Balagurusamy, E, *Computing fundamentals and C Programming*, McGraw-Hill Education, 2008.
2. Rema Theraja, *Programming in C*, Oxford, 2016, 2nd edition.
3. Forouzan, Gilberg, Prasad, *C Programming, A Problem Solving Approach*, CENGAGE, 3rd edition.

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(23CS0503) IT WORKSHOP
(Common to All Branches of Engineering)

COURSE OBJECTIVES
The objectives of this course

1. *To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables*
2. *To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS*
3. *To teach basic command line interface commands on Linux.*
4. *To teach the usage of Internet for productivity and self-paced life-long learning*
5. *To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.*

COURSE OUTCOMES (COs)
On successful completion of this course, students will be able to

1. *Perform Hardware troubleshooting.*
2. *Understand Hardware components and inter dependencies.*
3. *Safeguard computer systems from viruses/worms.*
4. *Document/ Presentation preparation.*
5. *Perform calculations using spread sheets.*
6. *Understand and Analyse the concepts of Prompt Engineering, Language Translation and Creative Writing using AI Tools*

LIST OF EXPERIMENTS
PC Hardware & Software Installation

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1: Word Orientation: The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeXand word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using La TeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeX and Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spread sheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

POWER POINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – ChatGPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.

- Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

- Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.

- Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

REFERENCES

1. Vikas Gupta, *Comdex Information Technology course tool kit*, WILEY Dream tech, 2003.
2. Cheryl A Schmidt, *The Complete Computer upgrade and repair book*, WILEY Dream tech, 2013, 3rd edition
3. *Introduction to Information Technology*, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition
4. Kate J. Chase, *PC Hardware - A Handbook*, PHI (Microsoft)
5. Leslie Lamport, *LaTeX Companion*, PHI/Pearson.
6. David Anfins on and Ken Quamme, *IT Essentials PC Hardware and Software Companion Guide*, – CISCO Press, Pearson Education, 3rd edition
7. Patrick Regan, *IT Essentials PC Hardware and Software Labs and Study Guide*, CISCO Press, Pearson Education, 3rd edition.

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(23HS0841) ENGINEERING PHYSICS LAB
(Common to All Branches of Engineering)

COURSE OBJECTIVES

The objectives of this course

To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Operate optical instruments like travelling microscope and spectrometer.*
2. *Estimate the wavelengths of different colours using diffraction grating.*
3. *Plot the intensity of the magnetic field of circular coil carrying current with distance.*
4. *Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively.*
5. *Calculate the band gap of a given semiconductor*
6. *Identify the type of semiconductor using Hall effect.*

LIST OF EXPERIMENTS

1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of dielectric constant using charging and discharging method.
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Determination of wavelength of Laser light using diffraction grating.
7. Estimation of Planck's constant using photoelectric effect.
8. Determination of the resistivity of semiconductors by four probe methods.
9. Determination of energy gap of a semiconductor using p-n junction diode.
10. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
11. Determination of Hall voltage and Hall coefficient of a given semiconductor using Halleffect.
12. Determination of temperature coefficients of a thermistor.
13. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
14. Determination of magnetic susceptibility by Kundt's tube method.
15. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
16. Sonometer: Verification of laws of stretched string.

17. Determination of young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde'sexperiment.

Note: Any **TEN** of the listed experiments are to be conducted. Out of which any TWOexperiments may be conducted in virtual mode.

REFERENCES

1. S. Balasubramanian, M.N. Srinivasan, *A Textbook of Practical Physics,* S. Chand Publishers, 2017.

WEB RESOURCES

1. www.vlab.co.in
2. https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

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(23EE0202) ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP
(Common to All Branches of Engineering)

COURSE OBJECTIVES

The objectives of this course

To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.* usage *of electronic measuring instruments.*
2. *Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.*
3. *Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.*
4. *Analyse various characteristics of electrical circuits, electrical machines, measuring instrument and digital circuits.*
5. *Design suitable circuits and methodologies for the measurement of various electrical parameters; Design suitable Household and commercial wiring.*
6. *Plot and discuss the characteristics of various electron devices.*

Activities:

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.

- Provide some exercises so that hardware tools and instruments are learned to be used by the students.

2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.

- Provide some exercises so that measuring instruments are learned to be used by the students.

3. Components:

- Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.

- Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

PART A: ELECTRICAL ENGINEERING LAB

List of experiments:

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises

REFERENCES:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition.

Note: Minimum Six Experiments to be performed.

PART B: ELECTRONICS ENGINEERING LAB

List of Experiments:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers.
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

REFERENCES

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version,
4. Pearson Education,2009.

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.

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(23CS0502) COMPUTER PROGRAMMING LAB
(Common to All Branches of Engineering)

COURSE OBJECTIVES
The objectives of this course

1. *The course aims to give students hands – on experience and train them on the concepts of the C- programming language.*

COURSE OUTCOMES (COs)
On successful completion of this course, students will be able to

1. *Read, understand, and trace the execution of programs written in C language.*
2. *Select the right control structure for solving the problem.*
3. *Develop C programs which utilize memory efficiently using programming constructs like pointers.*
4. *Develop Debug and Execute programs to demonstrate the applications of arrays in C.*
5. *Develop Debug and Execute programs to demonstrate the applications of functions in C.*
6. *Implement the C programs using File handling Concepts.*

UNIT-I
WEEK 1 - Objective: Getting familiar with the programming environment on the computer and writing the first program.
Suggested Experiments/Activities:
Tutorial 1: Problem-solving using Computers.
Lab1: Familiarization with programming environment

- **i)** Basic Linux environment and its editors like Vi, Vim & Emacs etc.
- **ii)** Exposure to Turbo C, gcc
- **iii)** Writing simple programs using printf(), scanf()

WEEK 2 - Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.
Suggested Experiments /Activities:
Tutorial 2: Problem-solving using Algorithms and Flow charts.
Lab 1: Converting algorithms/flow charts into C Source code. Developing the algorithms/flowcharts for the following sample programs

- **i)** Sum and average of 3 numbers
- **ii)** Conversion of Fahrenheit to Celsius and vice versa
- **iii)** Simple interest calculation

WEEK 3 - Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.
Suggested Experiments/Activities:
Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.

- **i)** Finding the square root of a given number
- **ii)** Finding compound interest
- **iii)** Area of a triangle using heron's formulae
- **iv)** Distance travelled by an object

UNIT-II

WEEK 4 - Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial 4: Operators and the precedence and as associativity:

Lab 4: Simple computational problems using the operator' precedence and associativity

- **i)** Evaluate the following expressions. a. A+B*C+(D*E) + F*G b. A/B*C-B+A*D/3 c. A+++B---A d. J= (i++) + (++i)
- **ii)** Find the maximum of three numbers using conditional operator
- **iii)** Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5 - Objective: Explore the full scope of different variants of "if construct" namely if-else, nullelse, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures.

- **i)** Write a C program to find the max and min of four numbers using if-else.
- **ii)** Write a C program to generate electricity bill.
- **iii)** Find the roots of the quadratic equation.
- **iv)** Write a C program to simulate a calculator using switch case.
- **v)** Write a C program to find the given year is a leap year or not.

WEEK 6 - Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops

Lab 6: Iterative problems e.g., the sum of series

- **i)** Find the factorial of given number using any loop.
- **ii)** Find the given number is a prime or not.
- **iii)** Compute sine and cos series
- **iv)** Checking a number palindrome
- **v)** Construct a pyramid of numbers.

UNIT-III

WEEK 7 - Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:

Tutorial 7: 1 D Arrays: searching.
Lab 7: 1D Array manipulation, linear search

- **i)** Find the min and max of a 1-D integer array.
- **ii)** Perform linear search on1D array.
- **iii)** The reverse of a 1D integer array
- **iv)** Find 2's complement of the given binary number.
- **v)** Eliminate duplicate elements in an array.

WEEK 8 - Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.
Suggested Experiments/Activities:
Tutorial 8: 2D arrays, sorting and Strings.
Lab 8: Matrix problems, String operations, Bubble sort

- **i)** Addition of two matrices
- **ii)** Multiplication two matrices
- **iii)** Sort array elements using bubble sort
- **iv)** Concatenate two strings without built-in functions
- **v)** Reverse a string using built-in and without built-in string functions

UNIT-IV
WEEK 9 - Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C
Suggested Experiments/Activities:
Tutorial 9: Pointers, structures and dynamic memory allocation
Lab 9: Pointers and structures, memory dereference.

- **i)** Write a C program to find the sum of a 1D array using malloc()
- **ii)** Write a C program to find the total, average of n students using structures
- **iii)** Enter n students data using calloc() and display failed students list
- **iv)** Read student name and marks from the command line and display the student details along with the total.
- **v)** Write a C program to implement realloc()

WEEK 10 - Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures
Suggested Experiments/Activities:
Tutorial 10: Bitfields, Self-Referential Structures, Linked lists
Lab10: Bitfields, linked lists Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

- **i)** Create and display a singly linked list using self-referential structure.
- **ii)** Demonstrate the differences between structures and unions using a C program.
- **iii)** Write a C program to shift/rotate using bitfields.
- **iv)** Write a C program to copy one structure variable to another structure of the same type.

UNIT-V

WEEK 11 - Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration.

Suggested Experiments/Activities:

Tutorial 11: Functions, call by value, scope and extent.

Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

- **i)** Write a C function to calculate NCR value.
- **ii)** Write a C function to find the length of a string.
- **iii)** Write a C function to transpose of a matrix.
- **iv)** Write a C function to demonstrate numerical integration of differential equations using Euler's method

WEEK 12 - Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

Suggested Experiments/Activities:

Tutorial 12: Recursion, the structure of recursive calls

Lab 12: Recursive functions

- **i)** Write a recursive function to generate Fibonacci series.
- **ii)** Write a recursive function to find the LCM of two numbers.
- **iii)** Write a recursive function to find the factorial of a number.
- **iv)** Write a C Program to implement Ackermann function using recursion.
- **v)** Write a recursive function to find the sum of series.

WEEK 13 - Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

Suggested Experiments/Activities:

Tutorial 13: Call by reference, dangling pointers

Lab 13: Simple functions using Call by reference, Dangling pointers.

- **i)** Write a C program to swap two numbers using call by reference.
- **ii)** Demonstrate Dangling pointer problem using a C program.
- **iii)** Write a C program to copy one string into another using pointer.
- **iv)** Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

WEEK 14 - Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

Suggested Experiments/Activities:

Tutorial 14: File handling

Lab 14: File operations

- **ii)** Write a C program to write and read text into a file.
- **iii)** Write a C program to write and read text into a binary file using fread() and fwrite()
- **iv)** Copy the contents of one file to another file.
- **v)** Write a C program to merge two files into the third file using command-line arguments.
- **vi)** Find no. of lines, words and characters in a file
- **vii)** Write a C program to print last n characters of a given file.

TEXT BOOKS

1. Ajay Mittal, *Programming in C: A practical approach*, Pearson.
2. Byron Gottfried, *Schaum' s Outline of Programming with C*, McGraw Hill

REFERENCES

1. Brian W. Kernighan and Dennis M. Ritchie, *The C Programming Language*, PrenticeHall of India
2. Forouzan, Gilberg, Prasad, *C Programming, A Problem-Solving Approach*, CENGAGE.

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I B.Tech – I Sem.

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(23HS0812) NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE
(Common to All Branches of Engineering)

COURSE OBJECTIVES
The objectives of this course

The objective of introducing this course is to impart discipline, character, fraternity, teamwork,social consciousness among the students and engaging them in selfless service.

COURSE OUTCOMES (COs)
On successful completion of this course, students will be able to:

1. *Understand the importance of discipline, character and service motto.*
2. *Solve some societal issues by applying acquired knowledge, facts, and techniques.*
3. *Explore human relationships by analyzing social problems.*
4. *Determine to extend their help for the fellow beings and downtrodden people.*
5. *Develop leadership skills and civic responsibilities.*
6. *Focus on awareness programmes that build community service*

UNIT- I Orientation
General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

Activities:
i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students –future plans-activities-releasingroad map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societalissues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT- II Nature & CareActivities:
i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

UNIT III Community ServiceActivities:

i) Conducting One Day Special Camp in a village contacting village-area leaders- Surveyin the village, identification of problems- helping them to solve via media- authorities-experts-etc.
ii) Conducting awareness programs on Health-related issues such as General Health,Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc.
iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
v) Any other programmes in collaboration with local charities, NGOs etc.

REFERENCES

1. Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme* Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. *Red Book - National Cadet Corps* – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering",McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. "Introduction to EnvironmentalEngineering and Science", Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. *Social Problems in India*, Rawat Publications, New Delhi.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

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I B.Tech – II Sem.

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(23HS0810) COMMUNICATIVE ENGLISH
(Common to All Branches of Engineering)

COURSE OBJECTIVES
The objectives of this course:

The main objective of introducing this course, Communicative English, is to facilitate effective listening, Reading, Speaking and Writing skills among the students. It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary. This course helps the students to make them effective in speaking and writing skills and to make them industry ready.

COURSE OUTCOMES (COs)
On successful completion of this course, students will be able to:

1. *Understand the context, topic, and pieces of specific information from social or Transactional dialogues.*
2. *Apply grammatical structures to formulate sentences and correct word forms.*
3. *Analyze discourse markers to speak clearly on a specific topic in informal discussions.*
4. *Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.*
5. *Create a coherent paragraph, essay, and resume.*
6. *Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively.*

UNIT-I

Lesson: HUMAN VALUES: Gift of Magi **(Short Story)**

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.

Grammar: Parts of Speech, Basic Sentence Structures-forming questions

Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT – II

Lesson: NATURE: The Brook by Alfred Tennyson (Poem)

Listening: Answering a series of questions about main ideas and supporting ideas afterlistening to audio texts.

Speaking: Discussion in pairs/small groups on specific topics followed by short structuretalks.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to linkthe ideas in a paragraph together.
Writing: Structure of a paragraph - Paragraph writing (specific topics)
Grammar: Cohesive devices - linkers, use of articles and zero article; prepositions.
Vocabulary: Homonyms, Homophones, Homographs.

UNIT – III

Lesson: BIOGRAPHY: Elon Musk

Listening: Listening for global comprehension and summarizing what is listened to.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed
Reading: Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
Writing: Summarizing, Note-making, paraphrasing
Grammar: Verbs - tenses; subject-verb agreement; Compound words,
Vocabulary: Collocations

UNIT – IV

Lesson: INSPIRATION: The Toys of Peace by Saki

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.
Writing: Letter Writing: Official Letters, Resumes.
Grammar: Reporting verbs, Direct & Indirect speech, Active & Passive Voice
Vocabulary: Words often confused, Jargons

UNIT – V

Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay)

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
Speaking: Formal oral presentations on topics from academic contexts
Reading: Reading comprehension.
Writing: Writing structured essays on specific topics.
Grammar: Editing short texts –identifying and correcting common errors in grammar andusage (articles, prepositions, tenses, subject verb agreement)
Vocabulary: Technical Jargons

TEXTBOOKS

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, OrientBlack Swan, 2023 (Units 1,2 & 3).
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5).

REFERENCES

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020.
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge,2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge UniversityPress, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

WEB RESOURCES:

GRAMMAR:

1. www.bbc.co.uk/learningenglish.
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

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(20HS0801) CHEMISTRY
(Common to EEE, ECE, CSE, IT & allied branches)

COURSE OBJECTIVES
The objectives of this course

1. *To familiarize engineering chemistry and its applications*
2. *To train the students on the principles and applications of electrochemistry andpolymers*
3. *To introduce instrumental methods, molecular machines and switches.*

COURSE OUTCOMES (COs)
On successful completion of this course, students will be able to:

1. *Acquire the knowledge on the behaviour and interactions between matter and energy at both the atomic and molecular levels.*
2. *Analyze and demonstrate the applications of modern engineering materials in real world.*
3. *Impart the knowledge on the essential aspects of electrochemical cells, emf and applications of emf measurements*
4. *Gain the knowledge about construction and applications of batteries and sensors,*
5. *Impart knowledge on the essential aspects of Principles and comprehend idea about the synthesis and engineering applications of polymers.*
6. *Analyse the molecular transitions of Electromagnetic radiation (EMR) with matter in various spectroscopic techniques.*

UNIT – I
Structure and Bonding Models:
Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of and Ψ^2, particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT- II
Modern Engineering Materials:
Semiconductors – Introduction, basic concept, application.
Super Conductors - Introduction basic concept, applications.
Super Capacitors - Introduction, Basic Concept , Classification – Applications.
Nano Materials - Introduction, classification, properties and applications of Fullerenes, Carbon nano tubes and Graphines nanoparticles.

UNIT- III
Electrochemistry and Applications:
Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.
Primary cells – Zinc-air battery, Secondary cells – lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygenfuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

UNIT - IV

Polymer Chemistry:

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.
Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.
Elastomers–Buna-S, Buna-N–preparation, properties and applications.
Conducting Polymers – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polyl Lactic Acid (PLA).

UNIT - V

Instrumental Methods and Applications:

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. High pressure Liquid Chromatography (HPLC) Classification, Principle, Instrumentation and Applications.

TEXTBOOKS

1. Jain and Jain, *Engineering Chemistry*, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, *Atkins' Physical Chemistry*, 10/e, Oxford University Press, 2010.

REFERENCES

1. Skoog and West, *Principles of Instrumental Analysis*, 6/e, Thomson, 2007.
2. J.D. Lee, *Concise Inorganic Chemistry*, 5th Edition, Wiley Publications, Feb.2008.
3. Fred W. Billmayer Jr, *Textbook of Polymer Science*, 3rd Edition.

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I B. Tech. – II Sem.

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(20HS0831) DIFFERENTIAL EQUATIONS & VECTOR CALCULUS
(Common to All Branches of Engineering)

COURSE OBJECTIVES
The objectives of this course

1. *To enlighten the learners in the concept of differential equations and multivariable calculus.*
2. *To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.*

COURSE OUTCOMES (COs)
On successful completion of this course, students will be able to:

1. *Solve the differential equations related to various engineering fields.*
2. *Create basic application problems described by second order linear differential equations with constant coefficients.*
3. *Understand basic properties of standard partial differential equations.*
4. *Identify solution methods for partial differential equations that model physical processes.*
5. *Interpret the physical meaning of different operators such as gradient, curl and divergence.*
6. *Estimate the work done against a field, circulation and flux using vector calculus.*

UNIT-I
Differential equations of first order and first degree
Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits.

UNIT-II
Linear differential equations of higher order (Constant Coefficients)
Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

UNIT-III
Partial Differential Equations
Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

UNIT-IV
Vector differentiation
Scalar and vector point functions, vector operator Del, Del applies to scalar point functions- Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT-V

Vector integration

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.

TEXTBOOKS

1. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 2017, 44th Edition.
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons, 2018, 10th Edition.

REFERENCES

1. George B. Thomas, Maurice D. Weir and Joel Hass, *Thomas Calculus*, Pearson Publishers, 2018, 14th Edition.
2. Dennis G. Zill and Warren S. Wright, Jones and Bartlett, *Advanced Engineering Mathematics*, 2018.
3. Glyn James, *Advanced Modern Engineering Mathematics*, Pearson publishers, 2018, 5th Edition.
4. R. K. Jain and S. R. K. Iyengar, *Advanced Engineering Mathematics*, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
5. B. V. Ramana, *Higher Engineering Mathematics*, McGraw Hill Education, 2017.

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I B.Tech – II Sem.

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(23CE0101) BASIC CIVIL AND MECHANICAL ENGINEERING
(Common to All Branches of Engineering)

PART A: BASIC CIVIL ENGINEERING

COURSE OBJECTIVES

The objectives of this course

1. *Get familiarized with the scope and importance of Civil Engineering sub-divisions.*
2. *Introduce the preliminary concepts of surveying.*
3. *Acquire preliminary knowledge on Transportation and its importance in nation's economy.*
4. *Get familiarized with the importance of quality, conveyance and storage of water*
5. *Introduction to basic civil engineering materials and construction techniques.*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to:

1. *Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.*
2. *Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying.*
3. *Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation and understand the process of water storage and its supply to the public.*

UNIT-I

Basics of Civil Engineering: Role of Civil Engineers in Society - Various Disciplines of Civil Engineering - Structural Engineering - Geo-technical Engineering - Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering - Scope of each discipline - Building Construction and Planning - Construction Materials - Cement - Aggregate - Bricks - Cement concrete - Steel. Introduction to Prefabricated construction Techniques

UNIT-II

Surveying: Objectives of Surveying - Horizontal Measurements - Angular Measurements - Introduction to Bearings - Levelling instruments used for levelling - Simple problems on levelling and bearings - Contour mapping.

UNIT-III

Transportation Engineering: Importance of Transportation in Nation's economic development - Types of Highway Pavements - Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering

Water Resources and Environmental Engineering: Introduction, Sources of water - Quality of water - Specifications - Introduction to Hydrology – Rainwater Harvesting - Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

TEXT BOOKS

1. M.S.Palanisamy, *Basic Civil Engineering,* Tata McGraw Hill publications (India) Pvt. Ltd. Fourth Edition, 2011.
2. S.S. Bhavikatti, *Introduction to Civil Engineering,* New Age International Publishers, First Edition, 2022.
3. Satheesh Gopi, *Basic Civil Engineering*, Pearson Publications, First Edition, 2009.

REFERENCES

1. S.K. Duggal, *Surveying, Vol- I and Vol-II,* Tata McGraw Hill Publishers, Fifth Edition, 2019
2. Santosh Kumar Garg, *Hydrology and Water Resources Engineering,* Khanna Publishers, Delhi, 2016.
3. Santosh Kumar Garg, *Irrigation Engineering and Hydraulic Structures*, Khanna Publishers, Delhi, 38th Edition, 2023.
4. S.K.Khanna, C.E.G. Justo and Veeraraghavan, *Highway Engineering*, Nemchand and Brothers Publications, 10th Edition, 2019.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

PART B: BASIC MECHANICAL ENGINEERING

COURSE OBJECTIVES

The objectives of this course

1. *Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.*
2. *Explain different engineering materials and different manufacturing processes.*
3. *Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.*

COURSE OUTCOMES (COs)

On successful completion of this course, studens will be able to

1. *Understand the role of mechanical engineering and materials in the manufacturing and automotive industries*
2. *Explain the basics of manufacturing processes and thermal engineering and its applications.*
3. *Describe the working of different powerplants. Mechanical power transmission systems and the applications of robotics in industrial sector.*

UNIT-I

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

UNIT-II

Manufacturing Processes: Principles of Casting**,** Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

Thermal Engineering – working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

UNIT-III

Power plants – working principle of Steam, Diesel, Hydro, Nuclear power plants.

Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

Introduction to Robotics - Joints & links, configurations, and applications of robotics.

(Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject)

TEXTBOOKS

1. V.Ganesan, *Internal Combustion Engines*, Tata McGraw Hill publications (India)Pvt. Ltd.
2. S.S. Rattan, *A Tear book of Theory of Machines* Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. Jonathan Wicker and Kemper Lewis, *An introduction to Mechanical Engineering*, Cengage learning India Pvt. Ltd.

REFERENCES

1. Appuu Kuttan KK, *Robotics*, I.K. International Publishing House Pvt. Ltd. Volume-I
2. L. Jyothish Kumar, Pulak MPandey,*3D printing & Additive Manufacturing Technology*, Springer publications
3. Mahesh M Rathore, *Thermal Engineering*, Tata McGraw Hill publications (India) Pvt.Ltd.
4. G. Shanmugam and M.S.Palanisamy, *Basic Civil and the Mechanical Engineering*, Tata McGraw Hill publications (India) Pvt. Ltd.

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(23EE0205) NETWORK ANALYSIS

COURSE OBJECTIVES

The objectives of this course

1. *To introduce basic laws, mesh & nodal analysis techniques for solving electrical circuits*
2. *To impart knowledge on applying appropriate theorem for electrical circuit analysis*
3. *To explain transient behavior of circuits in time and frequency domains*
4. *To teach concepts of resonance*
5. *To introduce open circuit, short circuit, transmission, hybrid parameters and their interrelationship.*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Understand basic electrical circuits with nodal and mesh analysis.*
2. *Analyse the circuit using network simplification theorems.*
3. *Find Transient response and Steady state response of a network.*
4. *Analyse magnetically coupled circuits*
5. *Analyse electrical networks in the Laplace domain.*
6. *Compute the parameters of a two-port network.*

UNIT- I

Types of circuit components, Types of Sources and Source Transformations, Mesh analysis and Nodal analysis, problem solving with resistances only including dependent sources also. Principal of Duality with examples.

Network Theorems: Thevenin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, Tellegens - problem solving using dependent sources also.

UNIT- II

Transients: First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem-solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots.

Laplace transform: introduction, Laplace transformation, basic theorems, problem solving using Laplace transform, partial fraction expansion, Heaviside's expansions, problem solving using Laplace transform.

UNIT- III

Steady State Analysis of A.C Circuits: Impedance concept, phase angle, series R-L, R-C, R-L- C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving using Laplace transforms also.

UNIT-IV

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, general case-resistance present in both branches, anti-resonance at all frequencies.

Coupled Circuits: Coupled Circuits: Self-inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, conductively coupled equivalent circuits- problem solving.

UNIT- V

Two-port Networks: Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h- parameters, Relationships Between parameter Sets, Parallel & series connection of two port networks, cascading of two port networks, problem solving using dependent sources also.

Image and iterative impedances. Image and iterative transfer constants. Insertion loss. Attenuators and pads. Lattice network and its parameters. Impedance matching networks.

TEXTBOOKS

1. ME Van Valkenburg, *Network Analysis*, Prentice Hall of India, revised, 3rd Edition, 2019.
2. William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, *Engineering Circuit Analysis*, 9th Edition, 2020.
3. John. D. Ryder, Network lines and Fields, 2nd Edition, PHI.

REFERENCES

1. D. Roy Choudhury, *Networks and Systems*, New Age International Publications, 2013.
2. Joseph Edminister and Mahmood Nahvi, *Electric Circuits*, Schaum's Outline Series, 7th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2017.
3. Charles K. Alexander and Matthew N. O. Sadiku, *Fundamentals of Electric Circuits*, Mc Graw-Hill Education.

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(23HS0811) COMMUNICATIVE ENGLISH LAB
(Common to All Branches of Engineering)

COURSE OBJECTIVES
The objectives of this course

The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning. The students will get trained in basic communication skills and also make them ready to face job interviews.

COURSE OUTCOMES (COs)
On successful completion of this course, students will be able to

1. *Understand the different aspects of the English language proficiency with emphasis on LSRW skills.*
2. *Apply communication skills through various language learning activities.*
3. *Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.*
4. *Evaluate and exhibit professionalism in participating in debates and group discussions.*
5. *Become active participants in the learning process and acquire proficiency in spoken English.*
6. *Speak with clarity and confidence thereby enhances employability skills.*

List of Topics:

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover letter, SOP
7. Group Discussions-methods & practice
8. Debates - Methods & Practice
9. PPT Presentations/ Poster Presentation
10. Interviews Skills

Suggested Software:

- Walden Infotech
- Young India Films

REFERENCES

1. Raman Meenakshi, Sangeeta-Sharma, *Technical Communication*. Oxford Press.2018.
2. Taylor Grant, *English Conversation Practice*, Tata McGraw-Hill Education India, 2016.
3. Hewing's, Martin. Cambridge, *Academic English* (B2), CUP, 2012.
4. J. Sethi & P.V. Dhamija, *A Course in Phonetics and Spoken English*, (2nd Ed),Kindle, 2013.

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(23HS0802) CHEMISTRY LAB
(Common to EEE, ECE, CSE, IT & allied branches)

COURSE OBJECTIVES
The objectives of this course

1. *Verify the fundamental concepts with experiments.*

COURSE OUTCOMES (COs)
On successful completion of this course, students will be able to

1. *Determine the cell constant and conductance of solutions.*
2. *Prepare advanced polymer Bakelite materials.*
3. *Measure the strength of an acid present in secondary batteries.*
4. *Analyse the IR spectra of some organic compounds.*
5. *Able to understand about the fundamental concepts of analytical instruments*
6. *Calculate strength of acid in Pb-Acid battery.*

LIST OF EXPERIMENTS
1. Measurement of 10Dq by spectrophotometric method
2. Conductometric titration of strong acid vs. strong base
3. Conductometric titration of weak acid vs. strong base
4. Determination of cell constant and conductance of solutions
5. Potentiometry - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a Bakelite
8. Verify Lambert-Beer's law
9. Wavelength measurement of sample through UV-Visible Spectroscopy
10. Identification of simple organic compounds by IR
11. Preparation of nanomaterials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry

Any Ten experiments may be conducted

REFERENCES
1. J. Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar, *Vogel's Quantitative Chemical Analysis*, 6th Edition, Pearson Publications.

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I B.Tech – II Sem.

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(20ME0301) WORKSHOP PRACTICE LAB
(Common to All Branches of Engineering)

COURSE OBJECTIVES
The objectives of this course

1. *Familiarize with the different types of wood and carpentry joints.*
2. *Develop Tapered Tray and Conical funnel using sheet metal.*
3. *Acquire practical knowledge on different types of fittings.*
4. *Provides hands-on training in the trades of House-Wiring .*
5. *Overview of metal cutting processes, foundry, Welding and plumbing, is provided through live demonstrations.*
6. *Acquire practical skills by performing the experiments in different shops of workshop.*

COURSE OUTCOMES (COs)
On successful completion of the course, the students will be able to

1. *Describe the different types of wood and carpentry joints.*
2. *Produce Tapered Tray and Conical funnel using sheet metal.*
3. *Understands about Fitting and their types.*
4. *Explain the method of preparation of various House-Wiring .*
5. *Apply basic techniques in foundry, Welding and plumbing.*
6. *Estimate the amount of material required for various models.*

SYLLABUS
1. **Demonstration**: Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.
   a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working**: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
   a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
   a) V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two-wheeler tyre
5. **Electrical Wiring**: Familiarity with different types of basic electrical circuits and make the following connections.
   a) Parallel and series b) Two-way switch c) Godown lighting d) Tube light e) Three phase motor
   f) Soldering of wires
6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.

7. **Welding Shop**: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.

TEXTBOOKS

1. Felix W, *Basic Workshop Technology: Manufacturing Process*, Independently Published, 2019.
2. Bruce J. Black, *Workshop Processes, Practices and Materials*; Routledge publishers, 5th Edn. 2015.
3. B.S. Raghuwanshi, *A Course in Workshop Technology Vol I. & II*, Dhanpath Rai & Co., 2015 & 2017.

REFERENCES

1. S. K. Hajra Choudhury & Others, *Elements of Workshop Technology, Vol. I* , Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. H. S. Bawa, Workshop Practice, Tata-McGraw Hill, 2004.
3. Soni P.M. & Upadhyay P.A., *Wiring Estimating, Costing and Contracting*; Atul Prakashan, 2021-22.

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I B.Tech – II Sem.

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(23EE0206) NETWORK ANALYSIS AND SIMULATION LABORATORY

COURSE OBJECTIVES (COs)

The objectives of this course

1. *To gain hands on experience in verifying Kirchoff's laws and network theorems.*
2. *To analyze transient behavior of circuits.*
3. *To study resonance characteristics.*
4. *To determine 2-port network parameters.*

COURSE OUTCOMES (COs)

On successful completion of the course, the students will be able to

1. *Verify Kirchoff's laws and network theorems.*
2. *Measure time constants of RL & RC circuits.*
3. *Analyze behavior of RLC circuit for different cases.*
4. *Analyze second order systems for different parameters*
5. *Design resonant circuit for given specifications.*
6. *Characterize and model the network in terms of all network parameters.*

The following experiments need to be performed using both Hardware and simulation Software. The experiments need to be simulated using software and the same need to be verified using the hardware.

1. Study of components of a circuit and Verification of KCL and KVL.
2. Verification of mesh and nodal analysis for AC circuits
3. Verification of Superposition, Thevenin's & Norton theorems for AC circuits
4. Verification of maximum power transfer theorem for AC circuits
5. Verification of Tellegen's theorem for two networks of the same topology.
6. Study of DC transients in RL, RC and RLC circuits
7. To study frequency response of various 1^{st} order RL & RC networks
8. To study the transient and steady state response of a 2^{nd} order circuit by varying its various parameters and studying their effects on responses
9. Find the Q Factor and Bandwidth of a Series and Parallel Resonance circuit.
10. Determination of open circuit (Z) and short circuit (Y) parameters
11. Determination of hybrid (H) and transmission (ABCD) parameters
12. To measure two port parameters of a twin-T network and study its frequency response.

Hardware Requirements:

Regulated Power supplies, Analog/Digital Function Generators, Digital Multimeters, Decade Resistance Boxes/Rheostats, Decade Capacitance Boxes, Ammeters (Analog or Digital), Voltmeters (Analog or Digital), Active & Passive Electronic Components

Software requirements:

Multisim/ Pspice/Equivalent simulation software tool, Computer Systems with required specifications

REFERENCES

1. ME Van Valkenburg, *Network Analysis*, Prentice Hall of India, revised 3rd Edition, 2019.
2. William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, *Engineering Circuit Analysis*, 9th Edition, 2020.

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(23HS0813) HEALTH AND WELLNESS, YOGA AND SPORTS
(Common to All branches of Engineering)

COURSE OBJECTIVES
The objectives of this course

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

COURSE OUTCOMES (COs)
On successful completion of this course, students will be able to

1. Understand the importance of yoga and sports for Physical fitness and sound health
2. Demonstrate an understanding of health-related fitness components.
3. Compare and contrast various activities that help enhance their health.
4. Assess current personal fitness levels.
5. Develop Positive Personality.
6. Apply various activities for holistic development.

UNIT-I
Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index(BMI) of all age groups.

Activities:

i) Organizing health awareness programmes in community
ii) Preparation of health profile
iii) Preparation of chart for balance diet for all age groups

UNIT- II
Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT- III
Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.
ii) Practicing general and specific warm up, aerobics
Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

REFERENCES

1. Gordon Edlin, Eric Golanty, *Health and Wellness*, 14th Edn. Jones & Bartlett Learning,2022
2. T.K.V.Desikachar, *The Heart of Yoga: Developing a Personal Practice.*
3. Archie J.Bahm, *Yoga Sutras of Patanjali*, Jain Publishing Company, 1993.
4. Wiseman, John Lofty, *SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere*, Third Edition, William Morrow Paperbacks, 2014.
5. Thomas Hanlon, *The Sports Rules Book/ Human Kinetics,* 3rd ed. Human Kinetics, Inc.2014.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as manyas Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting vivavoce on the subject.

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B.Tech-ECE

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(23HS0835) PROBABILITY AND COMPLEX VARIABLES

COURSE OBJECTIVES

The objectives of this course

1. *Understand the concepts of Probability, Random Variables and their characteristics (L2, L3)*
2. *Learn how to deal with multiple random variables, conditional probability, joint distribution and statistical independence.(L3, L5)*
3. *Formulate and solve engineering problems involving random variables. (L3)*
4. *Analyze limit, continuity and differentiation of functions of complex variables and Understand Cauchy-Riemann equations, analytic functions and various properties of analytic functions. (L2, L3)*
5. *Understand Cauchy theorem, Cauchy integral formulas and apply these to evaluate complex contour integrals. Classify singularities and poles; find residues and evaluate complex* integrals using the residue theorem. (L3, L5)

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. Understand the concepts of Probability, Random Variables and their characteristics
2. Learn how to deal with random variables, conditional probability, joint distribution and statistical independence.
3. Formulate and solve engineering problems involving random variables.
4. Understand the concepts of multiple random variable and operation that may be performed on multiple random variable and single random variable.
5. Analyze limit, continuity and differentiation of functions of complex variables and understand Cauchy-Riemann equations, analytic functions and various properties of analytic functions.
6. Understand Cauchy theorem, Cauchy integral formulas and apply these to evaluate complex contour integrals. Classify singularities and poles; find residues and evaluate complex integrals using the residue theorem.

UNIT-I

Probability & Random Variable : Probability through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events. Random variables (discrete and continuous), probability density functions, properties, mathematical expectation. Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh.

UNIT-II

Operations on Random variable: Moments-moments about the origin, Central moments, Variance and Skew, Chebyshev's inequality, moment generating function, characteristic function.

Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Interval conditioning, Statistical Independence.

UNIT-III

Operations on Multiple Random variables: Operations on Multiple Random Variables: Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties of Gaussian random variables.

UNIT-IV

Complex Variable – Differentiation: Introduction to functions of complex variable-concept of Limit & continuity- Differentiation, Cauchy-Riemann equations, analytic functions harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method.

UNIT-V

Complex Variable – Integration: Line integral-Contour integration, Cauchy's integral theorem (Simple Case), Cauchy Integral formula, Power series expansions: Taylor's series, zeros of analytic functions, singularities, Laurent's series, Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine.

TEXTBOOKS

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", 4th Edition, TMH, 2002.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2017, 44th Edition

REFERENCES

1. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", 4th Edition, PHI, 2002
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India
3. Henry Stark and John W.Woods, "Probability and Random Processes with Application to Signal Processing," 3rd Edition, Pearson Education, 2002.
4. B.V.Ramana, Higher Engineering Mathematics, Mc Graw Hill publishers.

Online Learning Resources:

https://onlinecourses.nptel.ac.in/noc20_ma50/preview
https://onlinecourses.nptel.ac.in/noc21_ma66/preview#:~:text=This%20course%20provides%20random%20variable,and%20simple%20Markovian%20queueing%20models.

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(23HS0814) UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT
(Common to All Branches of Engineering)

COURSE OBJECTIVES:
The objectives of this course

1. *To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.*
2. *To facilitate the development of a Holistic perspective among students 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. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.*
3. *To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching* interaction with Nature.

COURSE OUTCOMES (COs)
On successful completion of this course, students will be able to

1. *Define the terms like Natural Acceptance, Happiness and Prosperity (L1, L2)*
2. *Identify one's self, and one's surroundings (family, society nature) (L1, L2)*
3. *Apply what they have learnt to their own self in different day-to-day settings in real life (L3)*
4. *Relate human values with human relationship and human society. (L4)*
5. *Justify the need for universal human values and harmonious existence (L5)*
6. *Develop* as socially and ecologically responsible engineers (L3, L6)

Course Topics
The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1-hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.

The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

UNIT-I
Introduction to Value Education (6 lectures and 3 tutorials for practice session)

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

Lecture 2: Understanding Value Education
Tutorial 1: Practice Session PS1 Sharing about Oneself Lecture 3: self-exploration as the Process for Value Education

Lecture 4: Continuous Happiness and Prosperity –the Basic Human Aspirations
Tutorial 2: Practice Session PS2 Exploring Human Consciousness
Lecture 5: Happiness and Prosperity – Current Scenario
Lecture 6: Method to Fulfill the Basic Human Aspirations
Tutorial 3: Practice Session PS3Exploring Natural Acceptance

UNIT-II

Harmony in the Human Being (6 lectures and 3 tutorials for practice session)
Lecture 7: Understanding Human being as the Co-existence of the self and the body.
Lecture 8: Distinguishing between the Needs of the self and the body
Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.
Lecture 9: The body as an Instrument of the self
Lecture 10: Understanding Harmony in the self
Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self
Lecture 11: Harmony of the self with the body
Lecture 12: Programme to ensure self-regulation and Health
Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

UNIT-III

Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)
Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction
Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust
Lecture 15: 'Respect' – as the Right Evaluation
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship
Lecture 17: Understanding Harmony in the Society
Lecture 18: Vision for the Universal Human Order
Tutorial 9: Practice Session PS9 Exploring Systems to fulfill Human Goal

UNIT-IV

Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)
Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature
Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

UNIT-V

Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)
Lecture 23: Natural Acceptance of Human Values
Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture 26: Competence in Professional Ethics
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education

Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order
Practice Sessions for UNIT I – Introduction to Value Education
PS1 Sharing about Oneself
PS2 Exploring Human Consciousness
PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being
PS4 Exploring the difference of Needs of self and body
PS5 Exploring Sources of Imagination in the self
PS6 Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society PS7 Exploring the Feeling of Trust
PS8 Exploring the Feeling of Respect
PS9 Exploring Systems to fulfil Human Goal
Practice Sessions for UNIT IV – Harmony in the Nature (Existence)
PS10 Exploring the Four Orders of Nature
PS11 Exploring Co-existence in Existence
Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics
PS12 Exploring Ethical Human Conduct
PS13 Exploring Humanistic Models in Education
PS14 Exploring Steps of Transition towards Universal Human Order

READINGS:

Textbook and Teachers Manual

1. The Textbook R R Gaur, R Asthana, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. The Teacher's Manual
3. R R Gaur, R Asthana, G P Bagaria,Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

Mode of Conduct:

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.

Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.

Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

Online Resources:

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201- Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203- Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf
5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf
6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3- S2A%20Und%20Nature-Existence.pdf
7. https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023- 25%20Ethics%20v1.pdf
8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human- values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385
9. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

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(23EC0401) SIGNALS, SYSTEMS AND STOCHASTIC PROCESSES

COURSE OBJECTIVES

The objectives of this course

1. *Understanding the basics of signals and systems required for ECE courses.*
2. *To teach concepts of signals and systems and its analysis using different transform techniques.*
3. *To provide basic understanding of random processes which is essential for the random signals and systems encountered in communications and signal Processing areas.*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Understand the mathematical description and representation of continuous-time and discrete-time signals and systems. Classify the systems based on their properties and determine the response of them. (L2)*
2. *Analyze the frequency spectra of various continuous-time signals using different transform methods. (L4)*
3. *Apply sampling theorem to convert continuous-time signals to discrete-time signals and reconstruct back, different transform techniques to solve signals and system related problems. (L3)*
4. *Identify the suitable transform based on the system requirements. Determine the response of a system for the given input using the suitable transform. (L2)*
5. *Apply the basic concepts of probability, random variables & random signal for the spectral analysis. (L3)*
6. *Understand the concepts of various transform techniques and Random Processes. Formulate and solve engineering problems involving random processes. (L2)*

UNIT-I

Signals & Systems: Basic definitions and classification of Signals and Systems (Continuous time and discrete time), operations on signals, Concepts of Convolution and Correlation of signals, Analogy between vectors and signals-Orthogonality, mean square error

Fourier series: Trigonometric & Exponential forms of Fourier series, Properties, Concept of discrete spectrum, Illustrative Problems.

UNIT-II

Fourier Transform: Definition, Computation and properties of Fourier transform for different types of signals and systems, Inverse Fourier transform. Sampling: Sampling theorem – Graphical and analytical proof for Band Limited Signals, Reconstruction of signal from its samples, Effect of under sampling – Aliasing. Illustrative Problems.

Laplace Transform: Definition, ROC, Properties, Inverse Laplace transforms, the s-plane and BIBO stability, Transfer functions, System Response to standard signals, Solution of differential equations with initial conditions, Illustrative Problems.

UNIT-III

Signal Transmission through Linear Systems: Linear system, impulse response, Response of a linear system for different input signals, linear time-invariant (LTI) system, linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, System bandwidth,
Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between bandwidth and rise time, Energy and Power spectral densities, Illustrative Problems.

UNIT-IV

Random Processes – Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second-Order and Wide-Sense Stationarity, (N-Order) and Strict Sense Stationarity, Time Averages and Ergodicity, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

UNIT-V

Random Processes – Spectral Characteristics: The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

TEXTBOOKS

1. Peyton Z. Peebles, “Probability, Random Variables & Random Signal Principles”, 4th Edition, TMH, 2002.
2. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, “Signals and Systems”, 2nd Edition, PHI, 2009.

REFERENCES

1. Signals, Systems & Communications - B.P. Lathi, 2013, BSP.
2. Athanasios Papoulis and S. Unnikrishna Pillai, “Probability, Random Variables and Stochastic Processes”, 4th Edition, PHI, 2002
3. Simon Haykin and Van Veen, “Signals & Systems”, 2nd Edition, Wiley, 2005.
4. Matthew Sadiku and Warsame H. Ali, “Signals and Systems A primer with MATLAB”, CRC Press, 2016.
5. Hwei Hsu, “Schaum's Outline of Signals and Systems”, 4thEdition, TMH, 2019.

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(23EC0402) ELECTRONIC DEVICES & CIRCUITS

COURSE OBJECTIVES:

The objectives of this course

1. *Students will be able understand the basic principles of all semiconductor devices.*
2. *Able to analyze diode circuits, various biasing and small signal equivalent circuits of amplifiers, compare the performance of BJTs and MOSFETs*
3. *Able to design rectifier circuits and various amplifier circuits using BJTs and MOSFETs.*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Understand the working concept of various semiconductor devices (L1)*
2. *Understand principle of operation, characteristics and applications of semiconductor diodes, special diodes, BJTs, JFET and MOSFETs. (L2)*
3. *Applying the basic principles and solving the problems related to Semiconductor diodes,BJTs, and MOSFETs. (L3)*
4. *Analyze diode circuits for different applications such as rectifiers, clippers and clampers also analyze biasing circuits of BJTs, and MOSFETs. (L4)*
5. *Design of diode circuits and amplifiers using BJTs, and MOSFETs. (L4)*
6. *Compare the performance of various semiconductor devices. (L4)*

UNIT-I

PN junction diode: Review, diode current equation, Diode resistance, Transition and Diffusion Capacitance, effect of temperature on PN junction diode, Quantitative analysis of Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Ripple Factor and Regulation Characteristics, Clipping and Clamping circuits, Illustrative problems.

Special Diodes: Construction, operation and VI characteristics of Tunnel Diode, Varactor Diode, LED, LCD, Photo Diode, SCR and UJT.

UNIT-II

Review of Bipolar Junction Transistors, Characteristics, Transistor as an Amplifier and as a Switch, BJT Configurations, Limits of Operation, BJT Specifications.

Biasing and Stabilization: Operating Point, DC and AC Load Lines, Importance of Biasing, Fixed Bias, Collector to Base Bias, Self-Bias, Bias Stability, Thermal Runaway, Thermal Stability, Illustrative problems.

UNIT-III

BJT Small Signal Operation and Models- the transconductance, input resistance at the base, input resistance at the emitter, Voltage gain, separating the Signal and the DC Quantities, The Hybrid π Model, the T Model. Single Stage BJT Amplifiers - Common-Emitter (CE) amplifier without and with emitter resistance, Common-Base (CB) amplifier, Common- Collector (CC) amplifier or Emitter Follower, Problem solving.

UNIT-IV

Junction Field Effect Transistor (FET): Construction, Principle of Operation, V–I Characteristics, Comparison of BJT and FET, FET as Voltage Variable Resistor. FET biasing.

MOS Field Effect Transistors: Introduction, Device Structure and Physical Operation, CMOS, V - I Characteristics,MOSFET Circuits at DC, MOSFET as an Amplifier and as a Switch. Biasing in MOS Amplifier circuits - biasing by fixing VGS with and without source resistance, biasing using drain to gate feedback resistor, biasing using constant current source, body effect, Problem solving.

UNIT-V

MOSFET Small Signal Operation Models– the dc bias, separating the DC analysis and the signal analysis, Small signal equivalent circuit models, the transconductance, the T equivalent circuit model, Single stage MOS Amplifiers – common source (CS) amplifier without and with source resistance, common gate (CG) amplifier, source follower, Problem Solving.

TEXTBOOKS

1. Adel S. Sedra and Kenneth C. Smith, "Microelectronic Circuits – Theory and Applications", 6th Edition, Oxford Press, 2013.
2. J. Milliman and C Halkias, "Integrated electronics", 2nd Edition, Tata McGraw Hill, 1991.

REFERENCES

1. Donald A Neamen, "Electronic Circuits – analysis and design", 3rd Edition, McGraw Hill (India), 2019.
2. Behzad Razavi, "Microelectronics", Second edition, Wiley, 2013.
3. R.L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits," 9th Edition, Pearson, 2006.
4. Jimmie J Cathey, "Electronic Devices and Circuits," Schaum's outlines series, 3rd edition, McGraw-Hill (India), 2010.

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B.Tech-ECE

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II B. Tech. – I Sem.

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(23EC0403) DIGITAL CIRCUITS DESIGN

COURSE OBJECTIVES:

The objectives of this course

1. *Understand the properties of Boolean algebra, logic operations, and minimization of Boolean functions.*
2. *Analyze combinational and analyze sequential logic circuits.*
3. *Understand the concepts of FSM and compare various Programmable logic devices.*
4. *Model combinational and sequential circuits using HDLs.*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Describe various number systems, their representation. (L1)*
2. *Understand the properties of Boolean algebra, logic operations, concepts of FSM. (L2)*
3. *Apply techniques for minimization of Boolean functions.(L3)*
4. *Analyze combinational and Sequential logic circuits. (L4)*
5. *Compare various Programmable logic devices. (L4)*
6. *Design and Model combinational and sequential circuits using HDLs. (L5, L6)*

UNIT-I

Boolean algebra, logic operations, and minimization of Boolean functions: Review of Number Systems and Codes, Representation of unsigned and signed integers, Floating Point representation of real numbers, Laws of Boolean Algebra, Theorems of Boolean Algebra, Realization of functions using logic gates, Canonical forms of Boolean Functions, Minimization of Functions using Karnaugh Maps.

UNIT-II

Combinational Logic Circuits: Combinational circuits, Design with basic logic gates, design procedure, adders, subtractors, 4-bit binary adder/ subtractor circuit, BCD adder, carry look- a-head adder, binary multiplier, magnitude comparator, data selectors, priority encoders, decoders, multiplexers, demultiplexers.

UNIT-III

Hardware Description Language: Introduction to Verilog - structural specification of logic circuits, behavioral specification of logic circuits, hierarchical Verilog Code, Verilog for combinational circuits - conditional operator, if-else statement, case statement, for loop using sequential circuits with CAD tools.

UNIT-IV

Sequential Logic Circuits: Basic architectural distinction between combinational and sequential circuits, Design procedure, latches, flip-flops, truth tables and excitation tables, timing and triggering consideration, conversion of flip- flops, design of counters, ripple counters, synchronous counters, ring counter, Johnson counter, registers, shift registers, universal shift register. Verilog constructs for sequential circuits, flip-flop with clear capability, using Verilog constructs for registers and counters.

UNIT-V

Finite State Machines and Programmable Logic Devices:

Types of FSM, capabilities and limitations of FSM, state assignment, realization of FSM using flip-flops, Mealy to Moore conversion and vice-versa, reduction of state tables using partition technique, Design of sequence detector. Types of PLD's: PROM, PAL, PLA, basic structure of CPLD and FPGA, advantages of FPGAs.

TEXTBOOKS

1. M. Morris Mano, "Digital Design", 3rd Edition, PHI. (Unit I to IV)
2. Stephen Brown and ZvonkoVranesic, "Fundamentals of Digital Logic with Verilog Design", 3rd Edition, McGraw-Hill (Unit V)

REFERENCES

1. Charles H. Roth, Jr, "Fundamentals of Logic Design", 4th Edition, Jaico Publishers.
2. ZviKohavi and NirajK.Jha, "Switching and Finite Automata Theory, 3rd Edition, Cambridge University Press, 2010.
3. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", 2nd Edition, Prentice Hall PTR.
4. D.P. Leach, A.P. Malvino, "Digital Principles and Applications", TMH, 7th Edition.

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(23EC0404) ELECTRONIC DEVICES & CIRCUITS LAB

COURSE OBJECTIVES:

The objectives of this course

1. *Verify the theoretical concepts practically from all the experiments.*
2. *Analyse the characteristics of Diodes, BJT, MOSFET, UJT.*
3. *Design the amplifier circuits from the given specifications.*
4. *Model the electronic circuits using tools such as PSPICE/Multisim.*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Remember the concept of various semiconductor devices(L1)*
2. *Understand the characteristics and applications of basic electronic devices. (L2)*
3. *Plot the characteristics of electronic devices. (L3)*
4. *Analyze various biasing circuits and electronic circuits as amplifiers (L4).*
5. *Design MOSFET / BJT based amplifiers for the given specifications. (L5)*
6. *Simulate all circuits in PSPICE /Multisim. (L5).*

LIST OF EXPERIMENTS: (Implement / **Execute any 10 experiments**).

1. Verify various clipping and clamper circuits using PN junction diode and draw the suitable graphs.
2. Study and draw the Volt Ampere characteristics of UJT and determine η, IP, Iv, VP, &Vv from the experiment.
3. Verification of the input and output characteristics of BJT in Common Emitter configuration experimentally and find required parameters from the graphs.
4. Study and draw the input and output characteristics of BJT in Common Base configuration experimentally and determine required parameters from the graphs.
5. Verification of the input and output characteristics of BJT in Common Collector configuration experimentally and find required parameters from the graphsStudy and draw the V- I characteristics of JFET experimentally.
6. Study and draw the ***output*** and ***transfer*** characteristics of MOSFET (Enhance mode) in Common Source Configuration experimentally. Find ***Threshold voltage (VT), gm, & K*** from the graphs.
7. Study and draw the ***output*** and ***transfer*** characteristics of MOSFET (Depletion mode) or JFET in Common Source Configuration experimentally. Find ***IDSS, gm, & VP*** from the graphs.
8. Design and analysis of voltage- divider bias/self-bias circuit using BJT.
9. Design and analysis of self-bias circuit using MOSFET.
10. Design a suitable circuit for switch using MOSFET/BJT.
11. Design a small signal amplifier using MOSFET (common source) for the given specifications. Draw the frequency response and find the bandwidth.
12. Design a small signal amplifier using BJT(common emitter) for the given specifications. Draw the frequency response and find the bandwidth.

Tools / Equipment Required: Software Toollike Multisim/ Pspice or Equivalent,
DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

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(23EC0405) DIGITAL CIRCUITS & SIGNAL SIMULATION LAB

COURSE OBJECTIVES:

The objectives of this course

1. *Verify the truth tables of various logic circuits.*
2. *Design sequential/combinational circuit using Hardware Description Language and verify their functionality.*
3. *Simulate various Signals and Systems through MATLAB*
4. *Analyze the output of a system when it is excited by different types of deterministic and random signals.*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Verify thr truth tables of various logic circuits(L2)*
2. *Understand how to simulate different types of signals and system response(L2).*
3. *Design sequential and combinational logic circuits and .verify their functionality(L3, L4)*
4. *Analyze the response of different systems when they are excited by different signals and plot power spectral density of signals(L4)*
5. *Generate signals according to the given specifications(L5).*
6. *Analyze the stability of the system from S-plane(L4).*

List of Experiments:

PART A

1. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit.
2. Verification of functional table of 3 to 8-line Decoder /De-multiplexer
3. 4 variable logic function verification using 8 to1 multiplexer.
4. Design full adder circuit and verify its functional table.
5. Design a four-bit ring counter using D Flip–Flops/JK Flip Flop and verify output.
6. Design a four-bit Johnson's counter using D Flip-Flops/JK Flip Flops and verify output
7. Verify the operation of 4-bit Universal Shift Register for different Modes of operation.
8. Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T-Flip-Flops and Test It with a low frequency clock and sketch the output waveforms.
9. Design MOD–8 synchronous counter using T Flip-Flop and verify the result and sketch the output waveforms.
10. (a) Draw the circuit diagram of a single bit comparator and test the output

(b) Construct 7 Segment Display Circuit Using Decoder and7 Segment LED and test it.

Note: Design and verify combinational and sequential circuits using Hardware Description Language

REFERENCES:

1. M. Morris Mano, "Digital Design", 3rd Edition, PHI

PART B

List of Experiments:

1. Write a program to generate various Signals and Sequences: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc function.
2. Perform operations on Signals and Sequences: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
3. Write a program to find the trigonometric & exponential Fourier series coefficients of a rectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightings- Plot the discrete spectrum of the signal.
4. Write a program to find Fourier transform of a given signal. Plot its amplitude and phase spectrum.
5. Write a program to convolve two discrete time sequences. Plot all the sequences.
6. Write a program to find autocorrelation and cross correlation of given sequences.
7. Write a program to verify Linearity and Time Invariance properties of a given Continuous System.
8. Write a program to generate discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal.
9. Write a program to find magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale.
10. Write a program to generate Complex Gaussian noise and find its mean, variance, Probability Density Function (PDF) and Power Spectral Density (PSD).
11. Generate a Random data (with bipolar) for a given data rate (say 10kbps). Plot the same for a time period of 0.2 sec.
12. To plot pole-zero diagram in S-plane of given signal/sequence and verify its stability.

Note: Any 10 experiments. All the experiments are to be simulated using MATLAB or equivalent software.

REFERENCES:

Stephen J. Chapman, "MATLAB Programming for Engineers", Cengage, November 2012.

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(23CS0549) PYTHON PROGRAMMING

COURSE OBJECTIVES

The objectives of this course

1. *Introduce core programming concepts of Python programming language.*
2. *Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries*
3. *Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Understand the basics of Python syntax involves grasping its fundamental elements: variables, data types, control structures, functions, modules, and their applications in various scenarios (L1)*
2. *Summarize the features of lists, in Python and how Python programming concepts can be solve computational (L2)*
3. *Interpret the functions and Object Oriented Programming Concepts in python (L3)*
4. *Develop skills to implement the modules, libraries and exception handling (L4)*
5. *Exhibit competence in implementing and manipulating fundamental data structures such as lists, tuples, sets, dictionaries (L5)*
6. *Utilize different functional programming and file handling operations in python and can demonstrate the JSON applications (L6)*

UNIT-I

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.

Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: if statement, if-else statement, if...elif…else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

Sample Experiments:

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.
   i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators
5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

UNIT-II

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

Sample Experiments:

7. Write a program to define a function with multiple return values.
8. Write a program to define a function using default arguments.
9. Write a program to find the length of the string without using any library functions.
10. Write a program to check if the substring is present in a given string or not.
11. Write a program to perform the given operations on a list:
    i. additionii. insertioniii. slicing
12. Write a program to perform any 5 built-in functions by taking any list.

UNIT-III

Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.

Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.

Sample Experiments:

13. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
14. Write a program to count the number of vowels in a string (No control flow allowed).
15. Write a program to check if a given key exists in a dictionary or not.
16. Write a program to add a new key-value pair to an existing dictionary.
17. Write a program to sum all the items in a given dictionary.

UNIT-IV

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

Sample Experiments:

18. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
19. Python program to print each line of a file in reverse order.

20. Python program to compute the number of characters, words and lines in a file.
21. Write a program to create, display, append, insert and reverse the order of the items in the array.
22. Write a program to add, transpose and multiply two matrices.
23. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

UNIT-V

Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

Sample Experiments:

24. Python program to check whether a JSON string contains complex object or not.
25. Python Program to demonstrate NumPy arrays creation using array () function.
26. Python program to demonstrate use of ndim, shape, size, dtype.
27. Python program to demonstrate basic slicing, integer and Boolean indexing.
28. Python program to find min, max, sum, cumulative sum of array
29. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
    a) Apply head () function to the pandas data frame
    b) Perform various data selection operations on Data Frame
30. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

REFERENCES

1. Gowri shankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

Online Learning Resources/Virtual Labs:

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

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(23HS0805) ENVIRONMENTAL SCIENCE

COURSE OBJECTIVES

The objectives of this course

1. *To make the students to get awareness about the environment.*
2. *To understand the importance of protecting natural ecosystems for future.*
3. *To save earth from the inventions by Engineers.*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Make the students to get awareness about the environment and its components.*
2. *Understand the importance of protecting natural ecosystems.*
3. *Understand various types of pollutions and their effects.*
4. *Understand the various engineering techniques to protect the environment.*
5. *Make awareness about the social issues and laws of environmental protection.*
6. *Understand the concept of sustainable development and role of Engineering Technology in environment and human health.*

UNIT-I

Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT-II

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem.
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its Conservation : Introduction, Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat

loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT-III

Environmental Pollution: Definition, Cause, effects and control measures of :
a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT-IV

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies –Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT-V

Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/ mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

TEXTBOOKS

1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, “Environmental Studies”, Pearson education
3. S. Azeem Unnisa, “Environmental Studies” Academic Publishing Company
4. K. Raghavan Nambiar, “Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus”, Scitech Publications (India), Pvt. Ltd.

REFERENCES

1. Deeksha Dave and E.Sai Baba Reddy, “Textbook of Environmental Science”, Cengage Publications.
2. M.Anji Reddy, “Text book of Environmental Sciences and Technology”, BS Publication.

3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice hall of India Private limited
5. G.R.Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House
6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice hall of India Private limited

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(23HS0848) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
(Common to All Branches of Engineering)

COURSE OBJECTIVES:

The objectives of this course

1. *To inculcate the basic knowledge of microeconomics and financial accounting*
2. *To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost*
3. *To Know the Various types of market structure and pricing methods and strategy*
4. *To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.*
5. *To provide fundamental skills on accounting and to explain the process of preparing financial statements.*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Understand the nature of managerial economics and the role of it in business firms.(L1, L2)*
2. *Identify the determinants of demand and apply cost analysis under different market conditions.(L2,L3)*
3. *Integrate the concepts of price and output decisions of business firms.(L6)*
4. *Appreciate the importance of market structures and implement appropriate price and output decisions.(L2)*
5. *Assess the financial statements of a firm and the financial performance of the firm through the financial statements.(l5)*
6. *Measure operating, investing and financial performance of a firm.(L5)*

UNIT-I

Managerial Economics: Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

UNIT-II

Production and Cost Analysis: Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and long run Production Function- Isoquants and Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour-Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).

UNIT-III

Business Organizations and Markets: Introduction – Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition– Oligopoly-Price-Output Determination - Pricing Methods and Strategies

UNIT-IV

Capital Budgeting: Introduction – Nature, meaning, significance. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

UNIT-V

Financial Accounting and Analysis: Introduction – Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

TEXTBOOKS

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

REFERENCES

1. Ahuja Hl Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

Online Learning Resources:

https://www.slideshare.net/123ps/managerial-economics-ppt
https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-19917607
https://www.slideshare.net/balarajbl/market-and-classification-of-market
https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
https://www.slideshare.net/ashu1983/financial-accounting

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(23HS0850) ORGANISATIONAL BEHAVIOUR

(Common to All Branches of Engineering)

COURSE OBJECTIVES:

The objectives of this course

1. *To enable student's comprehension of organizational behavior*
2. *To offer knowledge to students on self-motivation, leadership and management*
3. *To facilitate them to become powerful leaders*
4. *To Impart knowledge about group dynamics*
5. *To make them understand the importance of change and development*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Define the Organizational Behaviour, its nature and scope.(L1)*
2. *Understand the nature and concept of Organizational behaviour.(L2)*
3. *Apply theories of motivation to analyse the performance problems.(L3)*
4. *Analyse the different theories of leadership.(L4)*
5. *Evaluate group dynamics (L5)*
6. *Develop as powerful leader(L6)*

UNIT-I

Introduction to Organizational Behavior : Meaning, definition, nature, scope and functions - Organizing Process – Making organizing effective -Understanding Individual Behaviour –Attitude - Perception - Learning – Personality.

UNIT-II

Motivation and Leading : Theories of Motivation- Maslow's Hierarchy of Needs - Hertzberg's Two Factor Theory - Vroom's theory of expectancy – Mc Cleland's theory of needs–Mc Gregor's theory X and theory Y– Adam's equity theory.

UNIT-III

Organizational Culture: Introduction – Meaning, scope, definition, Nature - Organizational Climate - Leadership - Traits Theory–Managerial Grid - Transactional Vs Transformational Leadership - Qualities of good Leader - Conflict Management -Evaluating Leader.

UNIT-IV

Group Dynamics: Introduction – Meaning, scope, definition, Nature- Types of groups - Determinants of group behaviour - Group process – Group Development - Group norms - Group cohesiveness - Small Groups - Group decision making - Team building - Conflict in the organization– Conflict resolution.

UNIT-V

Organizational Change and Development: Introduction –Nature, Meaning, scope, definition and functions- Organizational Culture - Changing the Culture – Change Management – Work Stress Management - Organizational management – Managerial implications of organization's change and development.

TEXTBOOKS

1. Luthans, Fred, Organisational Behaviour, McGraw-Hill, 12 Th edition.
2. P Subba Ran, Organisational Behaviour, Himalya Publishing House.

REFERENCES

1. McShane, Organizational Behaviour, TMH
2. Nelson, Organisational Behaviour, Thomson.
3. Robbins, P. Stephen, Timothy A. Judge, Organisational Behaviour, Pearson.
4. Aswathappa, Organisational Behaviour, Himalaya.

O**nline Learning Resources:**

https://www.slideshare.net/Knight1040/organizational-culture
9608857s://www.slideshare.net/AbhayRajpoot3/motivation-165556714
https://www.slideshare.net/harshrastogi1/group-dynamics-159412405
https://www.slideshare.net/vanyasingla1/organizational-change-development-26565951

R23

B.Tech-ECE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY::PUTTUR
(AUTONOMOUS)

II B. Tech. – II Sem.

L	T	P	C
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(23HS0851) BUSINESS ENVIRONMENT
(Common to All Branches of Engineering)

COURSE OBJECTIVES:

The objectives of this course

1. *To make the student to understand about the business environment*
2. *To enable them in knowing the importance of fiscal and monitory policy*
3. *To facilitate them in understanding the export policy of the country*
4. *To Impart knowledge about the functioning and role of WTO*
5. *To Encourage the student in knowing the structure of stock markets*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Define Business Environment and its Importance. (L1)*
2. *Understand various types of business environment.(L2)*
3. *Apply the knowledge of Money markets in future investment.(L3)*
4. *Analyse India's Trade Policy (L4)*
5. *Evaluate fiscal and monitory policy (L5)*
6. *Develop a personal synthesis and approach for identifying business opportunities.(L6)*

UNIT-I

Overview of Business Environment: Introduction – meaning Nature, Scope, significance, functions and advantages. Types- Internal &External, Micro and Macro. Competitive structure of industries - Environmental analysis- advantages & limitations of environmental analysis.

UNIT-II

Fiscal & Monetary Policy: Introduction – Nature, meaning, significance, functions and advantages. Public Revenues - Public Expenditure - Evaluation of recent fiscal policy of GOI. Highlights of Budget- Monetary Policy - Demand and Supply of Money –RBI -Objectives of monetary and credit policy - Recent trends- Role of Finance Commission.

UNIT-III

India's Trade Policy: Introduction – Nature, meaning, significance, functions and advantages. Magnitude and direction of Indian International Trade - Bilateral and Multilateral Trade Agreements - EXIM policy and role of EXIM bank -Balance of Payments– Structure & Major components - Causes for Disequilibrium in Balance of Payments - Correction measures

UNIT-IV

World Trade Organization: Introduction – Nature, significance, functions and advantages. Organization and Structure - Role and functions of WTO in promoting world trade - GATT - Agreements in the Uruguay Round –TRIPS, TRIMS - Disputes Settlement Mechanism - Dumping and Anti-dumping Measures.

UNIT-V

Money Markets and Capital Markets: Introduction – Nature, meaning, significance, functions and advantages. Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets - Reforms and recent development – SEBI – Stock Exchanges - Investor protection and role of SEBI, Introduction to international finance.

TEXTBOOKS

1. Francis Cherunilam, International Business: Text and Cases, Prentice Hall of India.
2. K. Aswathappa, Essentials of Business Environment: Texts and Cases & Exercises 13th Revised Edition.HPH

REFERENCES

1. K. V. Sivayya, V. B. M Das, Indian Industrial Economy, Sultan Chand Publishers, New Delhi, India.
2. Sundaram, Black, International Business Environment Text and Cases, Prentice Hall of India, New Delhi, India.
3. Chari. S. N, International Business, Wiley India.

E. Bhattacharya, International Business, Excel Publications, New Delhi.

Online Learning Resources:

https://www.slideshare.net/ShompaDhali/business-environment-53111245
https://www.slideshare.net/rbalsells/fiscal-policy-ppt
https://www.slideshare.net/aguness/monetary-policy-presentationppt
https://www.slideshare.net/DaudRizwan/monetary-policy-of-india-69561982
https://www.slideshare.net/ShikhaGupta31/indias-trade-policyppt
https://www.slideshare.net/viking2690/wto-ppt-60260883
https://www.slideshare.net/prateeknepal3/ppt-mo

R23

B.Tech-ECE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY::PUTTUR

(AUTONOMOUS)

II B. Tech. – II Sem.

L	T	P	C
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(23EE0212) LINEAR CONTROL SYSTEMS

COURSE OBJECTIVES:

The objectives of this course

1. *Introduce the basic principles and applications of control systems.*
2. *Learn the time response and steady state response of the systems.*
3. *Know the time domain analysis and solutions to time invariant systems.*
4. *Understand different aspects of stability analysis of systems in frequency domain.*
5. *Understand the concept of state space, controllability and observability.*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Identify open and closed loop control system and Represent simple systems in transfer function and state variable forms*
2. *Analyse simple systems in time domain.*
3. *Analyse simple systems in frequency domain*
4. *Design Compensators for given control systems using Lead, Lag networks*
5. *Infer the stability of systems in time and frequency domain.*
6. *Interpret characteristics of the system through state space approach and find out solution for simple control problems*

UNIT-I

Control Systems Concepts: Open loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback characteristics, Effects of positive and negative feedback, Mathematical models – Differential equations of translational and rotational mechanical systems and electrical systems, Analogous Systems, Block diagram reduction methods – Signal flow graphs - Reduction using Mason's gain formula. Controller components, DC Servomotor and AC Servomotor- their transfer functions, Synchros.

UNIT-II

Time Response Analysis: Step Response - Impulse Response - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants, Study of effects and Design of P, PI, PD and PID Controllers on second order system.

UNIT-III

Stability Analysis in Time Domain: The concept of stability – Routh's stability criterion – Stability and conditional stability - limitations of Routh's stability. The Root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root loci.

UNIT-IV

Frequency Response Analysis: Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram - Stability Analysis from Bode Plots. Polar Plots- Nyquist Plots- Phase margin and Gain margin-Stability Analysis. Compensation techniques – Study of Effects and Design of Lag, Lead, Lag-Lead Compensator design in frequency Domain on a second order system.

UNIT-V

State Space Analysis of Continuous Systems: Concepts of state, state variables and state model - differential equations & Transfer function models - Block diagrams. Diagonalization, Transfer function from state model, solving the Time invariant state Equations- State Transition Matrix and its Properties. System response through State Space models. The concepts of controllability and observability,

TEXTBOOKS

1. Modern Control Engineering by Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. Control Systems Engineering by I. J. Nagrath and M. Gopal, New Age International (P) Limited Publishers, 5th edition, 2007.

REFERENCES

1. Control Systems Principles & Design by M.Gopal, 4th Edition, McGraw Hill Education,2012.
2. Automatic Control Systems by B. C. Kuo and Farid Golnaraghi, John wiley and sons, 8th edition,2003.
3. Feedback and Control Systems, Joseph J Distefano III, Allen R Stubberud & Ivan J Williams, 2nd Edition, Schaum's outlines, McGraw Hill Education,2013.
4. Control System Design by Graham C. Goodwin, Stefan F. Graebe and Mario E. Salgado, Pearson, 2000.
5. Feedback Control of Dynamic Systems by Gene F. Franklin, J.D. Powell and Abbas Emami- Naeini, 6th Edition, Pearson,2010.

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B.Tech-ECE

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II B. Tech. – II Sem.

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(23EC0407) EM WAVES AND TRANSMISSION LINES

COURSE OBJECTIVES:

The objectives of this course

1. *To understand and analyze different laws and theorems of electrostatic fields.*
2. *To study and analyze different laws and theorems of magnetostatic fields.*
3. *Analyzing Maxwell's equations in different forms.*
4. *To learn the concepts of wave theory and its propagation through various mediums.*
5. *To get exposure to the properties of transmission lines.*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Apply the laws & theorems of electrostatic fields to solve the related problems(L1,L2,L3)*
2. *Analysis and application of magnetostatic laws and Theorems(L4)*
3. *Analyze maxwell's Equations in different forms(L4)*
4. *Learn the concepts of wave theory and its propagation through various mediums (L2)*
5. *Understand the properties of transmission lines and their applications. (L2)*
6. *Apply Maxwell's equation to represent EM wave equations(L3)*

UNIT-I

Review of Co-ordinate Systems,

Electrostatics: Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial Capacitors, Illustrative Problems.

UNIT-II

Magnetostatics: Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy, Illustrative Problems**.**

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements, Conditions at a Boundary Surface, Illustrative Problems.

UNIT-III

EM Wave Characteristics: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossy dielectrics, lossless dielectrics, free space, wave propagation in good conductors, skin depth, Polarization & Types, Illustrative Problems.

Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem, Illustrative Problems.

UNIT-IV

Transmission Lines - I : Types, Parameters, T & π Equivalent Circuits, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line, Lossless lines, distortion less lines, Illustrative Problems.

UNIT-V

Transmission Lines – II: Input Impedance Relations, Reflection Coefficient, VSWR, Average Power, Shorted Lines, Open Circuited Lines, and Matched Lines, Low loss radio frequency and UHF Transmission lines, UHF Lines as Circuit Elements, Smith Chart – Construction and Applications, Quarter wave transformer, Single Stub Matching, Illustrative Problems.

TEXTBOOKS

1. Elements of Electromagnetics, Matthew N.O. Sadiku, 4th Edition, Oxford University Press, 2008.
2. Electromagnetic Waves and Radiating Systems, E.C. Jordan and K.G. Balmain, 2nd Edition, PHI, 2000.

REFERENCES

1. Electromagnetic Field Theory and Transmission Lines, G. S. N. Raju, 2nd Edition, Pearson Education, 2013.
2. Engineering Electromagnetics, William H. Hayt Jr. and John A. Buck, 7th Edition, Tata McGraw Hill, 2006.
3. Electromagnetics, John D. Krauss, 3rd Edition, McGraw Hill, 1988.
4. Networks, Lines, and Fields, John D. Ryder,2nd Edition, PHI publications, 2012.

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B.Tech-ECE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY::PUTTUR
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II B. Tech. – II Sem.

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(23EC0408) ELECTRONIC CIRCUITS ANALYSIS

COURSE OBJECTIVES:

The objectives of this course

1. *Understand the characteristics of Differential amplifiers, feedback and power amplifiers.*
2. *Analyze the response of tuned amplifiers*
3. *Categorize different oscillator circuits based on the application*
4. *Design the electronic circuits for the given specifications and for a given application.*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Recognize the terminology used in analog circuits and Understand the characteristics of various amplifiers and oscillators. (L1, L2)*
2. *Examine the frequency response of multistage and differential amplifier circuits using BJT & MOSFETs at low and high frequencies. (L3)*
3. *Investigate different feedback and power amplifier circuits based on the application. (L4)*
4. *Derive the expressions for parameters like frequency of oscillations and period of oscillator and multivibrator circuits. (L4)*
5. *Evaluate the performance of different tuned amplifiers (L5)*
6. *Design analog circuits for the given specifications and application. (L6)*

UNIT-I

Multistage & Differential Amplifiers: Introduction, Classification of Amplifiers, Distortion in amplifiers, Coupling Schemes, RC Coupled Amplifier using BJT, Cascaded RC Coupled BJT Amplifiers, Cascode amplifier, Darlington pair, the MOS Differential Pair, Small-Signal Operation of the MOS Differential Pair, The BJT Differential Pair, and other Non ideal Characteristics of the Differential Amplifier.

UNIT-II

Frequency Response: Low-Frequency Response of the CS and CE Amplifiers, Internal Capacitive Effects and the High-Frequency Model of the MOSFET and the BJT, High-Frequency Response of the CE, Emitter follower, CS, CD, f_β,f_T and gain bandwidth product.

UNIT-III

Feedback Amplifiers: Introduction, The General Feedback Structure, Some Properties of Negative Feedback, The Four Basic Feedback Topologies, Series—Shunt, Series—Series, Shunt—Shunt, Shunt—Series.

Oscillators: General Considerations, Phase Shift Oscillator, Wien-Bridge Oscillator, LC Oscillators, Relaxation Oscillator, Crystal Oscillators, Illustrative Problems.

UNIT-IV

Power Amplifiers: Introduction, Class A amplifiers (Series fed, Transformer coupled, Push pull), Second Harmonic distortion, Class B amplifiers (Push pull, Complementary symmetry), Crossover distortion and Class AB operation, Class C amplifiers, Power BJTs, MOS power transistors.

UNIT-V

Tuned Amplifiers: Introduction, single Tuned Amplifiers – Q-factor, frequency response, Double Tuned Amplifiers – Q-factor, frequency response, Concept of stagger tuning and synchronous tuning.

Multivibrators: Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using Transistors.

TEXTBOOKS

1. Adel. S. Sedra and Kenneth C. Smith, "Micro Electronic Circuits," 6th Edition, Oxford University Press, 2011.
2. J. Millman, H. Taub and Mothiki S. PrakashRao - Pulse, Digital and Switching Waveforms –2nd Ed., TMH, 2008.
3. Millman, C Chalkias, "Integrated Electronics", 4thEdition, McGraw Hill Education (India) Private Ltd., 2015.

REFERENCES

1. Behzad Razavi, "Fundamentals of Micro Electronics", Wiley, 2010.
2. Donald A Neamen, "Electronic Circuits – Analysis and Design," 3rdEdition, McGraw Hill (India), 2019.
3. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits Theory", 9th Edition, Pearson/Prentice Hall, 2006.

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B.Tech-ECE

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(AUTONOMOUS)

II B. Tech. – II Sem.

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(23EC0409) ANALOG AND DIGITAL COMMUNICATIONS

COURSE OBJECTIVES

The objectives of this course

1. *Introduce various modulation and demodulation techniques of analog and digital communication systems.*
2. *Analyze different parameters of analog and digital communication techniques.*
3. *Understand function of various stages of AM, FM transmitters and Know characteristics of AM &FM receivers.*
4. *Analyze the performance of various digital modulation techniques in the presence of AWGN.*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Identify the terminology used in analog and digital communication technique for transmission of information/data.(L1)*
2. *Explain the basic operation of modulation and demodulation techniques in analog and digital communications.(L2)*
3. *Compute various parameters of baseband and passband transmission schemes by applying basic engineering knowledge.(L3)*
4. *Analyze the performance of different modulation and demodulation techniques to solve complex problems in the presence of noise.(L4)*
5. *To calculate the performance of all analog and digital modulation techniques to know the merits and demerits of each one of them in terms of bandwidth and power efficiency.(L5)*
6. *To analyze the required modulation technique for different channels.(L5)*

UNIT-I

Amplitude Modulation: Need for modulation, Amplitude Modulation - Time and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves - Switching modulator, Detection of AM Waves - Envelope detector, DSBSC modulation - time and frequency domain description, Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB-SC Modulated waves, COSTAS Loop, SSB modulation - time and frequency domain description, frequency discrimination and Phase discrimination methods for generating SSB, Demodulation of SSB Waves, principle of Vestigial side band modulation.

UNIT-II

Angle Modulation: Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave using Bessel functions, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Signal- Armstrong Method, Detection of FM Signal: Balanced slope detector, Phase locked loop, Comparison of FM and AM., Concept of Pre-emphasis and de-emphasis

UNIT-III

Transmitters: Classification of Transmitters, AM Transmitters, FM Transmitters

Receivers: Radio Receiver - Receiver Types - Tuned radio frequency receiver, Super heterodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, Image frequency, AGC, Amplitude limiting, FM Receiver, Comparison of AM and FM Receivers.

UNIT-IV

Introduction to Noise: Types of Noise, Receiver Model, Noise in AM, DSB, SSB, and FM Receivers.

Pulse Modulation: Types of Pulse modulation- PAM, PWM and PPM. Comparison of FDM and TDM. Pulse Code Modulation: PCM Generation and Reconstruction, Quantization Noise, Non-Uniform Quantization and Companding, Delta Modulation, DPCM, Noise in PCM and DM.

UNIT-V

Digital Modulation Techniques: Coherent Digital Modulation Schemes – ASK, BPSK, BFSK, QPSK, Non-coherent BFSK, DPSK. M-ary Modulation Techniques, Power Spectra, Bandwidth Efficiency.

Baseband Transmission and Optimal Reception of Digital Signal: A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Coherent Reception, ISI, Eye Diagrams.

TEXTBOOKS

1. Simon Haykin, "Communication Systems", JohnWiley& Sons, 4th Edition, 2004.
2. Wayne Tomasi - Electronics Communication Systems-Fundamentals through Advanced, 5thEd., PHI, 2009
3. B. P. Lathi, Zhi Ding " Modern Digital and Analog Communication Systems", Oxford press, 2011.

REFERENCES

1. Sam Shanmugam, "Digital and Analog Communication Systems",JohnWiley& Sons, 1999.
2. Bernard Sklar, F. J. harris"Digial Communications: Fundamentals andApplications", Pearson Publications, 2020.
3. Taub and Schilling, " Principles of Communication Systems", Tata McGraw Hill, 2007.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY::PUTTUR

(AUTONOMOUS)

II B. Tech. – II Sem.

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(23EC0410) ELECTRONIC CIRCUITS ANALYSIS LAB

COURSE OBJECTIVES:

The objectives of this course

1. *Plot the characteristics of Differential amplifiers, feedback and power amplifiers.*
2. *Analyze the response of tuned amplifiers and multivibrators.*
3. *Categorize different oscillator circuits based on the application.*
4. *Design the electronic circuits for the given specifications and for a given application.*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Know about the usage of equipment/components/software tools used to conduct experiments in analog circuits. (L2)*
2. *Know about the electrical specifications of equipment and components used to conduct experiments in analog circuits. (L2)*
3. *Conduct the experiment based on the knowledge acquired in the theory about various analog circuits using BJT/MOSFETs to find the important parameters of the circuit experimentally. (L3)*
4. *Analyze the given analog circuit to find required important metrics of it theoretically. (L4)*
5. *Compare the experimental results with that of theoretical ones and infer the conclusions. (L4)*
6. *Design the circuit for the given specifications. (L6)*

List of Experiments:

1. Design and Analysis of Darlington pair.
2. Frequency response of CE – CC multistage Amplifier
3. Design and Analysis of Cascode Amplifier.
4. Frequency Response of Differential Amplifier
5. Design and Analysis of any two topologies of feedback amplifies and find the frequency response of it.
6. Design and Analysis of Class A power amplifier.
7. Design and Analysis of Class AB amplifier.
8. Design and Analysis of RC phase shift oscillator.
9. Design and Analysis of LC Oscillator
10. Frequency Response of Single Tuned amplifier
11. Design a Bistable Multivibrator and analyze the effect of commutating capacitors anddraw the wave forms at base and collector of transistors.
12. Design an Astable Multivibrator and draw the wave forms at base and collector of transistors.
13. Design a Monostable Multivibrator and draw the input and output waveforms.
14. Draw the response of Schmitt trigger for gain of greater than and less than one.

Note: At least 12 experiments shall be performed.

Faculty members who are handling the laboratory shall see that students are given design specifications for a given circuit appropriately and monitor the design and analysis aspects of the circuit.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY::PUTTUR
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L	T	P	C
-	-	3	1.5

(23EC0411) ANALOG AND DIGITAL COMMUNICATIONS LAB

COURSE OBJECTIVES

The objectives of this course

1. *Understand the basics of analog and digital modulation techniques.*
2. *Integrate theory with experiments so that the students appreciate the knowledge gained from the theory course.*
3. *Design and implement different modulation and demodulation techniques and their applications.*
4. *Develop cognitive and behavioral skills for performance analysis of various modulation techniques.*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Know about the equipments/components used to conduct different analog and digital modulation techniques.(L2)*
2. *Conduct the experiment based on the knowledge acquired in theory about modulation and demodulation schems to find the important metrics of the communication system experimentally.(L3)*
3. *Analyze the performance of a given modulation technique and to find the parameters like Bandwidth and power.(L4)*
4. *Compare the experimental results with that of theoretical ones and infer the conclusions.(L4)*
5. *Analyze the components in radio receivers and to measure the characteristic parameters of radio receivers.(L4)*
6. *Design the digital modulation schemes for wired communication and wireless communication.(L6)*

List of Experiments:

Design the circuits and verify the following experiments taking minimum of six from each section shown below.

Section-A

1. AM Modulation and Demodulation
2. DSB-SC Modulation and Demodulation
3. Frequency Division Multiplexing
4. FM Modulation and Demodulation
5. Radio receiver measurements
6. PAM Modulation and Demodulation
7. PWM Modulation and Demodulation
8. PPM Modulation and Demodulation

Section-B

1. Sampling Theorem.
2. Time Division Multiplexing
3. Delta Modulation and Demodulation
4. PCM Modulation and Demodulation

5. BPSK Modulation and Demodulation
6. BFSK Modulation and Demodulation
7. QPSK Modulation and Demodulation
8. DPSK Modulation and Demodulation

Note: Faculty members (who are handling the laboratory) are requested to instruct the students not to use readymade kits for conducting the experiments. They are advised to make the students work in the laboratory by constructing the circuits and analyzing them during the lab sessions.

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L	T	P	C
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(23HS0818) SOFT SKILLS
(Common to All Branches of Engineering)

COURSE OBJECTIVES:

The objectives of this course

1. *To encourage all round development of the students by focusing on soft skills*
2. *To make the students aware of critical thinking and problem-solving skills*
3. *To enhance healthy relationship and understanding within and outside an organization*
4. *To function effectively with heterogeneous teams*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *List out various elements of soft skills (L1, L2)*
2. *Describe methods for building professional image (L1, L2)*
3. *Apply critical thinking skills in problem solving (L3)*
4. *Analyse the needs of an individual and team for well-being (L4)*
5. *Assess the situation and take necessary decisions (L5)*
6. *Create a productive workplace atmosphere using social and work-life skills ensuring personal and emotional well-being (L6)*

UNIT-I

Soft Skills & Communication Skills: Soft Skills - Introduction, Need - Mastering Techniques of Soft Skills – Communication Skills -Significance, process, types - Barriers of communication - Improving techniques.

Activities:

Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self-expression – articulating with felicity.

(The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)

Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.

Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.

Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation.

UNIT-II

Critical Thinking: Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open- mindedness – Creative Thinking - Positive thinking - Reflection

Activities: Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues –placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis

UNIT-III

Problem Solving & Decision Making: Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Team building - Effective decision making in teams – Methods & Styles

Activities:

Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision. Case Study & Group Discussion

UNIT-IV

Emotional Intelligence & Stress Management: Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips

Activities:

Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations. Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

UNIT-V

Corporate Etiquette

Etiquette- Introduction, concept, significance - Corporate etiquette - meaning, modern etiquette, benefits - Global and local culture sensitivity - Gender Sensitivity - Etiquette in interaction- Cell phone etiquette - Dining etiquette - Netiquette - Job interview etiquette - Corporate grooming tips -Overcoming challenges

Activities

Providing situations to take part in the Role Plays where the students will learn about bad and good manners and etiquette - Group Activities to showcase gender sensitivity, dining etiquette etc. - Conducting mock job interviews - Case Study - Business Etiquette Games

NOTE-:

1. The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill.
2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear.

TEXTBOOKS

1. Mitra Barun K, Personality Development and Soft Skills, Oxford University Press, Pap/Cdr edition 2012
2. Dr Shikha Kapoor, Personality Development and Soft Skills: Preparing for Tomorrow, I K International Publishing House, 2018

REFERENCES

1. Sharma, Prashant, Soft Skills: Personality Development for Life Success, BPB Publications 2018.
2. Alex K, Soft Skills S.Chand & Co, 2012 (Revised edition)

3. Gajendra Singh Chauhan & Sangeetha Sharma, Soft Skills: An Integrated Approach to Maximise Personality Published by Wiley, 2013
4. Pillai, Sabina & Fernandez Agna, Soft Skills and Employability Skills, Cambridge University Press, 2018
5. Soft Skills for a Big Impact (English, Paperback, Renu Shorey) Publisher: Notion Press
6. Dr. Rajiv Kumar Jain, Dr. Usha Jain, Life Skills (Paperback English) Publisher : Vayu Education of India, 2014

Online Learning Resources:

1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
3. https://youtu.be/-Y-R9hDl7lU
4. https://youtu.be/gkLsn4ddmTs
5. https://youtu.be/2bf9K2rRWwo
6. https://youtu.be/FchfE3c2jzc
7. https://www.businesstrainingworks.com/training-resource/five-free-business-etiquette-training-games/
8. https://onlinecourses.nptel.ac.in/noc24_hs15/preview
9. https://onlinecourses.nptel.ac.in/noc21_hs76/preview

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY::PUTTUR
(AUTONOMOUS)

II B. Tech. – II Sem.

L	T	P	C
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(23HS0815) DESIGN THINKING & INNOVATION
(Common to All Branches of Engineering)

COURSE OBJECTIVES:

The objective of this course is

To familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Define the concepts related to design thinking. (L1, L2)*
2. *Explain the fundamentals of Design Thinking and innovation (L1, L2)*
3. *Apply the design thinking techniques for solving problems in various sectors. (L3)*
4. *Analyse to work in a multidisciplinary environment (L4)*
5. *Evaluate the value of creativity (L5)*
6. *Formulate specific problem statements of real time issues (L3, L6)*

UNIT-I

Introduction to Design Thinking: Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT-II

Design Thinking Process: Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT-III

Innovation: Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations- Creativity to Innovation- Teams for innovation- Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT-IV

Product Design: Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies.

Activity: Importance of modelling, how to set specifications, Explaining their own product design.

UNIT-V

Design Thinking in Business Processes: Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs- Design thinking for Startups- Defining and testing Business Models and Business Cases- Developing & testing prototypes.

Activity: How to market our own product, About maintenance, Reliability and plan for startup.

TEXTBOOKS

1. Tim Brown,Change by design, Harper Bollins (2009)
2. Idris Mootee, Design Thinking for Strategic Innovation, 2013, John Wiley & Sons.

REFERENCES

1. David Lee, Design Thinking in the Classroom, Ulysses press
2. Shrutin N Shetty, Design the Future, Norton Press
3. William Lidwell,Universal Principles of Design- Kritinaholden, Jill Butter.
4. Chesbrough.H, The Era of Open Innovation – 2013

Online Learning Resources:

https://nptel.ac.in/courses/110/106/110106124/
https://nptel.ac.in/courses/109/104/109104109/
https://swayam.gov.in/nd1_noc19_mg60/preview

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II B. Tech. – II Sem.

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(23EC0418) COMMUNITY SERVICE PROJECT
(Common to All Branches of Engineering)

COMMUNITY SERVICE PROJECT

……Experiential learning through community engagement

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development.
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will benefit with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

- Every student should put in 6 weeks for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, housewives, etc

- A logbook must be maintained by each of the students, where the activities undertaken/involved to be recorded.
- The logbook has to be countersigned by the concerned mentor/faculty in charge.
- An evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.

The Community Service Project should be different from the regular programs of NSS/NCC/Green Corps/Red Ribbon Club, etc.

- Minor project reports should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training.

Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one –
    - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
    - Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
        - Agriculture
        - Health
        - Marketing and Cooperation
        - Animal Husbandry
        - Horticulture
        - Fisheries
        - Sericulture
        - Revenue and Survey
        - Natural Disaster Management
        - Irrigation
        - Law & Order
        - Excise and Prohibition
        - Mines and Geology
        - Energy
        - Internet
        - Free Electricity
        - Drinking Water

Personal Outcomes

- Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
- Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills.

Social Outcomes

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

Career Development

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity.

Relationship with the Institution

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research.

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES

- Improved institutional commitment.
- Improved student retention
- Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

- Satisfaction with student participation
- Valuable human resources needed to achieve community goals.
- New energy, enthusiasm and perspectives applied to community work.
- Enhanced community-university relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions, and modifications. Colleges are expected to focus on specific local issues for this kind of project. The students are expected to carry out these projects with involvement, commitment, responsibility, and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of project. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting should be ensured.

For Engineering Students

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aqua culture
11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods
15. Food habits
16. Air pollution
17. Water pollution
18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases
22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Crop rotation
27. Floury culture
28. Access to safe drinking water
29. Geographical survey
30. Geological survey
31. Sericulture
32. Study of species
33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people

39. Utilisation of free electricity to farmers and related issues
40. Gender ration in schooling lvel- observation.

Complimenting the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programs

Programs for School Children

1. Reading Skill Program (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Program on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Program on Socially relevant

themes. Programs for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Women's Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social

Entrepreneurship General Camps

1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharath
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programs on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important

days Programs for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality

Development Common

Programs

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programs in consonance with the Govt. Departments like –
    i. Agriculture
    ii. Health
    iii. Marketing and Cooperation
    iv. Animal Husbandry

v. Horticulture
vi. Fisheries
vii. Sericulture
viii. Revenue and Survey
ix. Natural Disaster Management
x. Irrigation
xi. Law & Order
xii. Excise and Prohibition

xiii. Mines and Geology
xiv. Energy

Role of Students:

- Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.
- For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
- As and when required the College faculty themselves act as Resource Persons.
- Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- And also, with the Governmental Departments. If the program is rolled out, the District Administration could be roped in for the successful deployment of the program.
- An in-house training and induction program could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project Activity

Duration: 8 weeks

1. **Preliminary Survey (One Week)**
   - A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
   - A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
   - The Governmental agencies, like revenue administration, corporation and municipal authorities and village secreteriats could be aligned for the survey.

2. **Community Awareness Campaigns (One Week)**
   - Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

3. **Community Immersion Programme (Three Weeks)**

   Along with the Community Awareness Programmes, the student batch can also work with any one of the below-listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to experiential learning about the community and its dynamics. Programs could be in consonance with the Govt. Departments.

4. **Community Exit Report (One Week)**

- During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks' works to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University. Throughout the Community Service Project, a daily logbook need to be maintained by the students batch, which should be countersigned by the governmental agencyrepresentative and the teacher-mentor, who is required to periodically visit the students and guide them.

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III B. Tech. – I Sem.

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(23EC0412) ANALOG AND DIGITAL IC APPLICATIONS

COURSE OBJECTIVES:

The objectives of this course

1. *To introduce the classification of Integrated Circuits, internal blocks and characteristics of Op-Amp.*
2. *To analyse linear and non-linear applications of Op-Amp .*
3. *To gain knowledge on active filters, timers and phased locked loops.*
4. *To understand the working of Voltage Regulators and Converters.*
5. *To study about different types of Digital ICs and their applications.*
6. *To introduce the classification of Integrated Circuits, internal blocks and characteristics of Op-Amp.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1 *Understand the Types of ICs (analog, digital, mixed), integration levels (SSI–VLSI), 741 Op-Amp structure & features.*
2 *Design/analyze linear Op-Amp circuits: inverting, non-inverting, differential, integrator, differentiator.*
3 *Build/test non-linear Op-Amp uses: comparators, Schmitt triggers, oscillators, waveform generators, log/antilog amps.*
4 *Design active filters (LP, HP, BP), use IC 555 timer and PLL for control/timing.*
5 *Design voltage regulators (723, 78XX/79XX), explain DAC & ADC architectures.*
6 *Use TTL/CMOS ICs for combinational (MUX, decoder) & sequential circuits (flip-flop, counter, shift register).*

UNIT-I

ICs and OP- AMPS

Integrated Circuits and Operational Amplifier: Introduction, Classification of IC‘s, IC chip size and circuit complexity, basic information of Op-Amp IC741 and its features, the ideal Operational amplifier, Op-Amp internal circuit, Op-Amp characteristics - DC and AC, Features of 741 Op-Amp.

UNIT-II

Applications of OP- AMP

Linear Applications of Op-Amp: Inverting, non-inverting, Differential amplifiers, adder, subtractor, Instrumentation amplifier, AC amplifier, V to I and I to V converters, Integrator and differentiator.

Non-Linear Applications of Op-Amp: Sample and Hold circuit, Log and Antilog amplifier, multiplier and divider, Comparators, Schmitt trigger, Multi vibrators, Triangular and Square waveform generators, Oscillators.

UNIT-III

Active Filters and other ICs

Active Filters: Introduction, Butterworth filters – 1st order, 2nd order low pass and high pass filters, band pass, band reject and all pass filters.

Timer and Phase Locked Loops: Introduction to IC 555 timer, description of functional diagram, monostable and a stable operations and applications, Schmitt trigger, PLL - introduction, basic principle, phase detector/comparator, voltage controlled oscillator (IC 566), low pass filter, monolithic PLL and applications of PLL.

UNIT-IV

Voltage Regulators and Converters

Voltage Regulator: Introduction, Series Op-Amp regulator, IC Voltage Regulators, IC 723 general purpose regulators, Switching Regulator.

D to A and A to D Converters: Introduction, basic DAC techniques - weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, A to D converters - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC Specifications.

UNIT-V

Digital ICs

CMOS Logic: CMOS logic levels, MOS transistors, Basic CMOS Inverter, NAND and NOR gates, CMOS AND-OR-INVERT and OR-AND-INVERT gates, implementation of any function using CMOS logic.

Combinational Logic IC's: Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Parallel Binary Adder/ Subtractor, Magnitude Comparators.

Sequential Logic IC's: Familiarity with commonly available 74XX & CMOS40XX Series ICs - All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers.

TEXT BOOKS:

1. *D. Roy Choudhury, Shail B. Jain, ―Linear Integrated Circuit‖, 4th edition (2012), New Age International Pvt.Ltd., New Delhi, India*
2. *Floyd, Jain, ―Digital Fundamentals‖, 8th edition (2009), Pearson Education, New Delhi.*

REFERENCES:

1. *Ramakant A. Gayakwad, ―OP-AMP and Linear Integrated Circuits‖, 4th edition (2012), Prentice Hall / Pearson Education, New Delhi.*
2. *Sergio Franco (1997), Design with operational amplifiers and analog integrated circuits, McGraw Hill, New Delhi.*
3. *Gray, Meyer (1995), Analysis and Design of Analog Integrated Circuits, Wiley International, New Delhi.*
4. *Chanda Laxmana Sudheer,M Janardhana Raj,B Saroja, Tammineni Sreelatha,D Jayanayudu,―Linear and Digital IC Applications,1st edition (2023),Shine Book Publications,Chattisgarh.*

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III B. Tech. – I Sem.

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(23EC0413) ANTENNAS & WAVE PROPAGATION

COURSE OBJECTIVES:

The objectives of this course

1. *To learn the antennas basic terminology, radiation mechanism of antennas and dipole antennas.*
2. *To gain knowledge on HF, VHF & UHF antennas, their operation and applications.*
3. *Analyze the working and applications of Microwave antennas.*
4. *Understand different techniques involved in the design of antenna arrays and antenna parameter measurements.*
5. *To study the various types of radio wave propagation methods.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understand the antennas basic terminology and radiation mechanism of antennas.*
2. *Gain knowledge on VHF and UHF antennas, their operation and applications.*
3. *Design and analyze the working and applications of Microwave antennas.*
4. *Analyze the principles and techniques used in the design of antenna arrays.*
5. *Understand the basic concepts and methods used in antenna measurements.*
6. *Gain a comprehensive knowledge about the types of radio wave propagation methods.*

UNIT-I

Antenna Basics & Dipole antennas: Definition of antenna, Radiation Mechanism – single wire, two wire, dipoles, Antenna Parameters - Radiation Patterns, Main Lobe and Side Lobes, Beam widths, Beam Area, Radiation Intensity, Beam Efficiency, Directivity, Gain and Resolution, Aperture Efficiency, Effective Height and length, Antenna Theorems. Radiation – Basic Maxwell‘s equations, Retarded potential-Helmholtz Theorem, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Field Components, Radiated power, Radiation Resistance, Beam width, Natural current distributions, far fields and patterns of Thin Linear Center-fed Antennas of different lengths, Illustrative problems.

UNIT-II

HF, VHF and UHF Antennas: Loop Antennas - Introduction, Small Loop, Comparison of far fields of small loop and short dipole, Radiation Resistances and Directives of small and large loops (Qualitative Treatment), Arrays with Parasitic Elements - Yagi - Uda Arrays, Folded Dipoles & their characteristics. Log periodic Antenna, Helical Antennas-Helical Geometry, Helix modes, Practical Design considerations for Monofilar Helical Antenna in Axial and Normal Modes. Horn Antennas- Types, Fermat‘s Principle, Optimum Horns, Design considerations of Pyramidal Horns, Illustrative Problems.

UNIT-III

Microwave Antennas: Microstrip Antennas- Introduction, features, advantages and limitations, Rectangular patch antennas- Geometry and parameters, characteristics of Micro strip antennas, Impact of different parameters on characteristics, reflector antennas - Introduction, Flat sheet and corner reflectors, parabola reflectors- geometry, pattern characteristics, Feed Methods, Reflector Types - Related Features, Lens Antennas - Geometry of Non-metallic Dielectric Lenses, Zoning , Tolerances, Applications, Illustrative Problems.

UNIT-IV

Antenna Arrays: Point sources - Definition, Patterns, arrays of 2 Isotropic sources- Different cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, Endfire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison, BSAa with Non-uniform Amplitude Distributions - General considerations and Bionomial Arrays, Illustrative problems.

Antenna Measurements: Introduction, Sources of errors, Patterns to be Measured, Pattern Measurement Arrangement, Directivity Measurement, Gain Measurements (by comparison, Absolute and 3-Antenna Methods).

UNIT-V

Wave Propagation: Introduction, Definitions, Characterizations and general classifications, different modes of wave propagation, Ray/Mode concepts, Ground wave propagation (Qualitative treatment) - Introduction, Plane earth reflections, Space and surface waves, wave tilt, curved earth reflections, Space wave propagation - Introduction, field strength variation with distance and height, effect of earth‘s curvature, absorption, Super refraction, M-curves and duct propagation, scattering phenomena, tropospheric propagation, fading and path loss calculations, Sky wave propagation - Introduction, structure of Ionosphere, refraction and reflection of sky waves by Ionosphere, Ray path, Critical frequency, MUF, LUF, OF, Virtual height and Skip distance, Relation between MUF and Skip distance, Multi-HOP propagation, Energy loss in Ionosphere, Summary of Wave Characteristics in different frequency ranges, Illustrative problems.

TEXT BOOKS:

1. *John D. Kraus, Ronald J. Marhefka and Ahmad S.Khan, ―Antennas and wave propagation‖, TMH, New Delhi, 4th Ed., 2010.*
2. *C.A. Balanis, ―Antenna Theory- Analysis and Design‖, John Wiley & Sons, 2nd Edn., 2001.*
3. *K.D. Prasad and SatyaPrakashan, ―Antennas and Wave Propagation‖, New Delhi, Tech. India Publications, 2001.*

REFERENCES:

1. *E.C. Jordan and K.G. Balmain, ―Electromagnetic Waves and Radiating Systems‖, 2nd Edition, PHI, 2000.*
2. *G.S.N Raju, ―Antenna and Wave Propagation‖, Pearson Education India, 3rd Edition 2009.*
3. *R K Shevgaonkar,‖ Electromagnetic Waves‖. Tata McGraw-Hill, 2006*

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III B. Tech. – I Sem.

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(23EC0414) MICROPROCESSORS AND MICROCONTROLLERS

COURSE OBJECTIVES:

The objectives of this course

1. *To introduce fundamental architectural concepts of microprocessors and microcontrollers.*
2. *To impart knowledge on addressing modes and instruction set of 8086 and 8051*
3. *To introduce assembly language programming concepts*
4. *To acquire the knowledge on interfacing various peripherals, configure and develop programs to interface peripherals/sensors.*
5. *To develop programs efficiently on ARM Cortex processors and debug.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Recall and identify fundamental concepts of microprocessor architectures.*
2. *Recall and identify fundamental concepts of microcontroller architectures*
3. *Demonstrate programming skills in assembly language for processors and controllers.*
4. *Analyze various interfacing techniques.*
5. *Analyze various microprocessors and microcontrollers.*
6. *Apply interfacing techniques to implement microprocessor/microcontroller-based systems.*

UNIT-I

8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

UNIT-II

8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT-III

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT-IV

Microcontroller: Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT-V

Interfacing Microcontroller: Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors

TEXT BOOKS:

1. *Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition,1994.*
2. *K M Bhurchandi, A K Ray, Advanced Microprocessors and Peripherals, 3rd edition, McGraw Hill Education, 2017.*
3. *Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition, Pearson, 2012.*

REFERENCES:

1. Ramesh S Gaonkar, Microprocessor Architecture Programming and Applications with the 8085, 6th edition, Penram International Publishing, 2013.

2. Kenneth J. Ayala, The 8051 Microcontroller, 3rd edition, Cengage Learning, 2004.

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III B. Tech. – I Sem.

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(23CS0519) INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS

COURSE OBJECTIVES:

The objectives of this course

1. *Introduce fundamental quantum concepts like superposition and entanglement.*
2. *Understand theoretical structure of qubits and quantum information.*
3. *Explore conceptual challenges in building quantum computers.*
4. *Explain principles of quantum communication and computing.*
5. *Examine real-world applications and the future of quantum technologies.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understand the shift from classical to quantum physics, including wave-particle duality and uncertainty.*
2. *Analyze quantum systems like trapped ions and superconducting circuits.*
3. *Evaluate decoherence and error correction in quantum hardware.*
4. *Explain quantum key distribution (QKD) for secure communication.*
5. *Assess quantum applications in drug discovery, optimization, and sensing.*
6. *Explore quantum ethics, policy, societal impacts, and careers.*

UNIT-I

INTRODUCTION TO QUANTUM THEORY AND TECHNOLOGIES

The transition from classical to quantum physics, Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty Principle, Wave-particle duality, Classical vs Quantum mechanics – theoretical comparison, Quantum states and measurement: nature of observation, Overview of quantum systems: electrons, photons, atoms, The concept of quantization: discrete energy levels, Why quantum? Strategic, scientific, and technological significance, A snapshot of quantum technologies: Computing, Communication, and Sensing, National and global quantum missions: India‘s Quantum Mission, EU, USA, China.

UNIT-II

THEORETICAL STRUCTURE OF QUANTUM INFORMATION SYSTEMS

What is a qubit? Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (non-engineering view),Quantum coherence and decoherence – intuitive explanation, Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract, The role of entanglement and non-locality in systems, Quantum information vs classical information: principles and differences, Philosophical implications: randomness, determinism, and observer role.

UNIT-III

BUILDING A QUANTUM COMPUTER – THEORETICAL CHALLENGES AND REQUIREMENTS

What is required to build a quantum computer (conceptual overview)?, Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability, Theoretical barriers: Why maintaining entanglement is difficult, Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison),Superconducting circuits, Trapped ions, Photonics, Vision vs reality: what‘s working and what remains elusive, The role of quantum software in managing theoretical complexities.

UNIT-IV

QUANTUM COMMUNICATION AND COMPUTING – THEORETICAL PERSPECTIVE

Quantum vs Classical Information, Basics of Quantum Communication, Quantum Key Distribution (QKD),Role of Entanglement in Communication, The Idea of the Quantum Internet – Secure Global Networking, Introduction to Quantum Computing, Quantum Parallelism (Many States at Once),Classical vs Quantum Gates, Challenges: Decoherence and Error Correction, Real-World Importance and Future Potential

UNIT-V

APPLICATIONS, USE CASES, AND THE QUANTUM FUTURE

Real-world application domains: Healthcare (drug discovery),Material science, Logistics and optimization, Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, Psi Quantum, Ethical, societal, and policy considerations, Challenges to adoption: cost, skills, standardization, Emerging careers in quantum: roles, skillsets, and preparation pathways, Educational and research landscape – India's opportunity in the global quantum race

TEXT BOOKS:

1. *Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 10th Anniversary Edition, 2010.*
2. *Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.*
3. *Chris Bernhardt, Quantum Computing for Everyone, MIT Press, 2019.*

REFERENCES:

1. *David McMahon, Quantum Computing Explained, Wiley, 2008.*
2. *Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.*
3. *Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.*
4. *Alastair I.M. Rae, Quantum Physics: A Beginner's Guide, Oneworld Publications, Revised Edition, 2005.*
5. *Eleanor G. Rieffel, Wolfgang H. Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.*
6. *Leonard Susskind, Art Friedman, Quantum Mechanics: The Theoretical Minimum, Basic Books, 2014.*
7. *Bruce Rosenblum, Fred Kuttner, Quantum Enigma: Physics Encounters Consciousness, Oxford University Press, 2nd Edition, 2011.*
8. *GiulianoBenenti, GiulioCasati, GiulianoStrini, Principles of Quantum Computation and Information, Volume I: Basic Concepts, World Scientific Publishing, 2004.*
9. *K.B. Whaley et al., Quantum Technologies and Industrial Applications: European Roadmap and Strategy Document, Quantum Flagship, European Commission, 2020.*
10. *Department of Science & Technology (DST), Government of India, National Mission on Quantum Technologies & Applications – Official Reports and Whitepapers, MeitY/DST Publications, 2020 onward.*

Online Learning Resources:

- *IBM Quantum Experience and Qiskit Tutorials*
- *Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley*
- *edX – The Quantum Internet and Quantum Computers*
- *YouTube – Quantum Computing for the Determined by Michael Nielsen*
- *Qiskit Textbook – IBM Quantum*

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(23EC0427) COMPUTER ARCHITECTURE & ORGANIZATION
(**Professional Elective – I**)

COURSE OBJECTIVES:

The objectives of this course

1. *To learn the design of various functional units of digital computers and performance issues of computer systems.*
2. *To understand the basic processing unit and their connections.*
3. *To get familiar with different types of Data representation and Computer Arithmetic operations.*
4. *To know about different types of memory and their interconnections.*
5. *To learn the basics of parallel computing and pipelining.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1 *Learn the design of various functional units of digital computers and performance issues of computer systems*

2 *Understand the basic processing unit and their connections*

3 *Know about different types of Data representation and Computer Arithmetic operations*

4 *Learn about different types of memory and their interconnections*

5 *Understand the architectures and characteristics of Different processors, and analyze their impact on instruction execution and performance.*

6 *Analyze pipelining, vector processing, and multiprocessor systems with focus on parallelism, interconnection, and cache coherence*

UNIT-I

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT-II

Micro programmed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

UNIT-III

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT-IV

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

UNIT-V

Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics. Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor. Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Inter-processor arbitration, Inter-processor communication and synchronization, Cache Coherence.

TEXT BOOKS:

1. *Computer System Architecture – M. Moris Mano, Third Edition, Pearson/PHI.*

REFERENCES:

1. *Computer Organization – Car Hamacher, ZvonksVranesic, SafeaZaky, Vth Edition, McGraw Hill.*
2. *Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.*
3. *Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.*

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(23EC0428) INFORMATION THEORY AND CODING

(**Professional Elective – I**)

COURSE OBJECTIVES:

The objectives of this course

1. *To provide an insight into the concept of information in the context of communication theory and communication receivers.*
2. *To implement various source coding algorithms and analyze their performance.*
3. *To gain knowledge about techniques for error detection and error correction.*
4. *To design linear block codes and cyclic codes.*
5. *To get familiar with various convolutional codes.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1	*Understand the fundamental concepts of information theory, including entropy and mutual information.*
2	*Apply various source coding algorithms to compress data and evaluate their efficiency.*
3	*Determine the capacity of communication channels based on Shannon's theorems.*
4	*Design and analyze linear block codes and cyclic codes for error correction.*
5	*Analyze the encoding and decoding processes of convolutional codes.*
6	*Gain knowledge on modern coding techniques like Turbo codes and LDPC codes.*

UNIT-I

Information Theory: Introduction, Definition of Entropy, Conditional Entropy, Relative Entropy, Basic Properties of Entropy, Mutual Information, Information Inequalities, Problem solving.

Block to Variable length Coding: Prefix-free Code, Coding a single Random Variable, Prefix, Free Code, Kraft Inequality, Bounds on optimal Code length, Coding a Single Random Variable, Rooted Tree with Probabilities, Shanon-Fano Coding, Free fix code, Coding an information Source, Huffman Coding, Example.

Variable to Block Length Coding: Proper message set, Assigning probabilities to K-ary rooted tree corresponding to a proper message set, Prefix free Coding of a proper message set, Tunstall message set, Tunstall coding.

UNIT-II

Asymptotic Equi-partition Property, Chebyshev inequality, Weak law of large numbers, Typical Sequences, Block to Block Coding of DMS: Consequences of Asymptotic Equipartition Property, Problem solving.

Universal Source Coding: Lempel-Ziv Algorithm, LZ -77 Encoding and Decoding, Lempel- Ziv Welch (LZW) Algorithm, LZW Encoding, and Decoding. Coding of Sources with memory, Channel Capacity, Noisy Channel Coding Theorem, Differential Entropy, Gaussian Channel, Rate Distortion Theory, Blahut-Arimoto Algorithm, problem solving.

UNIT-III

Error Control Coding: Introduction to Error Control Codes, Error Probability with Repetition in the Binary Symmetric Channel, Parity Check Bit Coding for Error Detection, Block Coding for Error Detection and Correction, The Hamming Distance, The upper bound of the Probability of Error with Coding, Soft Decision Decoding, Hard Decision Decoding.

UNIT-IV

Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Encoding Block Codes, Decoding of Block Codes, Single Parity Check bit Code, Repeated Codes, Hadamard Code, Hamming Code, Cyclic Codes, Generator and Parity-Check Matrices of Cyclic Codes, Encoding and Decoding of Cyclic Codes, BCH codes, Reed-Solomon Code.

UNIT-V

Convolutional Coding, Code Generation, Decoding Convolutional Code, the Code Tree, Decoding in the presence of Noise, State and Trellis Diagrams, The Viterbi Algorithm, Comparison of Error Rates in Coded and Uncoded Transmission, Turbo Codes, LDPC codes, Hard and Soft Decision Decoding.

TEXT BOOKS:

1. *Thomas M.Cover, Joy A. Thomas, Elements of Information Theory, John Wiley & Sons,2nd Edition, 2006.*
2. *Herbert Taub, Donald L Shilling, Goutam Saha, Principles of Communication Systems, 4th Edition, McGraw Hill, 2017.*

REFERENCES:

1. *Shu Lin, Daniel J. Costello Jr., Error Control Coding, Pearson, Second Edition, 2013.*
2. *Simon Haykin, Communication Systems, John Wiley, 4th Edition, 2010.*

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(23EC0429) DETECTION AND ESTIMATION THEORY
(**Professional Elective – I**)

COURSE OBJECTIVES:

The objectives of this course

1. *To understand the impact of white Gaussian noise on the detection of signals.*
2. *To analyze the detection of deterministic signals and random signals.*
3. *To learn about the nonparametric detections.*
4. *To analyze estimation signal parameter and apply suitable estimation techniques.*
5. *To understand the signal estimation in Discrete-Time techniques.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1 *Understand the impact of white Gaussian noise on the detection of signals.*

2 *Analyze the detection of deterministic signals using matched filter techniques.*

3 *Analyze the detection of random signals using statistical methods.*

4 *Learn about the nonparametric detections.*

5 *Analyze estimation signal parameter and apply suitable estimation techniques.*

6 *Understand the signal estimation in Discrete-Time techniques.*

UNIT-I

Statistical Decision Theory: Review of Gaussian variables and processes; problem formulation and objective of signal detection and signal parameter estimation in discrete-time domain. Bayesian, minimax, and Neyman-Pearson decision rules, likelihood ratio, receiver operating characteristics, composite hypothesis testing, locally optimum tests, detector comparison techniques, asymptotic relative efficiency.

UNIT-II

Detection of Deterministic Signals: Matched filter detector and its performance; generalized matched filter; detection of sinusoid with unknown amplitude, phase, frequency and arrival time, linear model.
Detection of Random Signals: Estimator-correlator, linear model, general Gaussian detection, detection of Gaussian random signal with unknown parameters, weak signal detection.

UNIT-III

Nonparametric Detection: Detection in the absence of complete statistical description of observations, sign detector, Wilcoxon detector, detectors based on quantized observations, robustness of detectors.

UNIT-IV

Estimation of Signal Parameters: Minimum variance unbiased estimation, Fisher information matrix, Cramer-Rao bound, sufficient statistics, minimum statistics, complete statistics; linear models; best linear unbiased estimation; maximum likelihood estimation, invariance principle; estimation efficiency; Bayesian estimation: philosophy, nuisance parameters, risk functions, minimum mean square error estimation, maximum a posteriori estimation.

UNIT-V

Signal Estimation in Discrete-Time: Linear Bayesian estimation, Weiner filtering, dynamical signal model, discrete Kalman filtering.

TEXT BOOKS:

1. *H. L. Van Trees, "Detection, Estimation and Modulation Theory: Part I, II, and III", John Wiley, NY, 1968.*
2. *H. V. Poor, "An Introduction to Signal Detection and Estimation", Springer, 2/e, 1998.*

REFERENCE BOOKS:

1. *S. M. Kay, "Fundamentals of Statistical Signal Processing: Estimation Theory", Prentice Hall PTR, 1993.*
2. *S. M. Kay, "Fundamentals of Statistical Signal Processing: Detection Theory", Prentice Hall PTR, 1998.*

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(23CE0150) GREEN BUILDINGS

(OPEN ELECTIVE-I)

COURSE OBJECTIVES:

The objectives of this course

1. *To understand the fundamental concepts of green buildings, their necessity, and sustainable features.*
2. *To analyze green building concepts, rating systems, and their benefits in India.*
3. *To apply green building design principles, energy efficiency measures, and renewable energy sources.*
4. *To evaluate air conditioning systems, HVAC designs, and energy modeling for sustainable buildings.*
5. *To assess material conservation strategies, waste management, and indoor environmental quality in green buildings.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Choose appropriate materials and techniques for achieving the goal of green buildings during their design.*
2. *Analyze market opportunities, resources, different practices of green buildings and its effects on environment*
3. *Evaluate energy efficiency in design of green buildings*
4. *Design effective and eco-friendly green buildings*
5. *Apply natural air conditioning and lighting techniques in design of green buildings*
6. *Conserve materials, water and maintain quality of environment in construction of green buildings*

UNIT – I

Introduction to Green buildings: Necessity of Green Buildings, Benefits of Green Buildings, Green Building Materials and Equipment in India, Key Requisites for Constructing a Green Building, Important Sustainable Features for Green Buildings.

UNIT – II

Green Building Concepts and Practices: Indian Green Building Council, Green Building Movement in India, Benefits Experienced in Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation; Green Building Opportunities and Benefits: Opportunities of Green Buildings, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy-Saving Approaches in Buildings, LEED India Rating System, and Energy Efficiency.

UNIT – III

Green Building Design: Introduction, Reduction in Energy Demand, Onsite Sources and Sinks, Maximizing System Efficiency, Steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources, Eco-Friendly Captive Power Generation for Factories, Building Requirements.

UNIT – IV

Air Conditioning: Introduction, CII Godrej Green Business Centre, Design Philosophy, Design Interventions, Energy Modelling, HVAC System Design, Chiller Selection, Pump Selection, Selection of Cooling towers, Selection of Air Handling Units, Pre-Cooling of Fresh Air, Interior Lighting Systems, Key Features of The Building, Eco-Friendly Captive Power Generation for Factories, Building Requirements.

UNIT – V

Material Conservation: Handling of Non-Process Waste, Waste Reduction During Construction, Materials With Recycled Content, Local Materials, Material Reuse, Certified Wood, Rapidly Renewable Building Materials and Furniture. Indoor Environment Quality and Occupational Health – Air Conditioning, Indoor Air Quality, Sick Building Syndrome, tobacco Smoke.

TEXT BOOKS:

1. *Indian Society of Heating Refrigerating and Air conditioning Engineers, Handbook on Green Practice, 2025*
2. *Tom Woolley and Sam Kimings, Green Building Hand Book, 2009*

REFERENCES:

1. *Trish riley, Complete Guide to Green Buildings.*
2. *Kent Peterson, Standard for the design for High Performance Green Buildings, 2009.*
3. *Energy Conservation Building Code –ECBC, BEE published, 2020.*
4. *Dr.G.Prabhakaran, Green Buildings and Eco-Engineering, Vinsa Publishing, 1st edition, 2025.*

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(23CE0151) CONSTRUCTION TECHNOLOGY AND MANAGEMENT

(OPEN ELECTIVE-I)

COURSE OBJECTIVES:

The objectives of this course

1. *Understand project management fundamentals, organizational structures, and leadership principles in construction.*
2. *Analyse manpower planning, equipment management, and cost estimation in civil engineering projects.*
3. *Apply planning, scheduling, and project management techniques such as CPM and PERT.*
4. *Evaluate various contract types, contract formation, and legal aspects in construction management.*
5. *Assess safety management practices, accident prevention strategies, and quality management systems in construction.*

COURSE OUTCOMES (COs):

On successful completion of this course students will be able to

1. *Realize objectives, functions, public relations and management structure in projects*
2. *Plan and care the human resource needed for the project and can fix the rent of the construction equipment and can perform benefit cost analysis.*
3. *Apply different techniques in scheduling of projects.*
4. *Formulate CPM/PERT networks to evaluate the project completion time and also monitor the project during its life cycle.*
5. *Draft a contract document by incorporating various clauses as per Indian Contract act.*
6. *Implement safety measures to reduce construction related accidents*

UNIT – I

Introduction: Project forms, Management Objectives and Functions; Organizational Chart of A Construction Company; Manager's Duties and Responsibilities; Public Relations; Leadership and Team - Work; Ethics, Morale, Delegation and Accountability.

UNIT – II

Man and Machine: Man-Power Planning, Training, Recruitment, Motivation, Welfare Measures and Safety Laws; Machinery for Civil Engineering., Earth Movers and Hauling Costs, Factors Affecting Purchase, Rent, and Lease of Equipment, and Cost Benefit Estimation.

UNIT – III

Planning, Scheduling and Project Management: Planning Stages, Construction Schedules and Project Specification, Monitoring and Evaluation; Bar-Chart, CPM, PERT, Network - formulation and Time Computation.

UNIT – IV

Contracts: Types of Contracts, formation of Contract - Contract Conditions - Contract for Labour, Material, Design, Construction - Drafting of Contract Documents Based on IBRD/ MORTH Standard Bidding Documents - Construction Contracts - Contract Problems - Arbitration and Legal Requirements Computer Applications in Construction Management: Software for Project Planning, Scheduling and Control.

UNIT – V

Safety Management; Implementation and Application of QMS in Safety Programs, ISO 9000 Series, Accident Theories, Cost of Accidents, Problem Areas in Construction Safety, Fall Protection, Incentives, Zero Accident Concepts, Planning for Safety, Occupational Health and Ergonomics.

TEXT BOOKS:

1. *SK. Sears, GA. Sears and RH. Cloug, Construction Project Management, John Wiley and Sons, 6th Edition, 2016.*
2. *Saleh Mubarak, Construction Project Scheduling and Control, 4th Edition, 2019*

REFERENCES:

1. *Brien, J.O. and Plotnick, F.L., CPM in Construction Management, McGraw Hill, 2015.*
2. *Punmia, B.C., and Khandelwal, K.K., Project Planning and control with PERT and CPM, Laxmi Publications, 2023.*
3. *Stephens Nunnally, Construction Methods and Management, Pearson New International, 8th Edition, Pearson, 2010*
4. *Rhoden, M and Cato B, Construction Management and Organizational Behaviour, Wiley-Blackwell, 2016.*

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(23EE0261) ELECTRICAL SAFETY PRACTICES AND STANDARDS

(OPEN ELECTIVE-I)

COURSE OBJECTIVES:

The objectives of this course

1. *To understand the basic principles of electrical safety, effects of electric shock, and hazards like arc and blast.*
2. *To learn about safety equipment, overvoltage protection, and fire prevention methods in electrical systems.*
3. *To gain knowledge of grounding practices, bonding methods, and maintaining safe distances in electrical environments.*
4. *To become familiar with electrical safety standards, regulations, and practical safety practices in various installations.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understanding the Fundamentals of Electrical Safety. L2*
2. *Identifying and Applying Safety Components. L3*
3. *Analyzing Grounding Practices and Electrical Bonding. L4*
4. *Applying Safety Practices in Electrical Installations and Environments. L4*
5. *Identify various national and international standards and statutory requirements related to electrical safety. L1*
6. *Compare and interpret the applications of different electrical safety codes and regulations. L4*

UNIT-I

Introduction To Electrical Safety: Fundamentals of Electrical safety-Electric Shock- physiological effects of electric current - Safety requirements –Hazards of electricity- Arc - Blast- Causes for electrical failure.

UNIT-II

Safety Components: Introduction to conductors and insulators- voltage classification -safety against over voltages- safety against static electricity-Electrical safety equipment's - Fire extinguishers for electrical safety.

UNIT-III

Grounding: General requirements for grounding and bonding- Definitions- System grounding- Equipment grounding - The Earth - Earthing practices- Determining safe approach distance-Determining arc hazard category.

UNIT-IV

Safety Practices: General first aid- Safety in handling hand held electrical appliances tools- Electrical safety in train stations-swimming pools, external lighting installations, medical locations- Case studies.

UNIT-V

Standards for Electrical Safety: Electricity Acts- Rules & regulations- Electrical standards-NFPA 70 E-OSHA standards-IEEE standards-National Electrical Code 2005 – National Electric Safety code NESC-Statutory requirements from electrical inspectorate

TEXT BOOKS:

1. *Massimo A.G.Mitolo, ―Electrical Safety of Low-Voltage Systems‖, McGraw Hill, USA, 2009.*
2. *Mohamed El-Sharkawi, ―Electric Safety - Practice and Standards‖, CRC Press, USA, 2014.*

REFERENCES:

1. *Kenneth G.Mastrullo, Ray A. Jones, ―The Electrical Safety Program Book‖, Jones and Bartlett Publishers, London, 2nd Edition, 2011.*
2. *Palmer Hickman, ―Electrical Safety-Related Work Practices‖, Jones & Bartlett Publishers, London, 2009.*
3. *Fordham Cooper, W., ―Electrical Safety Engineering‖, Butterworth and Company, London, 1986.*
4. *John Cadick, Mary Capelli-Schellpfeffer, Dennis K. Neitzel, ―Electrical Safety Hand book, McGraw-Hill, New York, USA, 4th edition, 2012.*

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(23ME0356) SUSTAINBLE ENERGY TECHNOLOGIES
(OPEN ELECTIVE-I)

COURSE OBJECTIVES:

The objectives of this course

1. *To demonstrate the importance the impact of solar radiation, solar PV modules.*
2. *To understand the principles of storage in PV systems*
3. *To discuss solar energy storage systems and their applications.*
4. *To get knowledge in wind energy and bio-mass*
5. *To gain insights in geothermal energy, ocean energy and fuel cells.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1	*Illustrate the importance of solar radiation and solar PV modules.*
2	*Discuss the storage methods in PV systems*
3	*Explain the solar energy storage for different applications*
4	*Understand the principles of wind energy, and bio-mass energy.*
5	*Attain knowledge in geothermal energy, ocean energy and fuel cells.*
6	*Explain the principles of sustainability and the environmental, social, economic aspects of energy use.*

UNIT – I

SOLAR RADIATION: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, Extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems.

UNIT – II

SOLAR PV MODULES AND PV SYSTEMS:

PV Module Circuit Design, Module Structure, Packing Density, Interconnections, Mismatch and Temperature Effects, Electrical and Mechanical Insulation, Lifetime of PV Modules, Degradation and Failure, PV Module Parameters, Efficiency of PV Module, Solar PV Systems-Design of Off Grid Solar Power Plant. Installation and Maintenance.

STORAGE IN PV SYSTEMS:

Battery Operation, Types of Batteries, Battery Parameters, Application and Selection of Batteries for Solar PV System, Battery Maintenance and Measurements, Battery Installation for PV System.

UNIT – III

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation.

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

UNIT – IV

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

UNIT – V

GEOTHERMAL ENERGY: Origin, Applications, Types of Geothermal Resources, Relative Merits.

OCEAN ENERGY: Ocean Thermal Energy; Open Cycle & Closed Cycle OTEC Plants, Environmental Impacts, Challenges.

FUEL CELLS: Introduction, Applications, Classification, Different Types of Fuel Cells Such as Phosphoric Acid Fuel Cell, Alkaline Fuel Cell, PEM Fuel Cell, MC Fuel Cell.

TEXT BOOKS:

1. *Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH*
2. *Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006*

REFERENCES:

1. *Principles of Solar Engineering - D.Yogi Goswami, Frank Krieth& John F Kreider / Taylor &Francis*
2. *Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd*
3. *Renewable Energy Technologies -Ramesh & Kumar /Narosa*
4. *Non-conventional Energy Source- G.D Roy/Standard Publishers*

Online Learning Resources:

https://nptel.ac.in/courses/112106318
https://youtube.com/playlist?list=PLyqSpQzTE6M-ZgdjYukayF6QevPv7WE-r&si=-mwIa2X-SuSiNy13
https://youtube.com/playlist?list=PLyqSpQzTE6M-ZgdjYukayF6QevPv7WE-r&si=Apfjx6oDfz1Rb_N3
https://youtu.be/zx04Kl8y4dE?si=VmOvp_OgqisILTAF

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(23CS0553) JAVA PROGRAMMING
(OPEN ELECTIVE I)

COURSE OBJECTIVES:

The objectives of this course

1. *Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.*
2. *Learn how to extend Java classes with inheritance and dynamic binding and how to use exception*
3. *handling in Java applications*
4. *Understand how to design applications with threads in Java*
5. *Understand how to use Java apis for program development*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understand the Java language components for implementing control statements.*
2. *Apply the concepts of OOP's fundamentals like classes, Methods and class libraries to develop applications*
3. *Apply the concepts of arrays, inheritance develop efficient java applications.*
4. *Analyze the interfaces for implementing multiple inheritance.*
5. *Evaluate the concepts of packages, file I/O, by using access control, and exception handling mechanisms to solve real world scenarios*
6. *Create the GUI applications by using concepts like multi-threading, Java FX, JDBC*

UNIT-I

Object Oriented Programming: Basic concepts, Principles, Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style. Data Types,

Variables, and Operators : Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT-II

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT-III

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.
Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super ClassObject Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.
Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT-IV

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Autounboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.
Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.
Java I/O and File: Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2)

UNIT-V

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.
Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter thread Communication - Suspending, Resuming, and Stopping of Threads. Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, Result Set Interface
Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

TEXTBOOKS:

1. *JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.*
2. *Joy with JAVA, Fundamentals of Object Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023.*
3. *JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.*

REFERENCE BOOKS:

1. *The complete Reference Java, 11thedition, Herbert Schildt, TMH*
2. *Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson*

Online Learning Resources:

1. *https://nptel.ac.in/courses/106/105/106105191/*
2. *https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547*
3. *618816347_shared/overview*

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(20CS0554) FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE
(OPEN ELECTIVE-I)

COURSE OBJECTIVES:

The objectives of this course

1. *The student should be made to study the concepts of Artificial Intelligence.*
2. *The student should be made to learn the methods of solving problems using Artificial Intelligence.*
3. *The student should be made to introduce the concepts of Expert Systems.*
4. *To understand the applications of AI, namely game playing, theorem proving, and machine learning.*
5. *To learn different knowledge representation techniques*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.*
2. *Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.*
3. *Learn different knowledge representation techniques.*
4. *Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.*
5. *Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.*
6. *Analyze Supervised Learning Vs. Learning Decision Trees*

UNIT-I

Introduction to AI: Intelligent Agents, Problem-Solving Agents,
Searching for Solutions - Breadth-first search, Depth-first search, Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces.

UNIT-II

Games: Optimal Decisions in Games, Alpha–Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents,
Logic- Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

UNIT-III

First-Order Logic - Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution.

Knowledge Representation: Ontological Engineering, Categories and Objects, Events.

UNIT-IV

Planning - Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Hierarchical Planning.

UNIT-V

Probabilistic Reasoning:

Acting under Uncertainty, Basic Probability Notation Bayes‘ Rule and Its Use, Probabilistic Reasoning, Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First- Order Probability.

TEXT BOOKS:

1. *Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.*

REFERENCES:

1. *Artificial Intelligence, 3rd Edn., E. Rich and K. Knight (TMH)*
2. *Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.*
3. *Artificial Intelligence, Shivani Goel, Pearson Education.*
4. *Artificial Intelligence and Expert systems – Patterson, Pearson Education.*

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(20CS0555) QUANTUM TECHNOLOGIES AND APPLICATIONS
(OPEN ELECTIVE-I)

COURSE OBJECTIVES:

The objectives of this course

1. *Introduce fundamental quantum concepts like superposition and entanglement.*
2. *Understand theoretical structure of qubits and quantum information.*
3. *Explore conceptual challenges in building quantum computers.*
4. *Explain principles of quantum communication and computing.*
5. *Examine real-world applications and the future of quantum technologies.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Explain core quantum principles in a non-mathematical manner.*
2. *Compare classical and quantum information systems.*
3. *Identify theoretical issues in building quantum computers.*
4. *Discuss quantum communication and computing concepts.*
5. *Recognize applications, industry trends, and career paths in quantum technology.*
6. *Societal & ethical implications of quantum technologies*

UNIT - I

Classical vs Quantum Paradigm, Postulates of Quantum Mechanics, Wavefunction and Schrödinger Equation (Time-independent), Quantum states, Superposition, Qubits, Measurement, Operators, and Observables, Entanglement and Non-locality

UNIT - II

Qubits and Bloch Sphere, Quantum Logic Gates: Pauli, Hadamard, CNOT, and Universal Gates
Quantum Circuits Basic Algorithms: Deutsch-Jozsa. Gover‘s, Shor‘s (conceptual), Error Correction and Decoherenceclauses.

UNIT - III

Teleportation & No-Cloning, BB84 Protocol, Quantum Networks & Repeaters, Classical vs Quantum Cryptography, Challenges in Implementation

UNIT - IV

Quantum Sensing: Principles and Technologies, Quantum-enhanced Measurements, Atomic Clocks, Gravimeters, Magnetometers, NV Centers, Industrial Applications

UNIT - V

Quantum Materials: Superconductors, Topological Insulators, Quantum Devices: Qubits, Josephson Junctions, National Quantum Missions (India, EU, USA, China), Quantum Careers and Industry Initiatives

TEXT BOOKS:

1. *"Quantum Computation and Quantum Information" by Michael A. Nielsen and Isaac L. Chuang (Cambridge University Press)*
2. *"Quantum Mechanics: The Theoretical Minimum" by Leonard Susskind and Art Friedman (Basic Books)*

REFERENCES:

1. *"Quantum Computing for Everyone" by Chris Bernhardt (MIT Press)*
2. *"Quantum Physics: A Beginner's Guide" by Alastair I.M. Rae*
3. *"An Introduction to Quantum Computing" by Phillip Kaye, Raymond Laflamme, and Michele Mosca*
4. *IBM Quantum Experience and Qiskit Documentation (https://qiskit.org/)*

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(23HS0855) MATHEMATICS FOR MACHINE LEARNING AND AI

(OPEN ELECTIVE I)

(Common to All Branches)

COURSE OBJECTIVES

The objectives of this course

1. *To provide a strong mathematical foundation for understanding and developing AI/ML algorithms.*
2. *To enhance the ability to apply linear algebra, probability, and calculus in AI/ML models.*
3. *To equip students with optimization techniques and graph-based methods used in AI applications.*
4. *To develop critical problem-solving skills for analyzing mathematical formulations in AI/ML.*

COURSE OUTCOMES (COs)

On successful completion of this course, the students should be able to

1. *Apply linear algebra concepts to ML techniques like PCA and regression.*
2. *Analyze probabilistic models and statistical methods for AI applications.*
3. *Implement optimization techniques for machine learning algorithms*
4. *Apply the fundamental concepts of Gradient Descent in machine learning to choose the right optimization algorithm*
5. *Utilize vector calculus and transformations in AI-based models.*
6. *Develop graph-based AI models using mathematical representations.*

UNIT-I
LINEAR ALGEBRA FOR MACHINE LEARNING

Review of Vector spaces, basis, linear independence, Vector and matrix norms, Matrix factorization techniques, Eigenvalues, eigenvectors, diagonalization, Singular Value Decomposition (SVD) and Principal Component Analysis (PCA).

UNIT-II
PROBABILITY AND STATISTICS FOR AI

Probability distributions: Gaussian, Binomial, Poisson. Bayes‘ Theorem, Maximum Likelihood Estimation (MLE), and Maximum a Posteriori (MAP).Entropy and Kullback-Leibler (KL) Divergence in AI, Cross entropy loss, Markov chains.

UNIT-III
OPTIMIZATION TECHNIQUES FOR ML

Multivariable calculus: Gradients, Hessians, Jacobians. Constrained optimization: Lagrange multipliers and KKT conditions. Gradient Descent and its variants (Momentum, Adam) Newton‘s method, BFGS method.

UNIT-IV
VECTOR CALCULUS & TRANSFORMATIONS
Vector calculus: Gradient, divergence, curl. Fourier Transform & Laplace Transform in ML applications.

UNIT-V
Graph Theory for AI
Graph representations: Adjacency matrices, Laplacian matrices. Bayesian Networks & Probabilistic Graphical Models. Introduction to Graph Neural Networks (GNNs).

TEXT BOOKS:
1. *Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Mathematics for Machine Learning, Cambridge University Press, 2020.*
2. *Christopher Bishop, Springer, Pattern Recognition and Machine Learning.*

REFERENCES:
1. *Gilbert Strang, Linear Algebra and Its Applications, Cengage Learning, 2016.*
2. *Jonathan Gross, Jay Yellen, Graph Theory and Its Applications, CRC Press, 2018.*

WEB REFERENCES:
1. MIT– Mathematics for Machine Learning https://ocw.mit.edu
2. Stanford CS229 – Machine Learning Course https://cs229.stanford.edu/
3. Deep AI–Mathematical Foundations for AI https://deepai.org

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(23HS0842) MATERIALS CHARACTERIZATION TECHNIQUES

(OPEN ELECTIVE-I)
(Common to all branches of Engineering)

COURSE OBJECTIVES:

The objectives of this course

1. *To provide exposure to different characterization techniques.*
2. *To explain the basic principles and analysis of different spectroscopic techniques.*
3. *To explain the basic principles and analysis of different spectroscopic techniques.*
4. *To illustrate the working of the Transmission electron microscope (TEM) - SAED patterns and its applications.*
5. *To educate the uses of advanced electric and magnetic instruments for characterization.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Analyze the crystal structure and crystallite size by various methods*
2. *Analyze the morphology of the sample by using a Scanning Electron Microscope.*
3. *Analyze the morphology and crystal structure of the sample by using Transmission Electron Microscope*
4. *Explain the differences between SEM and TEM*
5. *Explain the principle and experimental arrangement of various spectroscopic techniques*
6. *Identify the construction and working principle of various Electrical & Magnetic Characterization technique*

UNIT-I

Structure analysis by Powder X-Ray Diffraction

Introduction, Bragg‘s law of diffraction, Powder X- Ray diffraction, Intensity of Diffracted beams, Factors affecting Diffraction, Intensities, Structure of polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherer and Williamson-Hall (W-H) Methods, Small angle X- ray scattering (SAXS) (in brief).

UNIT- II

Microscopy technique -1 –Scanning Electron Microscopy (SEM)

Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (Secondary Electron and Backscatter Electron), Advantages, limitations and applications of SEM.

UNIT-III

Microscopy Technique -2 - Transmission Electron Microscopy (TEM)

Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy, Difference between SEM and TEM, Advantage and Limitations of Transmission Electron Microscopy

UNIT- IV

Spectroscopy techniques

Principle, Experimental arrangement, Analysis and advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy (ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).

UNIT- V

Electrical & Magnetic Characterization techniques

Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method, Vibrating sample Magnetometer (VSM) and SQUID.

TEXT BOOKS:

1. *Material Characterization: Introduction to Microscopic and Spectroscopic Methods – Yang Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2013.*
2. *Microstructural Characterization of Materials - David Brandon, Wayne D Kalpan, John Wiley & Sons Ltd., 2008*

REFERENCES:

1. *Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville BanwellandElaine M. McCash, Tata McGraw-Hill, 2008.*
2. *Elements of X-ray diffraction – Bernard Dennis Cullity& Stuart R Stocks, Prentice Hall , 2001 – Science.*
3. *Practical Guide to Materials Characterization: Techniques and Applications - Khalid Sultan – Wiley – 2021.*
4. *Materials Characterization Techniques -Sam Zhang, Lin Li, Ashok Kumar -CRC Press - 2008*

***NPTEL courses link**:*

1. https://nptel.ac.in/courses/115/103/115103030/
2. https://nptel.ac.in/content/syllabus_pdf/113106034.pdf
3. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-mm08/

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(23HS0806) CHEMISTRY OF ENERGY SYSTEMS

(OPEN ELECTIVE-I)

COURSE OBJECTIVES:

The objectives of this course

1. *To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.*
2. *To understand the basic concepts of processing and limitations of Fuel cells & their applications.*
3. *To impart knowledge to the students about fundamental concepts of photo chemical cells, reactions and applications*
4. *Necessity of harnessing alternate energy resources such as solar energy and its basic concepts.*
5. *To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquifaction method.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understand the problems based on electrode potential and concept of batteries. [L2]*
2. *Apply fuel technology in various energy and engineering contexts. [L3]*
3. *Analyze the design and working mechanisms and applications of photo electrochemical cells. [L4]*
4. *Analyze the advantages of photoelectric catalytic process such as high efficiency, low environmental impact and renewable energy applications. [L4]*
5. *Apply the electrochemical principles to photo voltaic cell, solar power and solar cells. [L3]*
6. *Analyze various methods for storage of hydrogen fuel. [L4]*

UNIT-I

Electrochemical Systems: Galvanic cell, Nernst equation, standard electrode potential, application of EMF, electrical double layer, polarization, Batteries- Introduction ,Lead- acid ,Nickel- cadmium, Lithium ion batteries and their applications.

UNIT-II

Fuel Cells: Fuel cell- Introduction, Basic design of fuel cell, working principle, Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), Fuel cell efficiency and applications.

UNIT-III

Photo and Photo electrochemical Conversions: Photochemical cells Introduction and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic

conversions and their applications.

UNIT-IV

Solar Energy: Introduction and prospects, photovoltaic (PV) technology, concentrated solar power (CSP), Solar cells and applications. .

UNIT-V

Hydrogen Storage: Hydrogen storage and delivery: State-of-the art, Established technologies, Chemical and Physical methods of hydrogen storage, Compressed gas storage, Liquid hydrogen storage, Other storage methods, Hydrogen storage in metal hydrides, metal organic frameworks (MOF), Metal oxide porous structures, hydrogel , and Organic hydrogen carriers.

TEXT BOOKS:

1. *Physical chemistry by Ira N. Levine.*
2. *Essentials of Physical Chemistry, Bahl and Bahl and Tuli.*
3. *Inorganic Chemistry, Silver and Atkins.*

REFERENCES:

1. *Fuel Cell Hand Book 7th Edition, by US Department of Energy (EG&G technical services And corporation)*
2. *Hand book of solar energy and applications by ArvindTiwari and Shyam.*
3. *Solar energy fundamental, technology and systems by Klaus Jagar et.al.*
4. *Hydrogen storage by Levine Klebonoff*

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(23HS0821) ENGLISH FOR COMPETITIVE EXAMINATIONS

(OPEN ELECTIVE-I)

COURSE OBJECTIVES:

The objectives of this course

1. *To enable the students to learn about the structure of competitive English*
2. *To understand the grammatical aspects and identify the errors*
3. *To enhance verbal ability and identify the errors*
4. *To improve word power to answer competitive challenges*
5. *To make them ready to crack competitive exams*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Identify the basics of English grammar and its importance*
2. *Explain the use of grammatical structures in sentences*
3. *Demonstrate the ability to use various concepts in grammar and vocabulary and their applications in everyday use and in competitive exams*
4. *Analyze an unknown passage and reach conclusions about it.*
5. *Choose the appropriate form of verbs in framing sentences*
6. *Develop speed reading and comprehending ability thereby perform better in competitive exams*

UNIT-I

GRAMMAR-1: Nouns-classification-errors-Pronouns-types-errors-Adjectives-types-errors-Articles-definite- indefinite-Degrees of Comparison-Adverbs-types- errors-Conjunctions-usage- repositions-usage-Tag Questions, types-identifying errors- Practice

UNIT-II

GRAMMAR-2: Verbs-tenses- structure-usages- negatives- positives- time adverbs-Sequence of tenses--If Clause-Voice-active voice and passive voice- reported Speech-Agreement- subject and verb- Modals-Spotting Errors-Practices

UNIT-III

VERBAL ABILITY: Sentence completion-Verbal analogies-Word groups-Instructions-Critical reasoning-Verbal deduction-Select appropriate pair-Reading Comprehension-Paragraph-Jumbles-Selecting the proper statement by reading a given paragraph.

UNIT-IV

READING COMPREHENSION AND VOCUBULARY: Competitive Vocabulary :Word Building – Memory techniques-Synonyms, Antonyms, Affixes-Prefix &Suffix-One word substitutes-Compound words-Phrasal Verbs-Idioms and Phrases-Homophones-Linking Words-Modifiers-Intensifiers - Mastering Competitive Vocabulary- Cracking the unknowing passage-speed reading techniques- Skimming & Scanning-types of answering–Elimination methods

UNIT-V

WRITING FOR COMPETITIVE EXAMINATIONS: Punctuation- Spelling rules- Word order-Sub Skills of Writing- Paragraph meaning-salient features-types - Note-making, Note-taking, summarizing- precise writing- Paraphrasing- Expansion of proverbs- Essay writing- types

TEXTBOOKS:

1. *Wren & Martin, English for Competitive Examinations, S.Chand & Co, 2021*
2. *Objective English for Competitive Examination, Tata McGraw Hill, New Delhi, 2014.*

REFERENCES:

1. *Hari Mohan Prasad, Objective English for Competitive Examination, Tata McGraw Hill, New Delhi, 2014.*
2. *Philip Sunil Solomon, English for Success in Competitive Exams, Oxford 2016*
3. *Shalini Verma , Word Power Made Handy, S Chand Publications*
4. *Neira, Anjana Dev & Co. Creative Writing: A Beginner's Manual. Pearson Education India, 2008.*
5. *Abhishek Jain,Vocabulary Learning Techniques Vol.I&II,RR Global Publishers 2013.*
6. *Michel Swan, Practical English Usage,Oxford,2006.*

Online Resources

1. *https://www.grammar.cl/english/parts-of-speech.htm*
2. *https://academicguides.waldenu.edu/writingcenter/grammar/partsofspeech*
3. *https://learnenglish.britishcouncil.org/grammar/english-grammar-reference/active- passive-voice*
4. *https://languagetool.org/insights/post/verb-tenses/*
5. *https://www.britishcouncil.in/blog/best-free-english-learning-resources-british-council*
6. *https://www.careerride.com/post/social-essays-for-competitive-exams-586.aspx*

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(23HS0822) ENTREPRENEURSHIP AND NEW VENTURE CREATION

(OPEN ELECTIVE-I)

COURSE OBJECTIVES:

The objectives of this course

1. *To foster an entrepreneurial mind-set for venture creation and intrapreneurial leadership.*
2. *To encourage creativity and innovation*
3. *To enable them to learn pitching and presentation skills*
4. *To make the students understand MVP development and validation techniques to determine Product-Market fit and Initiate Solution design, Prototype for Proof of Concept.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Develop an entrepreneurial mindset and appreciate the concept of entrepreneurship*
2. *Comprehend the process of problem-opportunity identification through design thinking, identify market potential and customers while developing a compelling value proposition solution*
3. *Analyze and refine business models to ensure sustainability and profitability*
4. *Build Prototype for Proof of Concept and validate MVP of their practice venture idea*
5. *Create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture*
6. *Prepare and deliver an investible pitch deck of their practice venture to attract stakeholders*

UNIT-I

Entrepreneurship Fundamentals and context: Meaning and concept, attributes and mindset of entrepreneurial and intrapreneurial leadership, role models in each and their role in economic development. An understanding of how to build entrepreneurial mindset, skill sets, attributes and networks while on campus.

Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students – 16industries to choose from), Venture Activity

UNIT-II

Problem & Customer Identification: Understanding and analysing the macro-Problem and Industry perspective - technological, socioeconomic and urbanization trends and their implication on new opportunities - Identifying passion - identifying and defining problem using Design thinking principles - Analysing problem and validating with the potential customer - Understanding customer segmentation, creating and validating customer personas.

Core Teaching Tool: Several types of activities including Class, game, Gen AI, ‗Get out of the Building' and Venture Activity.

UNIT-III

Solution design, Prototyping & Opportunity Assessment and Sizing: Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customer's needs and create a strong value proposition - Understanding prototyping and Minimum Viable product (MVP) - Developing a feasibility

prototype with differentiating value, features and benefits - Assess relative market position via competition analysis - Sizing the market and assess scope and potential scale of the opportunity.
Core Teaching Tool: Venture Activity, no-code Innovation tools, Class activity

UNIT-IV
Business & Financial Model, Go-to-Market Plan: Introduction to Business model and types, Lean approach, 9 block lean canvas model, riskiest assumptions to Business models. Importance of Build - Measure – Lean approach.
Business planning: Components of Business plan- Sales plan, People plan and financial plan.
Financial Planning: Types of costs, preparing a financial plan for profitability using financial template, understanding basics of Unit economics and analysing financial performance.
Introduction to Marketing and Sales, Selecting the Right Channel, creating digital presence, building customer acquisition strategy.
Choosing a form of business organization specific to your venture, identifying sources of funds: Debt& Equity, Map the Start-up Life-cycle to Funding Options.
Core Teaching Tool: Founder Case Studies – Sama and Securely Share; Class activity and discussions; Venture Activities.

UNIT-V
Scale Outlook and Venture Pitch readiness: Understand and identify potential and aspiration for scale vis-a-vis your venture idea. Persuasive Storytelling and its key components. Build an Investor ready pitch deck.
Core Teaching Tool: Expert talks; Cases; Class activity and discussions; Venture Activities.

TEXT BOOKS:

1. *Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha, Entrepreneurship, McGrawHill, 11th Edition.(2020)*
2. *Ries, E. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business,(2011).*
3. *Osterwalder, A., & Pigneur, Y. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons. (2010).*

REFERENCES:

1. *Simon Sinek,Start with Why, Penguin Books limited. (2011)*
2. *Brown Tim,Change by Design Revised & Updated: How Design Thinking Transforms Organizations and Inspires Innovation, Harper Business.(2019).*
3. *Namita Thapar (2022) The Dolphin and the Shark: Stories on Entrepreneurship, Penguin Books Limited*
4. *Saras D. Sarasvathy, (2008) Effectuation: Elements of Entrepreneurial Expertise, Elgar Publishing Ltd.*

E-RESOURCES:

Learning resource- Ignite 5.0 Course Wadhwani platform (Includes 200+ components of custom created modular content + 500+ components of the most relevant curated content)

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(23EC0415) ANALOG & DIGITAL IC APPLICATIONS LAB

COURSE OBJECTIVES:

The objectives of this course

1. *To design an Inverting and Non-inverting Amplifier using an Op Amp.*
2. *To demonstrate the Linear and Non-Linear Applications using IC 741.*
3. *To design Astable and Monostable Multivibrator using timer ICs.*
4. *To analyse the DAC and ADC converter.*
5. *To design Counters and Registers using digital ICs.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1 *Design an Inverting and Non-inverting Amplifier using an Op Amp.*

2 *Demonstrate the Linear and Non-Linear Applications using IC 741.*

3 *Design Astable and Monostable Multivibrator using timer ICs.*

4 *Analyse the DAC and ADC converter.*

5 *Design Combinational logic circuits using digital ICs.*

6 *Design Sequential logic circuits using digital ICs.*

List of Experiments: (At least 8 Linear and 4 Digital IC experiments shall be performed).

1. Design an Inverting and Non-inverting Amplifier using Op Amp and calculate gain.
2. Design Adder and Subtractor using Op Amp and verify addition and subtraction process.
3. Design a Comparator using Op Amp and draw the comparison results of A=B, A>B, A<B
4. Design a Integrator and Differentiator Circuits using IC741 and derive the required condition practically.
5. Design a Active LPF, HPF cutoff frequency of 2 KHZ and find the roll off of it.
6. Design a Circuit using IC741 to generate sine/square/triangular wave with period of 1KHZ and draw the output waveform.
7. Construct Mono-stable Multivibrator using IC555 and draw its output waveform.
8. Construct Astable Multivibrator using IC555 and draw its output waveform and also find its duty cycle.
9. Design a Schmitt Trigger Circuit and find its LTP and UTP.
10. Design Voltage Regulator usingIC723, IC 7805/7809/7912 and find its load regulation factor.
11. Design R-2R ladder DAC and find its resolution and write a truth table with respective voltages.
12. Design Parallel comparator type/ counter type/ successive approximation ADC and find its efficiency.
13. Design a 8x1 multiplexer using digital ICs.
14. Design a 4-bit Adder/Subtractor using digital ICs
15. Design a Decade counter and verify its truth table and draw respective waveforms.
16. Design a Up/down counter usingIC74163 and draw read/write waveforms.
17. Design a Universal shift register using IC 74194/195 and verify its shifting operation.

18. Design a 8x3 encoder/3x8 decoder and verify its truth table.

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(23EC0416) MICROPROCESSORS AND MICROCONTROLLERS LAB

COURSE OBJECTIVES:

The objectives of this course

1. *To become skilled in 8086 Assembly Language programming.*
2. *To understand the detailed software and hardware structure of the microprocessor.*
3. *Train their practical knowledge through laboratory experiments.*
4. *To understand and learn 8051 Microcontroller.*
5. *To acquire knowledge on microprocessors and microcontrollers, interfacing various peripherals, and configuring.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1 *To become skilled in 8086 Assembly Language programming.*

2 *To understand the detailed software and hardware structure of the microprocessor.*

3 *Train their practical knowledge through laboratory experiments.*

4 *To understand and learn 8051 Microcontroller.*

5 *To acquire knowledge on microprocessors and microcontrollers, interfacing various peripherals, and configuring.*

6 *To Apply 8086 ALPs for string, array, bit manipulation, and time-based applications.*

List of Experiments: (Any TEN of the experiments are to be conducted)

1. **Programs for 16 Bit Arithmetic Operations** (Using various addressing modes)
   a) Write an ALP to Perform Addition and Subtraction of Multi precision numbers.
   b) Write an ALP to Perform Multiplication and division of signed and unsigned Hexadecimal numbers.
   c) Write an ALP to find square, cube and factorial of a given number.
2. **Programs Involving Bit Manipulation Instructions**
   a) Write an ALP to find the given data is positive or negative.
   b) Write an ALP to find the given data is odd or even.
   c) Write an ALP to find Logical ones and zeros in a given data.
3. **Programs on Arrays for 8086**
   a) Write an ALP to find Addition/subtraction of N nos.
   b) Write an ALP for finding largest/smallest no.
   c) Write an ALP to sort given array in Ascending/descending order.
4. **Programs on String Manipulations for 8086**
   a) Write an ALP to find String length.
   b) Write an ALP for Displaying the given String.
   c) Write an ALP for Comparing two Strings.
   d) Write an ALP to reverse String and Checking for palindrome.

5. Programs for Digital Clock Design Using 8086

a) Write an ALP for Designing clock using INT 21H Interrupt.
b) Write an ALP for Designing clock using DOS Interrupt Functions.
c) Write an ALP for Designing clock by reading system time.

6. Interfacing Stepper Motor with 8086

a) Write an ALP to 8086 processor to Interface a stepper motor and operate it in clockwise by choosing variable step-size.
b) Write an ALP to 8086 processor to Interface a stepper motor and operate it in Anti-clockwise by choosing variable step-size.

7. Interfacing ADC/DAC with 8086

a) Write an ALP to 8086 processor to Interface ADC.
b) Write an ALP to 8086 processor to Interface DAC and generate Square Wave/Triangular Wave/Stepsignal.

8. Communication between Two Microprocessors

a) Write an ALP to have Parallel communication between two microprocessors using 8255
b) Write an ALP to have Serial communication between two microprocessor kits using 8251.

9. Programs using Arithmetic and Logical Instructions for 8051

a) Write an ALP to 8051 Microcontroller to perform Arithmetic operations like addition, subtraction,
b) Multiplication and Division.
c) Write an ALP to 8051 Microcontroller to perform Logical operations like AND, OR and XOR.
d) Programs related to Register Banks.

10. Programs to Verify Timers/Counters of 8051

a) Write a program to create a delay of 25msec using Timer0 in mode 1 and blink all the Pins of P0.
b) Write a program to create a delay of 50 µsec using Timer1 in mode 0 and blink all the Pins of P2.
c) Write a program to create a delay of 75msec using counter0 in mode 2 and blink all the Pins of P1.
d) Write a program to create a delay of 80 µsec using counter1 in mode 1 and blink all the Pins of P3.

11. UART Operation in 8051

a) Write a program to transfer a character serially with a baud rate of 9600 using UART.
b) Write a program to transfer a character serially with a baud rate of 4800 using UART.
c) Write a program to transfer a character serially with a baud rate of 2400 using UART.

12. Interfacing LCD with 8051

a) Develop and execute the program to interface16*2 LCD to 8051.
b) Develop and execute the program to interface LCD to 8051 in 4-bit or 8-bit mode.

REFERENCES:

1. *Kenneth.J.Ayala. The 8051 microcontroller, 3rd edition, Cengage learning,2010.*
2. *Advanced microprocessors and peripherals-A.K ray and K.M.Bhurchandani, TMH, 2nd edition2006.*
3. *The 8051 Microcontroller and Embedded Systems: Using Assembly and C by Muhammad AliMazidi, Janice Gillispie Mazidi, Second Edition.*

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(23EC0443) PCB DESIGN AND PROTOTYPE DEVELOPMENT

(Skill Enhancement course)

COURSE OBJECTIVES:

The objectives of this course

1. *Identifying Electronic Components Symbols & Footprints.*
2. *To analyse the capability to produce PCBs of their circuit.*
3. *To effectively use the design rules & interfacing between schematic & PCB.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Students can design a schematic of their circuit.*
2. *Students can design PCB layout of their design.*
3. *Detailed description and practical of PCB design*
4. *Apply PCB design rules to create single-sided, double-sided, or multilayer PCB layouts.*
5. *Select appropriate components, place and route them effectively, and verify the design using design-rule checking (DRC).*
6. *Fabricate and assemble PCB prototypes for analog, digital, or mixed-signal circuits. Demonstrate the ability to design and develop microcontroller-based application boards*

UNIT-I

Fundamental of basic electronics: Component identification, Component symbols & their footprints, understand schematic, Creating new PCB, Browsing footprints libraries, Setting up the PCB layers, Design rule checking, Track width selection, Component selection, Routing and completion of the design

UNIT-II

Introduction to PCB: Definition and Need/Relevance of PCB, Background and History of PCB, Types of PCB, Classes of PCB Design, Terminology in PCB Design, Different Electronic design automation (EDA)tools and comparison.

UNIT-III

PCB Design Process: PCB Design Flow, Placement and routing, Steps involved in layout design, Artwork generation Methods - manual and CAD, General design factors for digital and analogue circuits, Layout and Artwork making for Single-side, double-side and Multilayer Boards, Design for manufacturability, Design-specification standards

Practice Exercises: Any twelve experiments are to be done

1. Practice following PCB Design steps

    - Schematic Design: Familiarization of the Schematic Editor, Schematic creation, Annotation, Netlist generation.
    - Layout Design: Familiarization of Footprint Editor, Mapping of components, Creation of PCB layout Schematic.
    - Create new schematic components.
    - Create new component footprints.
2. Regulator circuit using 7805
3. Inverting Amplifier or Summing Amplifier using op-amp
4. Full-wave Rectifier
5. Astable multivibrator using IC555
6. Monostable multivibrator using IC555
7. RCPhase-shifter oscillator using transistor.
8. Wein-bridge Oscillator using op- amp
9. Full-Adder using half-adders.
10. 4-bit binary /MOD N counter using D-Flip flops.
11. One open-ended (analog/ digital/mixed circuit) experiments of similar nature and magnitude to the above are to be assigned by the teacher

(Student is expected to solve and execute/simulate independently).

12. Design an 8051 Development board having Power section consisting of IC7805, capacitor, resistor, headers, LED.
13. Design an 8051 Development board having Serial communication section consisting of MAX 232, Capacitors, DB9connector,Jumper, LEDs
14. Design an 8051 Development board having Reset & Input/output sections consisting of 89C51 Microcontroller, Electrolytic Capacitor, Resistor, Jumper, Crystal Oscillator, Capacitors
15. Fabricate a single-sided PCB, mount the components and assemble them in a cabinet for any one of the circuits mentioned in the above exercises.

REFERENCES:

1. Jon Varteresian, Fabricating Printed Circuit Boards, z, 2002
2. R. Tummala, Fundamentals of Microsystems Packaging, McGraw-Hill 2001
3. C. Robertson. PCB Designer´s Reference. Prentice Hall, 2003
4. Open-source EDA Tool KiCad Tutorial: http://kicad-pcb.org/help/tutorials/ 13. PCB Fabrication user guide page:
   http://www.wikihow.com/Create-Printed-Circuit-Boards
   http://www.siongboon.com/projects/2005-09-07_home_pcb_fabrication/
   http://reprap.org/wiki/MakePCBInstructions#Making_PCBs_yourself
   PCB Fabrication at home(video): https://www.youtube.com/watch?v=mv7Y0A9YeUc, https://www.youtube.com/watch?v=imQTCW1yWkg

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(23EC0417) TINKERING LAB

The aim of tinkering lab for engineering students is to provide a hands-on learning environment where students can explore, experiment, and innovate by building and testing prototypes. These labs are designed to demonstrate practical skills that complement theoretical knowledge.

COURSE OBJECTIVES:

The objectives of this course

1. *Encourage Innovation and Creativity*
2. *Provide Hands-on Learning and Impart Skill Development*
3. *Foster Collaboration and Teamwork*
4. *Enable Interdisciplinary Learning, Prepare for Industry and Entrepreneurship*
5. *Impart* Problem-Solving mind-set

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Demonstrate the ability to design and implement basic electronic circuits using breadboards and sensors.*
2. *Apply microcontroller programming and interfacing techniques for real-time applications.*
3. *Utilize 3D design and printing tools to develop mechanical prototypes.*
4. *Analyze environmental and biomedical parameters using appropriate sensors and design automation systems.*
5. *Implement AI/ML models for prediction, classification, and decision-making in smart systems.*
6. *Develop integrated smart systems for safety, automation, and resource optimization in real-world applications.*

These labs bridge the gap between academia and industry, providing students with the practical experience. Some students may also develop entrepreneurial skills, potentially leading to start- ups or innovation-driven careers. Tinkering labs aim to cultivate the next generation of engineers by giving them the tools, space, and mind-set to experiment, innovate, and solve real-world challenges.

List of experiments:

1) Make your own parallel and series circuits using breadboard for any application of your choice.
2) Design and 3D print a Walking Robot
3) Design and 3D Print a Rocket.
4) Temperature & Humidity Monitoring System (DHT11 + LCD)
5) Water Level Detection and Alert System
6) Automatic Plant Watering System
7) Bluetooth-Based Door Lock System
8) Smart Dustbin Using Ultrasonic Sensorgy

9) Fire Detection and Alarm System
10) RFID-Based Attendance System
11) Voice-Controlled Devices via Google Assistant
12) Heart Rate Monitoring Using Pulse Sensor
13) Soil Moisture-Based Irrigation
14) Smart Helmet for Accident Detection
15) Milk Adulteration Detection System
16) Water Purification via Activated Carbon
17) Solar Dehydrator for Food Drying
18) Temperature-Controlled Chemical Reactor
19) Ethanol Mini-Plant Using Biomass
20) Smart Fluid Flow Control (Solenoid + pH Sensor)
21) Portable Water Quality Tester
22) AI Crop Disease Detection
23) AI-based Smart Irrigation
24) ECG Signal Acquisition and Plotting
25) AI-Powered Traffic Flow Prediction
26) Smart Grid Simulation with Load Monitoring
27) Smart Campus Indoor Navigator
28) Weather Station Prototype
29) Firefighting Robot with Sensor Guidance
30) Facial Recognition Dustbin
31) Barcode-Based Lab Inventory System
32) Growth Chamber for Plants
33) Biomedical Waste Alert System
34) Soil Classification with AI
35) Smart Railway Gate
36) Smart Bin Locator via GPS and Load Sensors
37) Algae-Based Water Purifier
38) Contactless Attendance via Face Recognition

- **Note:** The students can also design and implement their own ideas, apart from the list of experiments mentioned above.
- **Note:** A minimum of 8 to 10 experiments must be completed by the students.

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(23EC0419) DIGITAL SIGNAL PROCESSING

COURSE OBJECTIVES:

The objectives of this course

1. *To get familiar with the properties of discrete time signals, systems and z-transform.*
2. *To learn the importance of FFT algorithm for computation of Discrete Fourier Transform and Fast Fourier Transform with decimations.*
3. *To understand the implementations of digital filter structures.*
4. *To analyse the FIR filter design using Fourier series and windowing methods.*
5. *To gain the knowledge on Programmable DSP Devices.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1 *Familiar with the properties of discrete time signals, systems and z-transform.*
2 *Apply Discrete Fourier Transform (DFT) and analyze frequency components of discrete signals.*
3 *Implement efficient computation of DFT using Fast Fourier Transform (FFT) algorithms.*
4 *Design and realize Infinite Impulse Response (IIR) digital filters.*
5 *Design and realize Finite Impulse Response (FIR) digital filters*
6 *Gain the knowledge on Programmable DSP Devices.*

UNIT-I

Introduction to discrete time signals and systems:

Introduction to digital signal processing, Review of discrete-time signals and systems, Analysis of discrete-time linear time invariant systems, frequency domain representation of discrete time signals and systems

Z–Transform: Definition, ROC, Properties, Poles and Zeros in Z-plane, the inverse Z- Transform, System analysis, Transfer function, BIBO stability, System Response to standard signals, Solution of difference equations with initial conditions, Illustrative Problems, analysis of linear time-invariant systems in the z-domain, pole-zero stability.

UNIT-II

Discrete Fourier Transform : Introduction, Discrete Fourier Series, properties of DFS, Discrete Fourier Transform, Inverse DFT, properties of DFT, Linear and Circular convolution, convolution using DFT, sampling, Quantization effects.

Fast Fourier Transform: Introduction, Fast Fourier Transform, Radix-2 Decimation in time and Decimation in frequency FFT, Inverse FFT (Radix-2).

UNIT-III

IIR Filters: Introduction to digital filters, Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filters from analog filters by Impulse invariant and bilinear transformation methods, Frequency transformations, Basic structures of IIR Filters - Direct form- I, Direct form-II, Cascade form and Parallel form realizations.

UNIT-IV

FIR Filters: Introduction, Characteristics of FIR filters with linear phase, Frequency response of linear phase FIR filters, Design of FIR filters using Fourier series and windowing methods (Rectangular, Triangular, Raised Cosine, Hanging, Hamming, Blackman), Comparison of IIR & FIR filters, Basic structures of FIR Filters – Direct form, Cascade form, Linear phase realizations.

UNIT-V

Architectures for Programmable DSP Devices: Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers, On- chip memory, On-chip peripherals.

TEXT BOOKS:

1. *John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing, Principles, Algorithms, and Applications, Pearson Education, 2007.*
2. *A.V.Oppenheim and R.W. Schaffer, Discrete Time Signal Processing ,PHI.*

REFERENCES:

1. *S.K.Mitra, Digital Signal Processing – A practical approach , 2nd Edition, Pearson Education, New Delhi, 2004.*
2. *MH Hayes, Digital Signal Processing, Schaum's Outline series, TATA Mc-Graw Hill, 2007.*
3. *Robert J. Schilling, Sandra L. Harris, Fundamentals of Digital Signal Processing using Matlab, Thomson, 2007.*

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(23EC0420) MICROWAVE AND OPTICAL COMMUNICATIONS

COURSE OBJECTIVES:

The objectives of this course

1. *To analyse different modes of operation in rectangular wave guides, circular wave guides and resonators.*
2. *To study and analyse various microwave components and microwave sources.*
3. *To gain knowledge on different microwave semiconductor devices and microwave measurements procedures.*
4. *To analyse different optical fiber modes and to study different types of distortions and losses in optical communication.*
5. *To study various optical sources, optical detectors and to analyze various optical links.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1 *Analyze different modes of operation in rectangular wave guides, circular wave guides and resonators.*
2 *Understand and analyze various microwave components and microwave sources.*
3 *Gain knowledge on different microwave semiconductor devices and microwave measurements procedures.*
4 *Understand light propagation in optical fibers and assess transmission characteristics such as attenuation and dispersion for different types of fibers.*
5 *Analyze different optical fiber modes and to study different types of distortions and losses in optical communication.*
6 *Understand and study various optical sources, optical detectors and to analyze various optical links*

UNIT-I

Waveguides: Introduction, Rectangular waveguides, Field expressions for TE and TM modes, Wave propagation in the guide, Phase and group velocities, Power transmission and attenuation, Waveguide current and mode excitation, Circular waveguide – TE and TM modes(Qualitative treatment only), Wave propagation, Cavity resonators (Qualitative treatment only).

UNIT-II

Passive Microwave Devices: Introduction to scattering parameters and their properties, Terminations, Variable short circuit, Attenuators, Phase shifters, Hybrid Tees (H-plane, E-plane, Magic Tees), Directional Couplers – Bethe hole and Two hole Couplers, Deriving Scattering matrix for Microwave passive devices. Microwave propagation in Ferrites, Gyrator, Isolator, Circulator.

Microwave Amplifiers and Oscillators: Microwave Tubes: Linear Beam Tubes – Two cavity Klystron amplifier -velocity modulation, bunching process, output power, Reflex Klystron oscillator, power output and efficiency, Travelling Wave Tube (TWT) – Bunching process and amplification process (Qualitative treatment only). Crossed Field Tubes – Magnetron oscillator, pi-mode operation, power output and efficiency, Hartree Condition.

UNIT-III

Microwave Semiconductor Devices: Gunn Oscillator – Principle of operation, Characteristics, Two valley model, IMPATT, TRAPATT diodes.

Microwave Measurements: Description of Microwave bench-different blocks and their features, errors and precautions, Microwave power measurements, Measurement of attenuation, frequency, VSWR (low, medium, high), Measurement of _Q' of a cavity, Impedance measurements.

UNIT-IV

Introduction to Optical Fibers and Transmission Characteristics: The propagation of light in optical waveguides – Classification of optical fibers – Numerical aperture, Step index and Graded index fiber – Modes in cylindrical fiber – Linearly polarized modes, Attenuation: Absorption, Scattering, Bending losses. Modal dispersion and chromatic dispersion – Single mode fiber - waveguide dispersion– MFD – PMD

UNIT-V

Optical Transmitters and Receivers: Optical Sources: - Light source materials – LED homo and hetero structures – surface and edge emitters – Quantum efficiency – Injection Laser Diode – Modes and threshold condition – Structures and Radiation Pattern. Optical detectors: – Physical principles – PIN and APD diodes – Photo detector noise

Optical Link Design: Point- to- point links – System considerations – Link Power budget – Rise time budget.

TEXTBOOKS:

1. *David M. Pozar,‖ Microwave Engineering‖ John Wiley & Sons, Inc. 4th edition, 2012*
2. *Samuel Y. Liao, —Microwave Devices and Circuits‖, PHI publications, Third Edition, 1997.*
3. *Gerd Keiser, —Optical Fiber Communications‖, McGraw Hill, Third Edition, 2000.*

REFERENCES:

1. *R. E. Collin, —Foundations for Microwave Engineering‖, Wiley Student Edition, Second Edition, 2009.*
2. *Om. P. Gandhi, —Microwave: Engineering and Applications‖, Kai Fa Book Company, 1981.*
3. *Reich H. J., et al, —Microwave Principles‖, MIT Press, 1972.*
4. *F E Terman, —Electronic and Radio Engineering‖, McGraw Hill, 4th Edition, 1984*

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(23EC0421) VLSI DESIGN

COURSE OBJECTIVES:

The objectives of this course

1. *To understand the steps involved in fabrication of ICs using MOS transistor technology.*
2. *To learn about the VLSI design processes, Stick diagrams and Layouts.*
3. *To gain knowledge on the Gate Level Design concepts.*
4. *To learn the design of various subsystems with different VLSI Design styles.*
5. *To get familiar with CMOS testing techniques.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understand the steps involved in fabrication of ICs using MOS transistor technology.*
2. *Understand the electrical propertiesof MOS transistor technology.*
3. *Learn about the VLSI design processes, Stick diagrams and Layouts.*
4. *Gain knowledge on the Gate Level Design concepts .*
5. *Learn the design of various subsystems with different VLSI Design styles.*
6. *Familiar with CMOS testing techniques and apply design-for-testability (DFT) techniques including BIST and scan design.*

UNIT-I

Introduction: Brief Introduction to IC technology MOS, PMOS, NMOS, CMOS & BiCMOS Technologies. Basic Electrical Properties of MOS and BiCMOS Circuits: IDS - VDS relationships, MOS transistor Threshold Voltage, figure of merit, Transconductance, Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT-II

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, Lambda(λ)-based design rules for wires, contacts and Transistors, Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

UNIT-III

Gate level Design: Logic gates and other complex gates, Switch logic, Alternate gate circuits. Basic Circuit Concepts: Sheet Resistance Rs and its concepts to MOS, Area Capacitances calculations, Inverter Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out

UNIT-IV

Subsystem Design: Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Counters.

VLSI Design styles: Full-custom, Standard Cells, Gate-arrays, FPGAs, CPLDs and Design Approach for Full-custom and Semi-custom devices, parameters influencing low power design.

UNIT-V

CMOS Testing: Need for testing, Design for testability - built in self-test (BIST) – testing combinational logic –testing sequential logic – practical design for test guide lines – scan design techniques.

TEXT BOOKS:

1. *Essentials of VLSI Circuits and Systems, Kamran Eshraghian, EshraghianDougles, A. Pucknell, 2005, PHI.*
2. *Modern VLSI Design – Wayne Wolf, 3 Ed., 1997, Pearson Education.*

REFERENCES:

1. *CMOS VLSI Design-A Circuits and Systems Perspective, Neil H.E Weste, David Harris, Ayan Banerjee, 3rd Edn, Pearson, 2009.*
2. *BehzadRazavi , ―Design of Analog CMOS Integrated Circuits‖, McGraw Hill, 2003.*
3. *Jan M. Rabaey, ―Digital Integrated Circuits‖, AnanthaChandrakasan and Borivoje Nikolic, Prentice-Hall of India Pvt.Ltd, 2nd edition, 2009.*

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(23EC0430) ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

(Professional Elective-II)

COURSE OBJECTIVES:

The objectives of this course

1. *To know about the performance characteristics of instruments and measurement of electrical quantities.*
2. *To understand the construction, working and applications of different types of CRO's.*
3. *To analyze the working of different types of bridges.*
4. *To study the working of signal & function generators and analyzers.*
5. *To analyze the working of sensors and transducers in measuring physical parameters.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1 *Understand and explain the static and dynamic performance characteristics of measuring instruments, and evaluate different types of measurement errors using statistical methods.*

2 *Analyze the working principles and applications of DC and AC voltmeters, ammeters, ohmmeters, and multimeters for measuring electrical quantities.*

3 *Explain the construction and operation of Cathode Ray Oscilloscopes (CROs) and their advanced types, and use them for measuring signal parameters like amplitude, frequency, and phase.*

4 *Explain the construction and operation of Cathode Ray Oscilloscopes (CROs) and their advanced types, and use them for measuring signal parameters like amplitude, frequency, and phase.*

5 *Explain the construction and operation of Cathode Ray Oscilloscopes (CROs) and their advanced types, and use them for measuring signal parameters like amplitude, frequency, and phase.*

6 *Identify and explain the operation of different transducers and sensors used for measuring physical parameters such as displacement, force, pressure, temperature, and pH, along with their signal conditioning methods.*

UNIT-I

Performance characteristics of Instruments: Static characteristics, Accuracy, Precision, Resolution, Sensitivity, static and dynamic calibration, Errors in Measurement, and their statistical analysis, dynamic characteristics-speed of Response, fidelity, Lag and dynamic error. DC ammeters, DC voltmeters-multirange, range extension/solid state and differential voltmeters, AC voltmeters–multirange, range extension. Thermocouple type RF ammeter, ohm meters, series type, shunt type, multimeter for voltage, current and resistance measurements.

UNIT-II

Oscilloscopes: Introduction, Basic Principle, Standard specifications of CRO,CRT features, vertical and horizontal amplifiers, horizontal and vertical deflection systems, sweep trigger pulse, delay line, sync selector circuits, probes for CRO – active, passive, and attenuator type, triggered sweep CRO, and Delayed sweep, dual trace/beam CRO, Measurement of amplitude, frequency and phase (Lissajous method). Principles of sampling oscilloscope, storage oscilloscope, and digital storage oscilloscope, Digital frequency counters, time & Period measurements.

UNIT-III

Bridges: DC Bridges for Measurement of resistance: Wheat stone bridge, Kelvin‘s Bridge, AC Bridges for Measurement of inductance- Maxwell‘s bridge, Hay‘s Bridge, Anderson bridge. Measurement of capacitance- Schearing Bridge, Wien Bridge. Errors and precautions in using bridges.

UNIT-IV

Signal Generators: Signal generator-fixed and variable, AF oscillators, function generators, pulse, random noise, sweep, and arbitrary waveform generators, their standards, specifications and principles of working (Block diagram approach).Wave analyzers, Harmonic distortion analyzers, Spectrum analyzers, and Logic analyzers.

UNIT-V

Sensors and Transducers: Active and passive transducers: Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) Temperature (resistance thermometers, thermocouples and thermistors), Velocity, Acceleration, Vibration, pH measurement Signal Conditioning Circuits.

TEXT BOOKS:

1. *A.D. Helfrick and W.D. Cooper, ―Modern Electronic Instrumentation and Measurement Techniques‖, 5th Edition, PHI, 2002.*
2. *H.S.Kalsi, ―Electronic Instrumentation‖, 2nd edition, Tata McGraw Hill, 2004.*

REFERENCES:

1. *David A. Bell, ―Electronic Instrumentation & Measurements‖, 2nd Edition, PHI, 2003.*
2. *K. Lal Kishore, ―Electronic Measurements & Instrumentations‖, Pearson Education, 2009.*

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(23EC0431) EMBEDDED SYSTEMS & IOT
(Professional Elective-II)

COURSE OBJECTIVES:

The objectives of this course

1. *To understand the Architecture, Development & Design of Embedded Systems and IoT.*
2. *To learn the architecture and programming of ARM Microcontroller.*
3. *To be able to work with Raspberry Pi using Python Programming.*
4. *To know about the loT standards, communication technologies and protocols for IoT devices.*
5. *To implement case studies and applications using the tools and techniques of IoT Platform.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understand the Architecture, Development & Design of Embedded Systems and IoT.*
2. *Learn the architecture and programming of ARM Microcontroller.*
3. *Work with Raspberry Pi using Python Programming.*
4. *Know about the loT standards, communication technologies and protocols for IoT devices.*
5. *Implement case studies and applications using the tools and techniques of IoT Platform.*
6. *Understand cloud-based IoT platforms and data analytics tools (like Node-RED, Hadoop, Spark) for real-world IoT solutions.*

UNIT-I

Introduction to Embedded Systems and Internet of Things (IoT): Introduction, Hardware & Software Architecture of Embedded Systems, Embedded Systems Development process, Architecture of Internet of Things, Physical Design & Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Tools, Applications of Embedded Systems and IoT, Design Methodology for IOT Products.

UNIT-II

ARM Microcontrollers Architecture and Programming: Architecture, Pin Diagram, Register Set & Modes, Memory Organization, Instruction set, Programming ports, Timer/Counter, Serial communication, I/O System, Development Tools, interrupts in C, Introduction ARM mBed platform.

UNIT-III

Fundamentals of Python Programming & Raspberry Pi: Introduction to python programming, Data Types & Data Structures, working with functions, Modules & Packages, File Handling, classes, REST full Web Services, Client Libraries, Introduction & programming Raspberry Pi3, Interfaces, Integrating Input Output devices with Raspberry Pi3

UNIT-IV

IoT Technologies, Standards, Tools & M2M Network: Fundamental characteristics and high- level requirements of IoT, IoT Reference models; Introduction to Communication Technologies & Protocols of IoT: BLE, Wi-Fi, LoRA, 3G/4G Technologies and HTTP, MQTT, CoAP protocols; Relevant Practicals on above technologies, M2M Network, SDN (Software Defined Networking) & NFV (Network Function Virtualization) for IoT

UNIT-V

IoT Platform, Cloud Computing Platforms & Data Analytics for IoT Development: IOT Platform Architecture (IBM Internet of Things & Watson Platforms); API Endpoints for Platform Services; Devices Creation and Data Transmission; Introduction to NODE-RED and Application deployment, Introduction to Data Analytics, Apache Hadoop, Apache Oozie, Spark & Storm

TEXT BOOKS:

1. *Arsheep Bahga, Vijay Madisetti, ―Internet of Things: A Hands-On Approach‖, 1st Edition, VPT, 2014.*
2. *K.V.K.K.Prasad, ―Embedded Real Time Systems: Concepts, Design and Programming‖, 1st Edition, Dreamtech Publication, 2014.*
3. *Adrian McEwen, Hakim Cassimally, ―Designing the Internet of Things‖, Wiley Publications, 2013*

REFERENCES:

1. *Jonathan W Valvano, ―Embedded Microcomputer Systems: Real-Time Interfacing‖, 3rd Edition, Thomson Engineering, 2012.*
2. *Olivier Hersent, David Boswarthick, Omar Elloumi, ―The Internet of Things:*
3. *Key applications and Protocols‖, 2nd Edition, Wiley Publications, 2012.*
4. *Rene Beuchat , Andrea Guerrieri & Sahand Kashani ―Fundamentals of System-on-Chip Design on Arm Cortex-M Microcontrollers‖ Paperback, 2 August 2021.*

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(23EC0432) SPEECH PROCESSING

(Professional Elective-II)

COURSE OBJECTIVES:

The objectives of this course

1. *To impart knowledge on anatomy and physiology of speech organs and the process of Speech Production.*
2. *To understand the methods for extracting of speech using Time domain parameters.*
3. *To learn the Frequency Domain Methods for Speech Processing.*
4. *To interpret and analyze LPC Parameters for Speech Processing.*
5. *To introduce the concepts of homomorphic Speech Processing.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Gain knowledge on anatomy and physiology of speech organs and the process of Speech Production.*
2. *Understand the methods for extracting of speech using Time domain parameters.*
3. *Learn the Frequency Domain Methods for Speech Processing.*
4. *Interpret and analyze LPC Parameters for Speech Processing.*
5. *Evaluate the concepts of homomorphic Speech Processing techniques.*
6. *Demonstrate practical knowledge of speech processing applications*

UNIT-I

Fundamentals of Digital Speech Processing: Anatomy & Physiology of Speech Organs, The process of Speech Production, The Acoustic Theory of Speech Production – Uniform lossless tube model, effect of losses in vocal tract and radiation at lips, Digital models for speech signals.

UNIT-II

Time Domain Methods for Speech Processing: Time domain parameters of speech, methods for extracting the parameters: Zero crossings, Auto-correlation function, pitch estimation.

UNIT-III

Frequency Domain Methods for Speech Processing: Short time Fourier analysis, Filter bank analysis, Spectrographic analysis, Formant extraction, Pitch extraction.

UNIT-IV

Linear predictive Coding (LPC) for Speech: Formulation of linear prediction problem in time domain, solution of normal equations, Interpretation of linear prediction in auto correlation and spectral domains, Method of Solution of the LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

UNIT-V

Homomorphic Speech Processing: Introduction Homomorphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, The Complex Cepstrum of Speech, pitch Detection and Formant Estimation; Applications of speech processing – Speech Enhancement, Speech recognition, Speech synthesis and Speaker Verification.

TEXT BOOKS:

1. *L.R. Rabiner and S. W. Schafer, Digital Processing of Speech Signals, Pearson Education.*
2. *Douglas O' Shaughnessy, Speech Communications: Human &Machine, 2nd Ed., Wiley- IEEE Press.*

REFERENCES:

1. *Thomas F. Quatieri, Discrete Time Speech Signal Processing: Principles and Practice, 1st Ed., Pearson Education.*
2. *Ben Gold & Nelson Morgan, Speech and Audio Signal Processing: Processing and Perception of Speech and Music ,1st Ed., Wiley.*

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(23EC0433) DIGITAL IMAGE PROCESSING
(Professional Elective-III)

COURSE OBJECTIVES:

The objectives of this course

1. *To learn the fundamentals of Image Processing with different Transforms.*
2. *To understand functions of Intensity Transformations and working fundamentals of Spatial Filters*
3. *To implement various models of Restoring and Reconstruction of Images from filtering projections.*
4. *To study the concepts of image compression using different coding &Wavelets and Multi resolution Processes.*
5. *To design image processing systems using Segmentation techniques for Morphological & Color Images.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1 *Learn the fundamentals of Image Processing with different Transforms.*
2 *Understand the functions of Intensity Transformations and working fundamentals of Spatial Filters.*
3 *Apply techniques for Enhancement of digital images.*
4 *Implement various models of Restoring and Reconstruction of Images from filtering projections.*
5 *Grasp the concepts of image compression using different coding &Wavelets and Multi resolution Processes.*
6 *Design the image processing systems using Segmentation techniques for Morphological & Color Images.*

UNIT-I

Introduction: Introduction to Image Processing, Fundamental steps in digital image processing, components of an image processing system, image sensing and acquisition, image sampling and quantization, some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing. Image Transforms: Need for image transforms, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform, Importance of Phase, Walsh Transform. Hadamard transform, Haar Transform, Slant transform, Discrete Cosine transform, KL Transform, SVD and Radon Transform, Comparison of different image transforms.

UNIT-II

Intensity Transformations and Spatial Filtering: Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters , sharpening spatial filters, Combining spatial enhancement methods Filtering in the Frequency Domain: Preliminary concepts, The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters, Selective filtering.

UNIT-III

Image Restoration and Reconstruction: A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering, geometric mean filter ,image reconstruction from projections.

UNIT-IV

Image compression: Fundamentals, Basic compression methods: Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit-Plane coding, Block Transform coding, Predictive coding Wavelets and Multiresolution Processing: Image pyramids, subband coding, Multiresolution expansions, wavelet transforms in one dimensions & two dimensions, Wavelet coding.

UNIT-V

Image segmentation: Fundamentals, point, line, edge detection, thresholding, region –based segmentation. Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, Segmentation using morphological watersheds.

Color image processing: color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

TEXT BOOKS:

1. *R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.*
2. *Jayaraman, S. Esakkirajan, and T. Veerakumar,‖ Digital Image Processing‖, Tata McGraw-Hill Education, 2011.*

REFERENCES:

1. *Anil K.Jain, ―Fundamentals of Digital Image Processing‖, Prentice Hall of India, 9th Edition, Indian Reprint, 2002.*
2. *B.Chanda, D.DuttaMajumder, ―Digital Image Processing and Analysis‖, PHI, 2009*

ONLINE LEARNING RESOURCES:

https://nptel.ac.in/courses/117105079 https://nptel.ac.in/courses/117105135

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(23EC0455) ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
(Professional Elective-III)

COURSE OBJECTIVES:

The objectives of this course

1. *To learn the basics and problems of Artificial Intelligence with rationality and structure of agents.*
2. *To describe the search for solutions using various search strategies & algorithms for optimization.*
3. *To evaluate the representation of Agents with Propositional Logic in Shopping World.*
4. *To understand the concepts of Machine Learning with different Perspectives.*
5. *To analyze Decision Tree Representation with different problems& issues.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1 Understand the modules and dependencies used in machine learning applications.

2 Apply regression and clustering techniques using appropriate datasets in machine learning.

3 Implement k-Nearest Neighbor algorithm and classify datasets including images using decision tree and CNN models.

4 Simulate basic signal processing operations such as convolution and correlation using suitable software tools.

5 Implement DFT, FFT, and IFFT techniques and analyze the frequency response of digital signals.

6 Implement and analyze IIR and FIR digital filters and verify their performance using frequency response analysis.

UNIT-I

Introduction: What Is AI, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT-II

Problem Solving: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, informed (Heuristic) Search Strategies, Local Search Algorithms and Optimization Problems, Searching with Nondeterministic Actions.

UNIT-III

Knowledge Representation: Knowledge-Based Agents, Logic, Propositional Logic: A Very Simple Logic, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, The Internet Shopping World.

UNIT-IV

Introduction to Machine Learning: Well-Posed Learning Problem, Designing a Learning system, Perspectives and Issues in Machine Learning.

Concept Learning and The General-to-Specific Ordering: Introduction, A Concept Learning Task, Concept Learning as Search, FIND-S: Finding a Maximally Specific Hypothesis, Version Spaces and the Candidate Elimination Algorithm, Remarks on Version spaces and Candidate- Elimination, Inductive Bias

UNIT-V

Decision Tree Learning: Introduction, Decision Tree Representation, Appropriate Problems for Decision Tree Learning, The Basic Decision Tree Learning Algorithm, Hypothesis Space Search in Decision Tree Learning, Inductive Bias in Decision Tree Learning, Issues in Decision Tree Learning.

TEXT BOOKS:

1. *Stuart Russell and Peter Norvig, ―Artificial Intelligence: A Modern Approach‖ , 3rd Edition, Pearson.*
2. *Tom M. Mitchell, Machine Learning, McGraw Hill Edition, 2013.*

REFERENCES:

1. *Saroj Kaushik, ―Artificial Intelligence‖, Cengage Learning India, 2011.*
2. *Elaine Rich and Kevin Knight, ―Artificial Intelligence‖, Tata McGraw Hill.*
3. *David Poole and Alan Mackworth, ―Artificial Intelligence: Foundations for Computational Agents‖, Cambridge University Press 2010.*
4. *Trivedi, M.C., ―A Classical Approach to Artifical Intelligence‖, Khanna Publishing House, Delhi.*
5. *Christopher Bishop, Pattern Recognition and Machine Learning (PRML) , Springer, 2007.*
6. *ShaiShalev-Shwartz and Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms (UML) , Cambridge University Press, 2014.*

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(23EC0434) SATELLITE COMMUNICATIONS
(Professional Elective-III)

COURSE OBJECTIVES:
The objectives of this course

1. *To learn the principles of orbital mechanics& satellite launch system with performance parameters.*
2. *To describe the elements of communication satellite design for matching reliability.*
3. *To know the working concepts of various multiple access techniques and Onboard processing.*
4. *To analyze the satellite links design with communication links.*
5. *To evaluate the working of earth station design with satellite broadcasting.*

COURSE OUTCOMES (COs):
On successful completion of this course, students will be able to

1 *Learn the principles of orbital mechanics& satellite launch system with performance parameters.*
2 *Describe the elements of communication satellite design for matching reliabilit*
3 *Gain knowledge on various multiple access techniques and Onboard processing.*
4 *Analyze the satellite links design with communication links.*
5 *Evaluate the working of earth station design with satellite broadcasting.*
6 *Apply satellite communication principles to propose solutions for real-world problems.*

UNIT-I
Elements of orbital mechanics. Equations of motion. Tracking and orbit determination. Orbital correction/control. Satellite launch systems. Multistage rocket launchers and their performance

UNIT-II
Elements of communication satellite design. Spacecraft subsystems. Reliability considerations. Spacecraft integration.

UNIT-III
Multiple access techniques. FDMA, TDMA,CDMA. Random access techniques. Satellite onboard processing.

UNIT-IV
Satellite link design: Performance requirements and standards. Design of satellite links – DOMSAT, INSAT, INTELSAT and INMARSAT. Satellite - based personal communication. links.

UNIT-V

Earth station design. Configurations. Antenna and tracking systems. Satellite broadcasting.

TEXT BOOKS:

1. *D. Roddy, Satellite Communication (4/e), McGraw- Hill, 2009.*
2. *T. Pratt & C.W. Bostain, Satellite Communication, Wiley 2000.*

REFERENCES:

1. *B.N. Agrawal, Design of Geosynchrons Spacecraft, Prentice- Hall,1986.*

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(23CE0152) DISASTER MANAGEMENT
(Open Elective-II)

COURSE OBJECTIVES:
The objectives of this course

1. *Understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.*
2. *Analyze the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.*
3. *Apply wind engineering principles and computational techniques in designing wind-resisting structures.*
4. *Evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.*
5. *Assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.*

COURSE OUTCOMES (COs):
On successful completion of this course, students will be able to:

1. *Examine types and patterns of natural disasters, interpret hazard maps, and evaluate disaster risk reduction and recovery measures.*
2. *Analyze the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.*
3. *Apply wind engineering principles in the design of wind–resistant structures.*
4. *Apply computational techniques for the analysis and design of wind–resistant structures.*
5. *Evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.*
6. *Design disaster-resistant structures with innovative construction materials.*

UNIT – I
Introduction to Natural Disasters: Introduction to Natural Disasters– Brief Introduction to Different Types of Natural Disasters, Occurrence of Disasters in Different Climatic and Geographical Regions, Hazard Maps (Earthquake and Cyclone) of The World and India, Regulations for Disaster Risk Reduction, Post-Disaster Recovery and Rehabilitation (Socioeconomic Consequences).

UNIT – II
Cyclones and their Impact: Cyclones and Their Impact– Climate Change and Its Impact On Tropical Cyclones, Nature of Cyclonic Wind, Velocities and Pressure, Cyclone Effects, Storm Surges, Floods, and Landslides. Behaviour of Structures in Past Cyclones and Windstorms, Case Studies - Cyclonic Retrofitting, Strengthening of Structures, and Adaptive Sustainable Reconstruction. Life-Line Structures, Such as Temporary Cyclone Shelters

UNIT – III

Wind Engineering and Structural Response: Wind Engineering and Structural Response– Basic Wind Engineering, Aerodynamics of Bluff Bodies, Vortex Shedding, and Associated Unsteadiness Along and Across Wind forces. Lab: Wind Tunnel Testing and Its Salient Features. Introduction to Computational Fluid Dynamics (CFD) - General Planning and Design Considerations Under Windstorms and Cyclones. Wind Effects on Buildings, Towers, Glass Panels, Etc., and Wind-Resistant Features in Design. Codal Provisions, Design Wind Speed, Pressure Coefficients. Coastal Zoning Regulations for Construction and Reconstruction in Coastal Areas - Innovative Construction Materials and Techniques, Traditional Construction Techniques in Coastal Areas

UNIT – IV

Seismology and Earthquake Effects: Seismology and Earthquake Effects– Causes of Earthquakes, Plate Tectonics, Faults, Seismic Waves; Magnitude, Intensity, Epicentre, Energy Release, and Ground Motions. Earthquake Effects– On Ground, Soil Rupture, Liquefaction, Landslides - Performance of Ground and Buildings in Past Earthquakes– Behaviour of Various Types of Buildings and Structures, Collapse Patterns; Behaviour of Non-Structural Elements Such as Services, Fixtures, and Mountings – Case Studies - Seismic Retrofitting– Weakness in Existing Buildings, Aging, Concepts in Repair, Restoration, and Seismic Strengthening.

UNIT – V

Planning and Design Considerations for Seismic Safety: Planning and Design Considerations for Seismic Safety– General Planning and Design Considerations; Building forms, Horizontal and Vertical Eccentricities, Mass and Stiffness Distribution, Soft Storey Effects, Etc.; Seismic Effects Related to Building Configuration. Plan and Vertical Irregularities, Redundancy, and Setbacks - Construction Details– Various Types of Foundations, Soil Stabilization, Retaining Walls, Plinth Fill, Flooring, Walls, Openings, Roofs, Terraces, Parapets, Boundary Walls, Underground and Overhead Tanks, Staircases, and Isolation of Structures. Innovative Construction Materials and Techniques - Local Practices– Traditional Regional Responses - Computational Investigation Techniques

TEXT BOOKS:

1. David Alexander, *Natural Disasters*, CRC Press, 1st Edition, 2017.
2. Edward A. Keller and Duane E. DeVecchio, *Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes*, Routledge, 5th Edition, 2019.

REFERENCES:

1. Ben Wisner, J.C. Gaillard, and IIan Kelman (Editors), *Handbook of Hazards and Disaster Risk Reduction and Management*, Routledge, 2nd Edition, 2012.
2. Damon P. Coppola, *Introduction to International Disaster Management*, Butterworth-Heinemann, 4th Edition, 2020.
3. Bimal Kanti Paul, *Environmental Hazards and Disasters: Contexts, Perspectives and Management*, Wiley-Blackwell, 2nd Edition, 2020.

ONLINE LEARNING RESOURCES:

1. *https://nptel.ac.in/courses/124107010*
2. *https://onlinecourses.swayam2.ac.in/cec19_hs20/preview*

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(23CE0153) SUSTAINABILITY IN ENGINEERING PRACTICES
(Open Elective-II)

COURSE OBJECTIVES:

The objectives of this course is to

1. *Understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.*
2. *Analyze sustainable construction materials, their durability, and life cycle assessment.*
3. *Apply energy calculations in construction materials and assess their embodied energy.*
4. *Evaluate green building standards, energy codes, and performance ratings.*
5. *Assess the environmental effects of energy use, climate change, and global warming.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Recognize the rule of construction materials in contributing to CO_2 emissions from materials*
2. *Choose construction materials that are more sustainable.*
3. *Calculate the embodied energy of various construction materials and assess their contribution to overall building energy consumption.*
4. *Differentiate between embodied and operational energy in buildings and evaluate total life cycle energy use for sustainable construction.*
5. *Implement energy efficiency standards, and rating systems such as LEED, GRIHA, and ECBC, including the role of materials, insulation, and thermal performance in sustainable building design*
6. *Analyze the environmental impacts of non-renewable energy sources, including their role in global warming, greenhouse effects, acid rain, and regional climate changes.*

UNIT – I

Introduction: Introduction and Definition of Sustainability - Carbon Cycle - Role of Construction Material: Concrete and Steel, Etc. - CO_2 Contribution from Cement and Other Construction Materials.

UNIT – II

Materials used in Sustainable Construction: Construction Materials and Indoor Air Quality - No/Low Cement Concrete - Recycled and Manufactured Aggregate - Role of QC and Durability - Life Cycle and Sustainability.

UNIT – III

Energy Calculations: Components of Embodied Energy - Calculation of Embodied Energy for Construction Materials - Energy Concept and Primary Energy - Embodied Energy Via-A-V is Operational Energy in Conditioned Building - Life Cycle Energy Use

UNIT – IV

Green Buildings: Control of Energy use in Building - ECBC Code, Codes in Neighbouring Tropical Countries - OTTV Concepts and Calculations – Features of LEED and TERI – GRIHA Ratings – Role of Insulation and Thermal Properties of Construction Materials - Influence of Moisture Content and Modelling - Performance Ratings of Green Buildings - Zero Energy Building

UNIT – V

Environmental Effects: Non-Renewable Sources of Energy and Environmental Impact– Energy Norm, Coal, Oil, Natural Gas - Nuclear Energy - Global Temperature, Green House Effects, Global Warming - Acid Rain: Causes, Effects and Control Methods - Regional Impacts of Temperature Change.

TEXT BOOKS:

1. *Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, Wiley Publishers, 5th Edition, 2022.*
2. *Steve Goodhew, Sustainable Construction Process, Wiley Blackwell, UK, 2020.*

REFERENCES:

1. *Craig A. Langston & Grace K.C. Ding, Sustainable Practices in the Built Environment, Butterworth Heinemann Publishers, 2014.*
2. *William P Spence, Construction Materials, Methods & Techniques, Yesdee Publication Pvt. Ltd, 3rd edition, 2019.*

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(23EE0262) RENEWABLE ENERGY SOURCES
(OPEN ELECTIVE II)

COURSE OBJECTIVES:

The objectives of this course is to

1. *Know the importance of energy, resources of renewable energy, their usage and impact on environment.*
2. *Recognize the significance of solar energy, its harnessing technologies & its applications.*
3. *Identify the method of exploiting energy from wind and parameters to be considered for the selection of site for wind turbine installation.*
4. *Explain the concept of bio energy and its conversion devices.*
5. *Differentiate various renewable energies such as tidal energy, fuel cells.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *State various sources of energies, its availability and explain the importance of them by observing the global energy scenario.*
2. *Distinguish the types of solar energy tapping devices and describe the method of harnessing the solar energy.*
3. *Summarize the wind energy systems and elucidate the impact of it in environmental aspects.*
4. *Describe the biomass conversion process and list out various bioenergy applications.*
5. *Interpret the knowledge of renewable energies such as tidal energy, OTEC.*
6. *Identify numerous applications renewable energy resources and illustrate its harnessing technologies.*

UNIT-I

Solar Energy: Solar radiation - beam and diffuse radiation, solar constant, Sun at Zenith, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, storage of solar energy-thermal storage.

UNIT-II

PV Energy Systems: Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Solar PV modules from solar cells, mismatch in series and parallel connections design and structure of PV modules, Electrical characteristics of silicon PV cells and modules, Stand-alone PV system configuration, Grid connected PV systems.

UNIT-III

Wind Energy: Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades; wind data and energy estimation and site selection considerations.

UNIT-IV

Geothermal Energy: Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geopressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India.

UNIT-V

Miscellaneous Energy Technologies: Ocean Energy: Tidal Energy-Principle of working, Operation methods, advantages and limitations. Wave Energy-Principle of working, energy and power from waves, wave energy conversion devices, advantages and limitations. Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration Fuel cell: Principle of working of various types of fuel cells and their working, performance and limitations.

TEXT BOOKS:

1. *G. D. Rai, ―Non-Conventional Energy Sources‖, 4th Edition, Khanna Publishers, 2000.*
2. *Chetan Singh Solanki ―Solar Photovoltaics fundamentals, technologies and applications‖ 2nd Edition PHI Learning Private Limited. 2012.*

REFERENCES:

1. *Stephen Peake, ―Renewable Energy Power for a Sustainable Future‖, Oxford International Edition, 2018.*
2. *S. P. Sukhatme, ―Solar Energy‖,3rd Edition, Tata Mc Graw Hill Education Pvt. Ltd, 2008.*
3. *B H Khan , ― Non-Conventional Energy Resources‖, 2nd Edition, Tata Mc Graw Hill Education Pvt Ltd, 2011.*
4. *S. Hasan Saeed and D.K.Sharma,―Non-Conventional Energy Resources‖,3rd Edition, S.K.Kataria& Sons, 2012.*
5. *G. N. Tiwari and M.K.Ghosal, ―Renewable Energy Resource: Basic Principles and Applications‖, Narosa Publishing House, 2004.*

ONLINE LEARNING RESOURCES:

1. *https://nptel.ac.in/courses/103103206*
2. *https://nptel.ac.in/courses/108108078*

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(23ME0349) AUTOMATION AND ROBOTICS
(Open Elective-II)

COURSE OBJECTIVES:
The objectives of this course

1. *Fundamentals of industrial automation, production types, automation strategies, and hardware elements used in modern manufacturing processes.*
2. *Understanding of automated manufacturing systems, and strategies for improving productivity and flexibility in industrial automation.*
3. *Knowledge of industrial automation and robotics, sensors, and end-effector design for modern manufacturing environments.*
4. *Explain industrial automation and robotics, and trajectory planning for intelligent and efficient manufacturing applications.*
5. *Familiarity of industrial automation and robotics, and practical applications in manufacturing processes.*

COURSE OUTCOMES (COs):
On successful completion of this course, students will be able to

1 *Understand and analyze the structure and functions of automated manufacturing systems, and evaluate hardware components for efficient production.*

2 *Analyze and design automated flow lines with or without buffer storage, perform quantitative evaluations, apply assembly line balancing techniques.*

3 *Classify robot configurations, select suitable actuators and sensors, analyze and apply automation and robotics principles to optimize production efficiency and flexibility.*

4 *Explain the various components of robots and its feed back systems and its corrective measures*

5 *Apply kinematic and dynamic modeling using D-H notation and select appropriate hardware and control strategies for real-world industrial scenario to analyze and design automated and robotic systems.*

6 *Design, program, and implement robotic systems, understand and apply robotics technology to manufacturing tasks.*

UNIT-I
Introduction to Automation: Introduction to Automation, Need, Types, Basic elements of an automated system, Manufacturing Industries, Types of production, Functions in manufacturing, Organization and information processing in manufacturing, Automation strategies and levels of automation, Hardware components for automation and process control, mechanical feeders, hoppers, orienters, high speed automatic insertion devices.

UNIT –II

Automated flow lines: Automated flow lines, Part transfer methods and mechanisms, types of Flow lines, flow line with/without buffer storage, Quantitative analysis of flow lines. Assembly line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

UNIT- III

Introduction to Industrial Robotics: Introduction to Industrial Robotics, Classification of Robot Configurations, functional line diagram, degrees of freedom. Components common types of arms, joints grippers, factors to be considered in the design of grippers.

Robot actuators and Feedback components: Actuators, Pneumatic, Hydraulic actuators, Electric & Stepper motors, comparison. Position sensors - potentiometers, resolvers, encoders - velocity sensors, Tactile sensors, Proximity sensors.

UNIT- IV

Manipulator Kinematics: Manipulator Kinematics, Homogenous transformations as applicable to rotation and transition - D-H notation, Forward inverse kinematics.

Manipulator Dynamics: Differential transformations, Jacobians, Lagrange - Euler and Newton – Euler formations. Trajectory Planning: Trajectory Planning and avoidance of obstacles path planning, skew motion, joint integrated motion - straight line motion.

UNIT- V

Robot Programming: Robot Programming, Methods of programming - requirements and features of programming languages, software packages. Problems with programming languages.

Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading - Process - spot and continuous arc welding & spray painting - Assembly and Inspection

TEXT BOOKS:

1. *Automation , Production systems and CIM,M.P. Groover /Pearson Edu.*
2. *Industrial Robotics - M.P. Groover, TMH. 3.*

REFERENCES:

1. *Robotics , Fu K S, McGraw Hill, 4th edition, 2010.*
2. *An Introduction to Robot Technology, P. Coiffet and M. Chaironze, Kogam Page Ltd. 1983 London.*
3. *Robotic Engineering , Richard D. Klafter, Prentice Hall*
4. *Robotics, Fundamental Concepts and analysis – Ashitave Ghosal ,Oxford Press, 1/e, 2006*
5. *Robotics and Control , Mittal R K &Nagrath I J , TMH.*

ONLINE LEARNING RESOURCES:

1. *https://www.youtube.com/watch?v=yxZm9WQJUA0&list=PLRLB5WCqU54UJG45UnazSYmnmhgt76o*
2. *https://www.youtube.com/watch?v=6f3bvIhSWyM&list=PLRLB5WCqU54X5Vy4DwjfSODT3ZJgwEjyE*

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III B. Tech. – II Sem.

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(23CS0511) OPERATING SYSTEMS
(Open Elective-II)

COURSE OBJECTIVES:

The objectives of this course

1. *Understand the fundamental principles of operating systems and their role in managing hardware and software resources.*
2. *Explore process management techniques, including scheduling algorithms, multithreading, and inter-process communication mechanisms.*
3. *Analyze memory management strategies such as paging, segmentation, and virtual memory to optimize system performance.*
4. *Evaluate deadlock conditions and file system structures, including resource allocation, disk scheduling, and RAID technologies.*
5. *Implement security and protection mechanisms to safeguard computer systems from threats and unauthorized access.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication.*
2. *Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection.*
3. *Analyze the requirement for process synchronization and deadlocks handled by operating system.*
4. *Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.*
5. *Illustrate different conditions for deadlock and their possible solutions.*
6. *Analyze the memory management and its allocation policies.*

UNIT - I

Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Free and Open-Source Operating Systems

System Structures: Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Building and Booting an Operating System, Operating system debugging

UNIT - II

Processes: Process Concept, Process scheduling, Operations on processes, Inter-process communication.

Threads and Concurrency: Multithreading models, Thread libraries, Threading issues.

CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling.

UNIT-III

Synchronization Tools: The Critical Section Problem, Peterson's Solution, Mutex Locks, Semaphores, Monitors, Classic problems of Synchronization.

Deadlocks: system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.

UNIT-IV

Memory-Management Strategies: Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping.

Virtual Memory Management: Introduction, Demand paging, Copy-on-write, Page replacement, Allocation of frames, Thrashing

Storage Management: Overview of Mass Storage Structure, HDD Scheduling.

UNIT-V

File System: File System Interface: File concept, Access methods, Directory Structure; File **system Implementation:** File-system structure, File-system Operations, Directory implementation, Allocation method, Free space management; File-System Internals: File-System Mounting, Partitions and Mounting, File Sharing.

Protection: Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix.

TEXT BOOKS:

1. *Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2016.*
2. *Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (Topics: Inter-process Communication and File systems.)*

REFERENCES:

1. *Tanenbaum A S, Woodhull A S, Operating Systems Design and Implementation, 3rd edition, PHI, 2006.*
2. *Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw Hill, 2012.*
3. *Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009*
4. *Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004*

ONLINE LEARNING RESOURCES:

1. *https://nptel.ac.in/courses/106/106/106106144/*
2. *http://peterindia.net/OperatingSystems.html*

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(23CS0556) INTRODUCTION TO MACHINE LEARNING
(Open Elective-II)

COURSE OBJECTIVES:

The objectives of this course

1. *To introduce the fundamental concepts and types of machine learning.*
2. *To develop a deep understanding of supervised and unsupervised learning algorithms.*
3. *To understand mathematical foundations of learning models and algorithms.*
4. *To evaluate model performance using appropriate statistical and analytical tools.*
5. *To apply machine learning techniques to solve real-world problems using tools such as Scikit- learn.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understand and distinguish among different types of learning methods.*
2. *Apply supervised and unsupervised learning algorithms to datasets.*
3. *Analyze model performance using cross-validation and error metrics.*
4. *Build, test, and improve machine learning models for classification and prediction.*
5. *Use Python-based libraries (e.g., Scikit-learn) to implement ML algorithms*
6. *Evaluate machine learning models using appropriate validation techniques*

UNIT-I

Introduction to Machine Learning &Preparing to Model: Introduction: What is Human Learning? Types of Human Learning, what is Machine Learning? Types of Machine Learning, Problems Not to Be Solved Using Machine Learning, Applications of Machine Learning, State-of-The-Art Languages/Tools in Machine Learning, Issues in Machine Learning

Preparing to Model: Introduction, Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Quality and Remediation, Data Pre-Processing

UNIT-II

Modeling and Evaluation &Basics of Feature Engineering:

Introduction, selecting a Model, training a Model (for Supervised Learning), Model Representation and Interpretability, Evaluating Performance of a Model, Improving Performance of a Model Basics of Feature Engineering: Introduction, Feature Transformation, Feature Subset Selection

UNIT- III Bayesian Concept Learning & Supervised Learning: Classification Introduction, Why Bayesian Methods are Important? Bayes‘ Theorem, Bayes‘ Theorem and Concept Learning, Bayesian Belief Network .

Supervised Learning: Classification: Introduction**,** Example of Supervised Learning**,** Classification Model**,** Classification Learning Steps**,** Common Classification Algorithms-*k*- Nearest Neighbour (*k*NN), Decision tree, Random forest model, Support vector machines

UNIT-IV

Supervised Learning: Regression: Introduction, Example of Regression, Common Regression Algorithms-Simple linear regression, Multiple linear regression, Assumptions in Regression Analysis, Main Problems in Regression Analysis, Improving Accuracy of the Linear Regression Model, Polynomial Regression Model, Logistic Regression, Maximum Likelihood Estimation.

UNIT-V

Unsupervised Learning: Introduction, Unsupervised vs Supervised Learning, Application of Unsupervised Learning, Clustering – Clustering as a machine learning task, Different types of clustering techniques, Partitioning methods, *K*-Medoids: a representative object-based technique, Hierarchical clustering, Density-based methods-DBSCAN Finding Pattern using Association Rule- Definition of common terms, Association rule, Theapriori algorithm for association rule learning, Build the a priori principle rules

TEXT BOOKS:

1. *Machine Learning, SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, Pearson, 2019.*

REFERENCES:

1. *EthernAlpaydin, ―Introduction to Machine Learning‖, MIT Press, 2004.*
2. *Stephen Marsland, ―Machine Learning -An Algorithmic Perspective‖, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series,2014.*
3. *Andreas C. Müller and Sarah Guido ―Introduction to Machine Learning with Python: A Guide for Data Scientists‖, Oreilly.*

ONLINE LEARNING RESOURCES:

1. *Andrew Ng, ―Machine Learning B.Techning‖*
2. *https://www.deeplearning.ai/machine-learning- B.Techning/*
3. *Shai Shalev-Shwartz , Shai Ben-David, ―Understanding Machine Learning: From Theory to Algorithms‖ , Cambridge University Press*
4. *https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html*

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(23HS0853) OPTIMIZATION TECHNIQUES FOR ENGINEERS
(Open Elective –II)
(Common to All Branches)

COURSE OBJECTIVES:
The objectives of this course

1. *To provide the basic knowledge about Optimization, importance, application areas of in the industry, Linear Programming.*
2. *To impart different optimization models under typical situations in the business organization like transportation, assignment.*
3. *To understand the process of sequencing in a typical industry.*
4. *To describe different game strategies under cut-throat competitive business environment*

COURSE OUTCOMES (COs):
On successful completion of this course, the students should be able to

1. *Understand the meaning, purpose, tools of Operations Research and linear programming in solving practical problems in industry.*
2. *Interpret the transportation models' solutions and infer solutions to the real-world problems.*
3. *Develop mathematical skills to analyze and solve nonlinear programming models arising from a wide range of applications.*
4. *Understand theoretical concepts, formulating problems, applying various methods, and analyzing their performance.*
5. *Apply the concept of non-linear programming for solving the problems involving non-linear constraints and objectives.*
6. *Apply the concept of unconstrained geometric programming for solving the problems involving non-linear constraints and objectives.*

UNIT-I
Linear programming I
Introduction, Applications of Linear Programming, Standard form of a Linear Programming Problem, Geometry of Linear Programming Problems, Basic Definitions in Linear Programming. Simplex Method, Simplex Algorithm and Two phase Simplex Method, Big-M method.

UNIT-II
Linear programming II: Duality in Linear Programming
Symmetric Primal-Dual Relations, General Primal-Dual Relations, Duality Theorem, Dual Simplex Method, Transportation Problem and assignment problem, Complementary slackness Theorem

UNIT-III
Non-linear programming: Unconstrained optimization techniques
Introduction: Classification of Unconstrained minimization methods,

Direct Search Methods: Random Search Methods: Descent Method and Fletcher Powell Method, Grid Search Method

UNIT-IV

Non-linear programming: Constrained optimization techniques

Introduction, Characteristics of a constrained problem, Random Search Methods, complex method, Sequential linear programming, Basic approach in methods of Feasible directions, Zoutendijk's method of feasible directions: direction finding problem, determination of step length, Termination criteria.

UNIT-V

Geometric Programming

Unconstrained Minimization Problems: solution of unconstrained geometric programming using differential calculus and arithmetic-geometric inequality.

Constrained minimization Problems: Solution of a constrained geometric programming problem, primal-dual programming in case of less-than inequalities, geometric programming with mixed inequality constraints.

TEXT BOOKS:

1. *Singiresu S Rao., Engineering Optimization: Theory and Practices, New Age Int. (P) Ltd. Publishers, New Delhi.*
2. *J. C. Panth, Introduction to Optimization Techniques, (7-e) Jain Brothers, New Delhi.*

REFERENCES:

1. *Harvey M. Wagner, Principles of Operation Research, Printice-Hall of India Pvt. Ltd. New*
2. *Delhi.*
3. *Peressimi A.L., Sullivan F.E., Vhl, J. J. Mathematics of Non-linear Programming, Springer – Verlag.*

WEB REFERENCES:

1. *https://onlinecourses.nptel.ac.in/noc24_ee122/preview*
2. *https://archive.nptel.ac.in/courses/111/105/111105039/*
3. *https://onlinecourses.nptel.ac.in/noc21_ce60/preview*

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(23HS0858) MATHEMATICAL FOUNDATION OF QUANTUM TECHNOLOGIES
(Open Elective-II)
(Common to All Branches)

COURSE OBJECTIVES:
The objectives of this course

1. *To provide students with essential linear algebra foundations including vector spaces, inner products, and operators for quantum mechanical applications.*
2. *To develop understanding of the transition from finite-dimensional systems to infinite- dimensional function spaces and Hilbert space concepts.*
3. *To establish quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution principles.*
4. *To enable students to apply quantum mechanical principles to solve problems in simple quantum systems and understand statistical interpretation.*
5. *To introduce advanced concepts in composite systems, measurement processes, and modern perspectives in quantum mechanics.*

COURSE OUTCOMES (COs):
On successful completion of this course, the students should be able to

1. *Apply linear algebra concepts to function spaces and analyze the transition from finite to infinite dimensional systems.*
2. *Understand vector spaces, inner products, and linear operators with applications to quantum systems.*
3. *Analyze quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution.*
4. *Apply quantum mechanical principles to solve problems in simple quantum systems and evaluate statistical interpretations.*
5. *Understand statistical applications and interpretation with measurement processes..*
6. *Evaluate advanced concepts in composite systems and synthesize understanding of measurement processes and modern quantum theory.*

UNIT-I
Linear Algebra Foundation for Quantum Mechanics
Vector spaces definition and examples (R^2, R^3, function spaces), Inner products (dot product, orthogonality, normalization), Linear operators (matrices, eigenvalues, eigenvectors), Finite-dimensional examples (2×2 matrices, spin-1/2 systems), Dirac notation introduction ($|\psi\rangle$, $\langle \varphi|$, $\langle \varphi|\psi\rangle$), Change of basis (transformations, unitary matrices).

UNIT-II
From Finite to Infinite Dimensions
Function spaces (L^2 space, square-integrable functions), Inner products for functions ($\int \phi^* \phi \, dx$), Orthogonal function sets (Fourier series, basis functions), Introduction to Hilbert space concept (complete inner product spaces), Position and momentum representations (wave functions), Operators on functions (d/dx, multiplication by x).

UNIT-III

Quantum Mechanical Formalism

Mathematical formulation (states as vectors, observables as operators), Measurement theory (Born rule, expectation values, probabilities), Uncertainty relations (mathematical derivation from commutators), Time evolution (Schrödinger equation, unitary evolution).

UNIT-IV

Applications and Statistical Interpretation

Simple applications (infinite square well, harmonic oscillator), Statistical interpretation (ensembles, pure vs mixed states), Measurement process (von Neumann measurement scheme).

UNIT-V

Advanced Topics

Composite systems (tensor products basic introduction), Reversibility and irreversibility (unitary evolution vs measurement), Thermodynamic connections (equilibrium states, entropy), Modern perspectives (decoherence, measurement problem conceptual).

TEXT BOOKS:

1. David J. Griffiths, Darrell F. Schroeter, —*Introduction to Quantum Mechanics*, 3rd Edition, Cambridge University Press (2018).
2. R. Shankar, *Principles of Quantum Mechanics*, 2nd Edition, Kluwer Academy/Plenum Publishers (1994).

REFERENCES:

1. George. F. Simmons, —*Introduction to Topology and Modern Analysis*, MedTech Science Press.
2. Gilbert Strang, *Linear Algebra and Its Applications*, 4th Edition, Cengage Learning (2006).
3. John von Neumann and Robert T Beyer, *Mathematical Foundations of Quantum Mechanics*,Princeton Univ. Press (1996).

WEB RESOURCES:

1. https://eclass.uoa.gr/modules/document/file.php/CHEM248/Griffiths%20-%20Introduction%20to%20Quantum%20Mechanics%203rd%20ed%202018.pdf
2. https://fisica.net/mecanica-quantica/Shankar%20-%20Principles%20of%20quantum%20mechanics.pdf

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(23HS0843) PHYSICS OF ELECTRONIC MATERIALS AND DEVICES
(Open Elective-II)
(Common to all branches of Engineering)

COURSE OBJECTIVES:

The objectives of this course

1. *To make the students to understand the concept of crystal growth, defects in crystals and thin films.*
2. *To provide insight into various semiconducting materials and their properties.*
3. *To develop a strong foundation in semiconductor physics and device engineering.*
4. *To elucidate excitonic and luminescent processes in solid-state materials.*
5. *To understand the principles, technologies, and applications of modern display systems.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understand crystal growth and thin film preparation*
2. *Summarize the basic concepts of semiconductors*
3. *Illustrate the working of various semiconductor devices.*
4. *Explain the different types of Transistors.*
5. *Analyze various luminescent phenomena and the devices based on these concepts*
6. *Explain the working of different display devices*

UNIT-I

Fundamentals of Materials Science

Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth.The basic idea of point, line, and planar defects. Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RF and glow discharge).

UNIT- II

Semiconductors

Introduction, charge carriers in semiconductors, Change of electron-hole concentration- Qualitative analysis, The Fermi level & Fermi-Dirac distribution Function, Effects of temperature on Fermi-Dirac distribution Function Temperature dependency of carrier concentration, Conductivity and mobility, High field effects. Diffusion and drift, generation and recombination, Diffusion length., effective mass, Electron and Hole in quantum well,

UNIT III

Physics of Semiconductor Devices:

Introduction, Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Heterojunctions, Transistors, BJT.

UNIT- IV

Excitons and Luminescence:

Luminescence: Different types of luminescence, basic definitions, Light emission in solids, Inter-band luminescence, Direct and indirect gap materials.

Photoluminescence : General Principles of photoluminescence, Excitation and relaxation, OLED, Quantum-dot.

Electro-luminescence : General Principles of electroluminescence, light emitting diode, diode laser.

UNIT- V

Display devices :

LCD, three-dimensional display: Holographic display, light- field displays: Head-mounted display, MOEMS (Micro-Opto-Electro-Mechanical Systems).

TEXT BOOKS:

1. *Principles of Electronic Materials and Devices-S.O. Kasap, McGraw-Hill Education (India) Pvt. Ltd.,4thedition, 2021.*
2. *Semiconductor physics & devices: basic principles, 4th Edition, McGraw-Hill, 2012.*

REFERENCES:

1. *Solid State Electronic Devices -B.G. Streetman and S. Banerjee, PHI Learning,6th edition.*
2. *Electronic Materials Science- Eugene A. Irene, Wiley, 2005.*
3. *Electronic Components and Materials, Grover and Jamwal, DhanpatRai and Co., New Delhi., 2012.*
4. *An Introduction to Electronic Materials for Engineers-Wei Gao, Zhengwei Li, Nigel Sammes, World Scientific Publishing Co. Pvt. Ltd. 2nd Edition,2011.*

NPTEL course links:

https://nptel.ac.in/courses/113/106/113106062/
https://onlinecourses.nptel.ac.in/noc20_ph24/preview

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(23HS0807) CHEMISTRY OF POLYMERS AND APPLICATIONS
(Open Elective-II)

COURSE OBJECTIVES:

The objectives of this course

1. *To understand the basic principles of polymers*
2. *To understand natural polymers and their applications.*
3. *To impart knowledge to the students about synthetic polymers, their preparation and importance.*
4. *To impart knowledge to the students about synthetic polymers, their preparation and importance.*
5. *To enumerate applications of conducting and degradable polymers in engineering.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understand fundamentals of polymers and moulding of plastics. [L2]*
2. *Analyze the chemical and physical properties of natural polymers and their applications. [L4]*
3. *Apply the knowledge of thermoplastic and thermoset polymers in practical situations. [L3]*
4. *Evaluate the environmental and industrial relevance of synthetic polymers and their applications.*
5. *Understand the fundamental principles of hydrogel in polymer networks. [L2]*
6. *Analyze the preparation and mechanism of conducting and degradable polymers. [L4]*

UNIT – I
POLYMERS BASICS AND CHARACTERIZATION

Basic concepts of Polymers, Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution. Measurement of molecular weight: End group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers.

UNIT – II
NATURAL POLYMERS & MODIFIED CELLULOSICS

Natural Polymers: Chemical & Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins.

Modified cellulosics: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEA.

UNIT – III
SYNTHETIC POLYMERS

Addition and condensation polymerization processes– Bulk, Solution, Suspension and Emulsion polymerization. Preparation and significance, classification of polymers based on physical properties. Fibers and elastomers, General Applications. Preparation of Polymers based on different types of

monomers, Olefin polymers (PE, PVC),Poly Carbonates,Urea-formaldehyde, phenol – formaldehyde, Melamine-Formaldehyde,Epoxy and Ion exchange resins.

UNIT-IV

HYDROGELS OF POLYMER NETWORKS

Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels**,** Applications of hydrogels in drug delivery.

UNIT – V

CONDUCTING AND DEGRADABLE POLYMERS

Conducting polymers: Introduction, Classification, Mechanism of conduction in Poly Acetylene, Poly Aniline, Poly Thiophene, Doping, Applications.

Degradable polymers: Introduction, Classifications, Examples, Mechanism of degradation, poly lactic acid, Nylon-6, Polyesters, applications.

TEXT BOOKS:

1. *A Text book of Polymer science, Billmayer*
2. *Polymer Chemistry – G.S.Mishra*
3. *Polymer Chemistry – Gowarikar*

REFERENCES:

1. *Organic polymer Chemistry, K.J.Saunders, Chapman and Hall.*
2. *Advanced Organic Chemistry, B.Miller, Prentice Hall.*
3. *Polymer Science and Technology by Premamoy Ghosh, 3rd edition, Mc Graw-Hill, 2010.*

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B.Tech-ECE

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(23HS0823) ACADEMIC WRITING AND PUBLIC SPEAKING

(Open Elective-II)

COURSE OBJECTIVES:

The objectives of this course

1. *To encourage all round development of the students by focusing on writing skills*
2. *To make the students aware of non-verbal skills*
3. *To develop analytical skills*
4. *To deliver effective public speeches*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understand various elements of Academic Writing*
2. *Identify sources and avoid plagiarism*
3. *Demonstrate the knowledge in writing a Research paper*
4. *Analyse different types of essays*
5. *Assess the speeches of others and know the positive strengths of speakers*
6. *Build confidence in giving an impactful presentation to the audience*

UNIT-I

Introduction to Academic Writing: Introduction to Academic Writing – Essential Features of Academic Writing – Courtesy – Clarity – Conciseness – Correctness – Coherence – Completeness – Types – Descriptive, Analytical, Persuasive, Critical writing.

UNIT-II

Academic Journal Article: Art of condensation- summarizing and paraphrasing - Abstract Writing, writing Project Proposal, writing application for internship, Technical/Research/Journal Paper Writing – Conference Paper writing - Editing, Proof Reading – Plagiarism.

UNIT-III

Essay & Writing Reviews: Compare and Contrast – Argumentative Essay – Exploratory Essay – Features and Analysis of Sample Essays – Writing Book Report, Summarizing, Book/film Review- SoP.

UNIT-IV

Public Speaking: Introduction, Nature, characteristics, significance of Public Speaking – Presentation – 4 Ps of Presentation – Stage Dynamics – Answering Strategies –Analysis of Impactful Speeches- Speeches for Academic events.

UNIT-V

Public Speaking and Non-Verbal Delivery: Body Language – Facial Expressions-Kinesics – Oculesics – Proxemics – Haptics – Chronomics -Paralanguage – Signs.

TEXT BOOKS:

1. *Critical Thinking, Academic Writing and Presentation Skills: MG University Edition Paperback – 1 January 2010 Pearson Education; First edition (1 January 2010)*
2. *Pease, Allan & Barbara. The Definitive Book of Body LanguageRHUS Publishers, 2016*

REFERENCES:

1. *Alice Savage, Masoud Shafiei Effective Academic Writing,**2Ed.,**2014 Oxford University Press.*
2. *Shalini Verma, Body Language, S Chand Publications 2011.*
3. *Sanjay Kumar and Pushpalata,Communication Skills 2E 2015, Oxford.*
4. *Sharon Gerson, Steven Gerson,Technical Communication Process and Product, Pearson, New Delhi, 2014*
5. *Elbow, Peter. Writing with Power. OUP USA, 1998*

ONLINE LEARNING RESOURCES:

1. *https://youtu.be/NNhTIT81nH8*
2. *https://www.youtube.com/watch?v=478ccrWKY-A*
3. *https://www.youtube.com/watch?v=nzGo5ZC1gMw*
4. *https://www.youtube.com/watch?v=Qve0ZBmJMh4*
5. *https://courses.lumenlearning.com/publicspeakingprinciples/chapter/chapter-12- nonverbal-aspects-of-delivery/*
6. *https://onlinecourses.nptel.ac.in/noc21_hs76/preview*
7. *https://archive.nptel.ac.in/courses/109/107/109107172/#*
8. *https://archive.nptel.ac.in/courses/109/104/109104107/*

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(23EC0422) MICROWAVE AND OPTICAL COMMUNICATIONS LAB

COURSE OBJECTIVES:

The objectives of this course

1. *To understand the working of microwave bench set up and characteristics of microwave sources.*
2. *To verify the characteristics of various microwave components and to draw the radiation pattern of antennas.*
3. *To verify the characteristics of optical sources & detectors and to study about losses in optical fiber.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1 *Understand the working of microwave bench set up and characteristics of microwave sources.*
2 *Verify the characteristics of various microwave components and to draw the radiation pattern of antennas.*
3 *Verify the characteristics of optical sources & detectors and to study about losses in optical fib*
4 *Evaluate the performance of antennas through radiation pattern and gain measurements.*
5 *Characterize and evaluate optical sources like LEDs and laser diodes used in fiber communication.*
6 *Demonstrate the ability to perform optical signal modulation and analyze performance parameters in optical links.*

PART-A: Microwave Lab - Any Seven (7) Experiments

1. Reflex Klystron Characteristics
2. Gunn Diode Characteristics
3. Attenuation Measurement
4. Directional Coupler Characteristics
5. VSWR Measurement
6. Impedance Measurements
7. Frequency and Wavelength measurement
8. Scattering Parameters of Directional coupler
9. Scattering Parameters of Magic TEE
10. Radiation pattern measurement of a Antenna
11. Antenna gain measurement

Part B: Optical Fiber Lab - Any five (5) Experiments

1. Characterization of LED
2. Characterization of Laser Diode
3. Intensity Modulation of Laser output through Optical fiber
4. Measurement of data rate for digital Optical link
5. Measurement of Numerical Aperture.
6. Measurement of Losses for Analog optical link

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(23EC0423) VLSI DESIGN LAB

COURSE OBJECTIVES:

The objectives of this course

1. *To design a logic circuit using CMOS transistor using 180 nm technology in terms of schematic, symbol, test bench, DC and AC analysis.*
2. *To evaluate different schematics &output responses for AOI logic by using different software tools.*
3. *To design CMOS circuits using Full & Semi custom IC designs for analyzation.*
4. *To design different layouts using different software tools for analog circuits.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Design a logic circuit using CMOS transistor using 180 nm technology in terms of schematic, symbol, test bench. .*
2. *Analyze DC and AC characteristics of CMOS digital and analog circuits.*
3. *Evaluate different schematics &output responses for AOI logic by using different software tools.*
4. *Design CMOS circuits using Full & Semi custom IC designs for analyzation.*
5. *Design different layouts using different software tools for analog circuits*
6. *Perform characterization and analysis of MOS devices and amplifiers*

List of Experiments: (Any TEN of the experiments are to be conducted)

1. ***Design and analysis of CMOS Inverter***
   a) Implement CMOS inverter schematic using 180 nm technology and design its symbol.
   b) Implement test bench for CMOS Inverter and check its output response.
   c) Perform DC and AC analysis for CMOS inverter.
   d) Check the performance of CMOS inverter using parametric sweep.
2. ***Design and analysis of NAND and NOR Logic gates***
   a) Implement NAND/NOR schematic using 180 nm technology and design its symbol.
   b) Implement test bench for NAND/NOR and check its output response.
   c) Perform DC and AC analysis for NAND/NOR.
   d) Check the performance of NAND/NOR using parametric sweep.
3. ***Design and analysis of XOR and XNOR Logic gates***
   a) Implement XOR/XNOR schematic using 180 nm technology and design its symbol.
   b) Implement test bench for XOR/XNOR and check its output response.
   c) Perform DC and AC analysis for XOR/XNOR.
   d) Check the performance of XOR/XNOR using parametric sweep.
4. ***Design of AOI logic***
   a) Design Schematic for AB+C_D and check its output response.
   b) Design Schematic for AB_+C_D and check its output response.
   c) Design Schematic for (A+B_)(C+D) and check its output response.
   d) Design Schematic for (A+B_)(C_+D) and check its output response.
5. ***Design and analysis of Full adder***

a) Design full adder using Full custom IC design.
b) Design full adder using Semi custom IC design.

6. ***Analysis of NMOS and PMOS characteristics***
   a) Implement test bench for NMOS/PMOS transistor.
   b) Perform DC and AC analysis for NMOS/PMOS transistor
   c) Check the performance of NMOS/PMOS transistor using parametric sweep.

7. ***Design and analysis of Common source amplifier***
   a) Implement CS amplifier schematic using 180 nm technology and design its symbol.
   b) Implement test bench for CS amplifier and check its output response.
   c) Perform DC and AC analysis for CS amplifier.
   d) Check the performance of CS amplifier using parametric sweep.

8. ***Design and analysis of Common drain amplifier***
   a) Implement CD amplifier schematic using 180 nm technology and design its symbol.
   b) Implement test bench for CD amplifier and check its output response.
   c) Perform DC and AC analysis for CD amplifier.
   d) Check the performance of CD amplifier using parametric sweep.

9. ***Design of MOS differential amplifier***
   a) Design differential amplifier schematic using 180 nm technology and its symbol.
   b) Implement test bench for differential amplifier and check its output response.
   c) Perform DC and AC analysis for differential amplifier.
   d) Check the performance of differential amplifier using parametric sweep.

10. ***Design of differential amplifier using FET/BJT***
    a) Design differential amplifier using FET/BJT schematic using 180 nm technology and its symbol.
    b) Implement test bench for two stage differential amplifier and check its output response.
    c) Perform DC and AC analysis for differential amplifier.
    d) Check the performance of differential amplifier using parametric sweep.

11. ***Design of Inverter Layout***
    a) Design and implement inverter schematic.
    b) Design the layout for inverter using 180 nm tech file.
    c) Perform LVS for schematic and layout
    d) Check and remove all DRC violations.
    e) Extract parasitic R and C in layout.

12. ***Design of NAND/NOR Layout***
    a) Design and implement NAND/NOR schematic.
    b) Design the layout for inverter using 180 nm tech file.
    c) Perform LVS for schematic and layout
    d) Check and remove all DRC violations.
    e) Extract parasitic R and C in layout

The students are required to design the schematic diagrams using CMOS logic and to draw the layout diagrams to perform the experiments with the Industry standard EDA Tools.

Software Required:

i. Mentor Graphics/ Synopsis/ Cadence / Equivalent Industry Standard Software.

ii. Personal computer system with necessary software to run the programs and to implement.

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(23EC0444) MACHINE LEARNING AND DSP
(Skill Enhancement course)

COURSE OBJECTIVES:

The objectives of this course

1. *To understand the modules and dependencies for machine learning corresponding to different applications.*
2. *To understand a range of machine learning regression techniques & clustering along with their datasets.*
3. *To write the programs and implement k-Nearest Neighbor algorithm to classify the iris data sets, images & CNN.*
4. *To simulate the basic signal processing operations like convolution and correlation.*
5. *To simulate the DSP operations like DFT, FFT & implement IIR and FIR filters using simulation software and verify their frequency responses.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1 *Understand the modules and dependencies used in machine learning applications.*
2 *Apply regression and clustering techniques using appropriate datasets in machine learning.*
3 *Implement k-Nearest Neighbor algorithm and classify datasets including images using decision tree and CNN models.*
4 *Simulate basic signal processing operations such as convolution and correlation using suitable software tools.*
5 *Implement DFT, FFT, and IFFT techniques and analyze the frequency response of digital signals.*
6 *Implement and analyze IIR and FIR digital filters and verify their performance using frequency response analysis.*

MACHINE LEARNING (Implement any six concepts)

Implement the following concepts using python with supporting applications.

1. Familiarizing with Anaconda and Jupyter for importing modules and dependencies for ML Familiarization with NumPy, Panda and Matplotlib by Loading Dataset in Python
2. **Linear regression***:* Predict the profit of a company/House price from a dataset using the concept of linear regression. Implement the speech recognition model (NLP) from a speech/audio dataset using the concept of linear regression
3. ***Logistic regression***:
    a) Identify whether the patient has diabetes or not from diabetes dataset using Logistic regression

b) Implement the speech to text model (NLP- Speech recognitions system) from a speech dataset using the concept of linear regression

4. ***Polynomial regression***:

   a. Determine the quality of wine using wine dataset with the help of polynomial regression

   b. Implement the speech recognition model (NLP) from a speech / audio data set using the concept of polynomial regression.

5. **K-means clustering***:* Apply the concept of K-means clustering for image segmentation problem (Brain tumor and Lung images)/Color quantization
6. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set to demonstrate the working of the decision tree based ID3 algorithm.
7. Write a program to implement the k-Nearest Neighbor algorithm for image classification and distance metric learning for large margin with image classification applications using k-nearest neighbor.
8. **PCA/LDA:** Reduce the dimensionality of a dataset for Face recognition system
9. Design an Artificial neural network for Digit classification using Back Propagation Algorithm for MNIST Data set. Train MLP using Gradient descent algorithm by applying Linear, Sigmoid, tanh, and ReLu activation functions
10. **Digit recognition using CNN:** Identify the digit s 0-9 from MNIST data and CIFR 10 set using CNN
11. ImageClassificationusingCNN:ClassifycatsanddogsusingCNNfromthegivendataset
12. LSTM (Long Short-Term Memory Networks)/ARIMA--- Implementation biomedical signals (like EEG, ECG, EMG) classifications and disease prediction.

DIGITAL SIGNAL PROCESSING (Implement any six concepts)

1. Generate the following standard discrete time signals.
   i) Unit Impulse ii) Unit step iii) Ramp iv) Exponential v) Sawtooth
2. Generate sum of two sinusoidal signals and find the frequency response (magnitude and phase).
3. Implement and verify linear and circular convolution between two given signals.
4. Implement and verify autocorrelation for the given sequence and cross correlation between two given signals.
5. Compute and implement the N-point DFT of a given sequence and compute the power density spectrum of the sequence.
6. Implement and verify N-point DIT-FFT of a given sequence and find the frequency response (magnitude and phase).
7. Implement and verify N-point IFFT of a given sequence.
8. Design IIR Butterworth filter and compare their performances with different orders (Low Pass Filter /High Pass Filter)
9. Design IIR Chebyshev filter and compare their performances with different orders (Low Pass Filter /High Pass Filter).
10. Design FIR filter (Low Pass Filter /High Pass Filter) using windowing technique.
    i. Using rectangular window, ii. Using hamming window , iii. Using Kaiser window

11. Design and verify Filter (IIR and FIR) frequency response by using Filter design and Analysis Tool.
12. Compute the Decimation and Interpolation for the given signal.
13. Real time implementation of an audio signal using a digital signal processor.

REFERENCES:

1. *S.N.Sivanandam and S.N.Deepa, Introduction to neural networks usingMatlab,2006.*
2. *Simon Haykin,Neural Networks and LearningMachines,PHI,2008.*
3. *Digital Signal Processing: Alon V. Oppenhelm, PHI*
4. *Digital Signal processing(II-Edition): S.K. Mitra, TMH*

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(23HS0816) TECHNICAL PAPER WRITING & IPR

COURSE OBJECTIVES:

The objectives of this course

1. *To enable the students to practice the basic skills of research paper writing*
2. *To make the students understand the importance of IP and to educate them on the basic concepts of Intellectual Property Rights.*
3. *To practice the basic skills of performing quality literature review*
4. *To help them in knowing the significance of real life practice and procedure of Patents.*
5. *To enable them learn the procedure of obtaining Patents, Copyrights, & Trade Marks*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Identify key secondary literature related to their proposed technical paper Writing*
2. *Explain various principles and styles in technical writing*
3. *Use the acquired knowledge in writing a research/technical paper*
4. *Analyze rights and responsibilities of holder of Patent, Copyright, Trademark, International Trademark etc.*
5. *Evaluate different forms of IPR available at national & international level*
6. *Develop skill of making search of various forms of IPR by using modern tools and techniques.*

UNIT-I

Principles of Technical Writing: Styles in technical writing; clarity, precision, coherence and logical sequence in writing-avoiding ambiguity- repetition, and vague language -highlighting your findings-discussing your limitations -hedging and criticizing -plagiarism and paraphrasing.

UNIT-II

Technical Research Paper Writing: Abstract- Objectives-Limitations-Review of Literature- Problems and Framing Research Questions- Synopsis.

UNIT-III

Process of Research: Publication Mechanism: Types of Journals- Indexing-Seminars- Conferences-Proof Reading–Plagiarism Style; Seminar & Conference Paper Writing; Methodology-Discussion-Results- Citation Rules.

UNIT-IV

Introduction to Intellectual Property: Introduction, Types of Intellectual Property, International Organizations, Agencies and Treaties, Importance of Intellectual Property Rights: Purpose and Function of Trade-Marks, Acquisition of Trade-Mark Rights, Protectable Matter, Selecting Evaluating Trade Mark and Trade Mark Registration Processes.

UNIT-V

Law of Copy Rights: Fundamentals of Copy Right Law, Originality of Material, Rights of Reproduction, Rights to Perform the Work Publicly, Copy Right Ownership Issues, Copy Right Registration, Notice of Copy Right, International Copy Right Law, Law of Patents: Foundation of Patent Law, Patent Searching Process, Ownership Rights and Transfer. Patent Law and Intellectual Property Audits.

TEXT BOOKS:

1. *Deborah. E. Bouchoux, Intellectual Property Rights, Cengage Learning India, 2013*
2. *Meenakshi Raman, Sangeeta Sharma. Technical Communication:Principles and practices.Oxford.*

REFERENCES:

1. *R.Myneni, Law of Intellectual Property, 9th Ed, Asia law House, 2019.*
2. *Prabuddha Ganguli,Intellectual Property Rights Tata Mcgraw Hill, 2001*
3. *P.Naryan,Intellectual Property Law, 3rd Ed ,Eastern Law House, 2007.*
4. *Adrian Wallwork. English for Writing Research PapersSecond Edition. Springer Cham Heidelberg New York ,2016*
5. *Dan Jones, Sam Dragga, Technical Writing Style*

ONLINE RESOURCES:

1. *https://theconceptwriters.com.pk/principles-of-technical-writing/*
2. *https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.h tml*
3. *https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.h tml*
4. *https://www.manuscriptedit.com/scholar-hangout/process-publishing-research-paper- journal/*
5. *https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&Practice.pdf*
6. *https://lawbhoomi.com/intellectual-property-rights-notes/*
7. *https://www.extension.purdue.edu/extmedia/ec/ec-723.pdf*

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(23EC0424) DATA COMMUNICATIONS AND NETWORKING

COURSE OBJECTIVES:

The objectives of this course

1. *To provide a conceptual understanding of the fundamentals of data communications and computer networks.*
2. *To explore different network architectures, models, and transmission media used in data communication.*
3. *To analyze error detection and correction methods, data link protocols, and medium access techniques.*
4. *To understand the functioning of network and transport layer protocols, including addressing, routing, and congestion control.*
5. *To study application layer protocols, network security mechanisms, and techniques to ensure data integrity.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understand of the fundamentals of data communications and computer networks.*
2. *Learn different network architectures, models, and transmission media used in data communication.*
3. *Analyze error detection and correction methods, data link protocols, and medium access techniques.*
4. *Grasp the functioning of network and transport layer protocols, including addressing, routing, and congestion control.*
5. *Gain knowledge on application layer protocols, network security mechanisms, and techniques to ensure data integrity.*
6. *Demonstrate knowledge of network devices, IP addressing, subnetting, routing algorithms, and transport protocols like TCP and UDP.*

UNIT-I

Overview of Data Communication and Networking: Introduction; Data communications: components, direction of data flow; network criteria, physical structure, categories of network (LAN, MAN, WAN); Internet: brief history, Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.

UNIT-II

Physical Layer: Overview of data (analog & digital), signal (analog& digital), transmission (analog & digital) & transmission media (guided & unguided), queuing theory , its applications in data communication, Data Encoding Techniques, Circuit switching, time division & space division switching.

UNIT-III

Data link Layer: Types of errors, framing (character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC

Medium Access sub layer: Point to Point Protocol, Token Ring; Reservation, Polling, Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA Traditional Ethernet, fast Ethernet.

UNIT-IV

Network layer: Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing: IP addressing, subnetting; Routing: techniques, static vs. dynamic routing, Unicast Routing Protocols: RIP, OSPF, BGP; Other Protocols: ARP, IP, ICMP, IPV6

Transport layer: Process to Process delivery; UDP; TCP; Congestion Control: Open Loop, Closed Loop choke packets; Quality of service: techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm.

UNIT-V

Application Layer: Introduction to DNS, SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography (Public, Private Key based), Digital Signature, Firewalls.

TEXT BOOKS:

1. *B. A. Forouzan – ―Data Communications and Networking (3rd Ed.) ― – TMH*
2. *A.S. Tanenbaum – ―Computer Networks (4th Ed.)‖ – Pearson Education/PHI*

REFERENCES:

1. *W. Stallings – ―Data and Computer Communications (5th Ed.)‖ – PHI/ Pearson Education*
2. *Kurose and Rose – ―Computer Networking -A top down approach featuring the internet‖ – Pearson Education*
3. *Leon, Garica, Widjaja – ―Communication Networks‖ – TMH*

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(23HS0861) BUSINESS ETHICS AND CORPORATE GOVERNANCE

COURSE OBJECTIVES:

The objectives of this course

1. *To make the student understand the principles of business ethics*
2. *To enable them in knowing about the ethics in management*
3. *To facilitate the student' role in corporate culture*
4. *To impart knowledge about the fair-trade practices*
5. *To encourage the student in knowing about the corporate governance*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Apply various ethical principles in business and corporate social responsibility practices*
2. *Recognize how personal ethics can influence behavior and apply in decision making*
3. *Explain the ethical challenges facing the various functional departments*
4. *Identify the organizational and cultural variables that impact ethical judgment*
5. *Analyze various ethical codes in corporate governance*
6. *Identify organizational policies and systems that employ ethical conduct*

UNIT-I

Ethics Introduction: Meaning – Nature, Scope, Significance, Loyalty, and Ethical Behavior- Value Systems - Business Ethics - Types, Characteristics, Factors, Contradictions and Ethical Practices in Management - Corporate Social Responsibility – Issues of Management – Crisis Management.

UNIT-II

Ethics in Management: Introduction- Ethics in Production, Finance, Human Resource Management and Marketing Management - The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in Different Cultures - Culture and Individual Ethics – Professional Ethics and Technical Ethics.

UNIT III

Corporate Culture Introduction - Meaning, definition, Nature, and significance – Key elements of corporate culture, shared values, beliefs and norms, rituals, symbols and language - Types of corporate culture, hierarchical culture, market driven culture – Organization leadership and corporate culture, leadership styles and their impact on culture, transformational leadership and culture change.

UNIT- IV

Legal Frame Work: Law and Ethics -Agencies Enforcing Ethical Business Behavior - Legal Impact – Environmental Protection, Fair Trade Practices, Legal Compliances, Safeguarding Health and Wellbeing of Customers – Corporate Law, Securities and Financial Regulations, Corporate Governance Codes and Principles.

UNIT –V

Corporate Governance: Introduction - Meaning – Corporate Governance Code, Transparency & Disclosure -Role of Auditors, Board of Directors and Shareholders. Global Issues, Accounting and Regulatory Frame Work - Corporate Scams - Committees in India and Abroad, Corporate Social Responsibility. BoDs Composition, Cadbury Committee - Various committees - Reports - Benefits and Limitations.

TEXT BOOKS:

1. *Murthy CSV: Business Ethics and Corporate Governance, HPH July 2017*
2. *Bholananth Dutta, S.K. Podder – Corporation Governance, VBH. June 2010*

REFERENCES:

1. *Dr. K. Nirmala, Karunakara Reddy. Business Ethics and Corporate Governance, HPH.*
2. *H.R.Machiraju: Corporate Governance, HPH, 2013.*
3. *K. Venkataramana, Corporate Governance, SHBP.*
4. *N.M.Khandelwal. Indian Ethos and Values for Managers.*

ONLINE RESOURCES:

1. *https://onlinecourses.nptel.ac.in/noc21_mg46/*
2. *https://archive.nptel.ac.in/courses/110/105/110105138/*
3. *https://onlinecourses.nptel.ac.in/noc21_mg54/*
4. *https://onlinecourses.nptel.ac.in/noc22_mg54/*
5. *https://archive.nptel.ac.in/courses/109/106/109106117/*

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(23HS0862) E-BUSINESS

COURSE OBJECTIVES:

The objectives of this course

1. *To provide knowledge on emerging concept on E-Business related aspect.*
2. *To understand various electronic markets & business models.*
3. *To impart the information about electronic payment systems & banking.*
4. *To create awareness on security risks and challenges in E-commerce.*
5. *To make the students aware of different e-marketing channels & strategies.*

COURSE OUTCOMES (COs);

On successful completion of this course, students will be able to

1. *Remember E-Business & its nature, scope and functions.*
2. *Understand E-market-Models which are practicing by the organizations*
3. *Apply the concepts of E-Commerce in the present globalized world.*
4. *Analyze the various E-payment systems & importance of net banking.*
5. *Evaluate market research strategies & E-advertisements.*
6. *Understand importance of E-security & control*

UNIT - I

Electronic Business: Introduction – Nature, Meaning, Significance, Functions and Advantages - Definition of Electronic Business - Functions of Electronic Commerce (EC)-Advantages & Disadvantages of E-Commerce –E-Commerce and E-Business, Internet Services, Online Shopping- E-Commerce Opportunities for Industries.

UNIT – II

Electronic markets and business models: Introduction –E-Shops-E-Malls E-Groceries - Portals - Vertical Portals-Horizontal Portals - Advantages of Portals -Business Models- Business to Business (B2B)-Business to Customers(B2C) - Business to Government(B2G)-Auctions-B2B Portals in India.

UNIT - III

Electronic Payment Systems: Introduction to Electronic Payment Systems (EPS) -Types of Electronic Payments - Credit/Debit Cards, E-wallets, UPI, and Crypto Currencies -Smart Cards and Digital Wallets: Features and Usage -Electronic Fund Transfer (EFT): Role in Business Transactions -Infrastructure Requirements and Regulatory Aspects of E-payments.

UNIT - IV

E-Security: Security Risks and Challenges in Electronic Commerce - Cyber Threats - Phishing, Hacking, Identity Theft, and Malware - Digital Signatures & Certificates - Security Protocols over Public Networks (HTTP, SSL, TLS) -Firewalls in Securing E-business Platforms.

UNIT - V

E-Marketing:

Introduction – Online Marketing – Advantages of Online Marketing – Internet Advertisement – Advertisement Methods – Conducting Online Market Research– – E-marketing Planning**.**

TEXT BOOKS:

1. *Arati Oturkar & Sunil Khilari. E-Business. Everest Publishing House, 2022.*
2. *P.T.S Joseph. E-Commerce, Fourth Edition, Prentice Hall of India, 2011.*

REFERENCES:

1. *Debjani, Kamalesh K Bajaj. E-Commerce, Second Edition Tata McGraw-Hill's, 2005.*
2. *Dave Chaffey.E-Commerce E-Management, Second Edition, Pearson, 2012.*
3. *Henry Chan. E-Commerce Fundamentals and Application, Raymond Leatham Wiley India 2007.*
4. *S. Jaiswal. E-Commerce Galgotia Publication Pvt Ltd., 2003.*

ONLINE RESOURCES:

https://www.slideshare.net/fatimahAlkreem/e-businessppt-67935771
https://www.slideshare.net/VikramNani/e-commerce-business models
https://www.slideshare.net/RiteshGoyal/electronic-payment-system
https://www.slideshare.net/WelingkarDLP/electronic-security
https://www.slideshare.net/Ankitha2404/emarketing-ppt

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(23HS0863) MANAGEMENT SCIENCE

COURSE OBJECTIVES:

The objectives of this course

1. *To provide fundamental knowledge on Management, Administration, Organization & its concepts.*
2. *To make the students understand the role of management in Production*
3. *To impart the concept of HRM in order to have an idea on Recruitment, Selection, Training & Development, job evaluation and Merit rating concepts*
4. *To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management*
5. *To make the students aware of the contemporary issues in modern management*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Remember the concepts & principles of management and designs of organization in a practical world*
2. *Understand the knowledge of Work-study principles & Quality Control techniques in industry*
3. *Apply the process of Recruitment & Selection in organization.*
4. *Analyze the concepts of HRM & different training methods.*
5. *Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.*
6. *Create awareness on contemporary issues in modern management & technology.*

UNIT-I

Introduction to Management: Management - Concept and Meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor‘s Scientific Theory-Henry Fayol‘s principles - Elton Mayo‘s Human Relations - **Organizational Designs** - Line Organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee Form of Organization - Social Responsibilities of Management.

UNIT- II

Operations Management: Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), Work Study - Statistical Quality Control- **Material Management** - Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - **Marketing Management** - Concept - Meaning - Nature-Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.

UNIT-III

Human Resources Management (HRM): HRM - Definition and Meaning – Nature - Managerial and Operative Functions - Job Analysis - Human Resource Planning(HRP) - Employee Recruitment-Sources of Recruitment - Employee Selection - Process - Employee Training and Development - Methods - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration.

UNIT-IV

Strategic & Project Management: Definition& Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis - **Project Management** - Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost- Analysis - Project Crashing (Simple problems).

UNIT-V

Contemporary Issues In Management: Customer Relations Management(CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management(SCM) - Enterprise Resource Planning (ERP) - Performance Management – Employee Engagement and Retention - Business Process Re-engineering and Bench Marking - Knowledge Management – Change Management –Sustainability and Corporate Social Responsibility.

TEXT BOOKS:

1. *Frederick S. Hillier, Mark S. Hillier. Introduction to Management Science, October 26, 2023*
2. *A.R Aryasri, Management Science, TMH, 2019*

REFERENCES:

1. *Stoner, Freeman, Gilbert.Management, Pearson Education, New Delhi, 2019.*
2. *Koontz & Weihrich, Essentials of Management, 6/e, TMH, 2005.*
3. *Thomas N.Duening & John M.Ivancevich, Management Principles and Guidelines, Biztantra.*
4. *Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.*
5. *Samuel C.Certo, Modern Management, 9/e, PHI, 2005*

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(23EC0435) RADAR ENGINEERING

(Professional Elective - IV)

COURSE OBJECTIVES:

The objectives of this course

1. *To understand the basic working principle of Radar and target detection procedure.*
2. *To learn about the working and applications of CW and Frequency modulated Radar.*
3. *To comprehend the working and applications of MTI and Pulse Doppler Radar*
4. *To understand different methods of tracking a target and their limitations.*
5. *To analyze the effect of noise at the receiver and uses of phased array antennas and navigational aids.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understand the radar principles and analyze performance using radar range equations, SNR, and target characteristics.*
2. *Evaluate the working principles and applications of Continuous Wave (CW) and Frequency Modulated (FM-CW) radar systems and solve related illustrative problems.*
3. *Analyze MTI and Pulse Doppler radar systems with clutter reduction techniques like delay line cancellers and staggered PRFs.*
4. *Illustrate various tracking techniques such as sequential lobing, conical scan, and monopulse tracking and explain their effectiveness in target tracking.*
5. *Evaluate radar signal detection in noise using matched filters, CFAR, and detection criteria, considering receiver performance parameters.*
6. *Describe phased array antenna principles, beam steering, and modern radar technologies including SDR, stealth, and navigation aids like VOR and ILS.*

UNIT-I

Basics of Radar: Introduction, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications, Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, Illustrative Problems. Radar Equation: SNR, Envelope Detector, False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Display types, Illustrative Problems.

UNIT-II

CW and Frequency Modulated Radar: Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar, Illustrative Problems.FM-CW Radar, Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW altimeter, Multiple Frequency CW Radar.

UNIT-III

MTI and Pulse Doppler Radar: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, And Staggered PRFs. Range Gated Doppler Filters, MTI Radar Parameters, Limitations to MTI Performance,MTI versus Pulse Doppler radar.

UNIT-IV

Tracking Radar: Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one- and two-coordinates), Phase Comparison Monopulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT-V

Detection of Radar Signals in Noise: Introduction, Noise Figure and Noise Temperature, Matched Filter Receiver – Response Characteristics and Derivation, Correlation detection, Detection criteria, Detector Characteristics, Automatic Detection, Constant False Alarm Rate Receiver. Introduction to Software Defined Radio,Introduction to Stealth technology.

Radar Receivers: Introduction to Phased Array Antennas- Basic Concepts, Electronically Steered Phased Array Antennas, Phase Shifters, Frequency – scan Arrays, Radiation for Phased Array, Architecture for Phased Arrays. Radiation Pattern. Beam Steering and Beam Width changes. Navigational Aids : Direction Finder, VOR,ILS and Loran.

TEXT BOOKS:

1. *Merrill I. Skolnik, —Introduction to Radar Systems‖, 2nd Edition, TMH Special Indian Edition, 2007.*
2. *Byron Edde, —Radar Principals, Technology, Applications‖, Pearson Education, 1992.*

REFERENCES:

1. *Peebles, —Radar Principles‖, Wiley, New York, 1998.*
2. *G.S.N.Raju, —Radar Engineering and Fundamentals of Navigational Aids‖, I. K. International Pvt. Ltd.*
3. *G. SasiBhushan Rao, — Microwave and Radar Engineering‖, Pearson Education, 2014*

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IV B. Tech. – I Sem.

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(23EC0436) DSP PROCESSORS & ARCHITECTURES
(Professional Elective - IV)

COURSE OBJECTIVES:

The objectives of this course

1. *Understand DSP fundamentals and analyze computational accuracy using MATLAB tools.*
2. *To study the architecture and pipelining features of programmable DSP devices.*
3. *To learn instruction sets, addressing modes, and on-chip features of processors like TMS320C54XX.*
4. *To implement DSP algorithms and FFT using fixed-point arithmetic on DSP hardware.*
5. *To design real-time DSP systems with memory and I/O interfaces.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Explain DSP concepts like sampling, DFT/FFT, and filtering, and use MATLAB for analysis.*
2. *Evaluate number formats, precision limits, and error sources in DSP systems.*
3. *Analyze DSP architectures, pipelining, and performance features.*
4. *Develop programs using commercial DSP processors like TMS320C54XX by applying their instruction sets, addressing modes, and on-chip features.*
5. *Implement filters, FFT, and controllers on DSP hardware with proper scaling.*
6. *Interface DSP processors with memory and I/O devices.*

UNIT-I

Introduction to Digital Signal Processing: Introduction, a Digital signal-processing system, the sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB.

Computational Accuracy in DSP Implementations: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT-II

Architectures for Programmable DSP Devices: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

Execution Control and Pipelining: Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models.

UNIT-III

Programmable Digital Signal Processors: Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On- Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

UNIT-IV

Implementations of Basic DSP Algorithms: The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing.

Implementation of FFT Algorithms: An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

UNIT-V

Interfacing Memory and I/O Peripherals to Programmable DSP Devices: Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

TEXT BOOKS:

1. *Avtar Singh and S. Srinivasan, ―Digital Signal Processing Implementation‖, 1st Edition, Cengage Learning, 2004.*
2. *Lapsley et al. S. Chand and Co, ―DSP Processor Fundamentals, Architectures & Features‖, 2000.*

REFERENCES:

1. *B. Venkata Ramani and M. Bhaskar, ―Digital Signal Processors, Architecture, Programming and Applications‖, TMH, 2004.*
2. *Jonatham Stein, ―*
3. *Digital Signal Processing: A Computer Science Perspective‖, John Wiley, 2000.*

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(23EC0437) CELLULAR & MOBILE COMMUNICATIONS
(Professional Elective - IV)

COURSE OBJECTIVES:
The objectives of this course

1. *To explain the basic cellular system and its working.*
2. *To understand the impact of multipath fading channels and techniques to mitigate fading effects in cellular communication.*
3. *To explore frequency management, channel assignment strategies, and different types of handoffs in cellular networks.*
4. *To analyze the performance of mobile antennas, interference issues, and cellular system design principles.*
5. *To evaluate system performance metrics such as dropped call rates, handoff strategies, and spectrum efficiency.*

COURSE OUTCOMES (COs):
On successful completion of this course, students will be able to

1. *Understand the basic cellular system and its working.*
2. *Analyze the design elements of cellular radio systems such as frequency reuse, co-channel interference, and cell splitting strategies.*
3. *Evaluate signal propagation in various terrains and environments and apply models for predicting mobile signal behavior and coverage.*
4. *Explain the principles of antenna design and selection for mobile and base station applications to improve coverage and reduce interference.*
5. *Evaluate the performance of cellular systems, including signal reception, handoff efficiency, and spectrum utilization.*
6. *Assess mobile communication system performance using handoff strategies, vehicle location methods, and system evaluation parameters like dropped call rates and spectrum efficiency.*

UNIT-I
Cellular Mobile Radio Systems: Introduction to Cellular Mobile system, basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Analog and Digital Cellular systems.

UNIT-II
Elements of Cellular Radio System Design: General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a Omni directional Antenna system, Cell splitting, consideration of the components of cellular system.

Interference: Introduction to Co-channel interference, real time co-channel interference, Co- channel measurement, design of Antenna system, Antenna parameters and their effects, diversity receiver, non-co-channel interference-different types.

UNIT-III

Cell Coverage for Signal and Traffic: Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long-distance propagation antenna height gain, form of a point-to-point model.

UNIT-IV

Cell Site and Mobile Antennas: Sum and difference patterns and their synthesis, Omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas.

Frequency Management and Channel Assignment: Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non fixed channel assignment.

UNIT-V

Handoff: Handoff, dropped calls and cell splitting, types of handoffs, handoff invitation, delaying handoff, forced handoff, mobile assigned handoff. Intersystem handoff, cell splitting, micro cells, vehicle locating methods, dropped call rates and their evaluation.

System Evaluations: Performance evaluation, Signal evaluation, Measurement of average received level and level crossings, Spectrum efficiency evaluation.

TEXT BOOKS:

1. *W .C. Y. Lee, —Mobile cellular telecommunications‖, Tata Mc-Graw Hill, 2nd Edition, 2006.*
2. *Theodore. S. Rapport, —Wireless communications‖, Pearson Education, 2ndEdn., 2002.*

REFERENCES:

1. *Gordon L. Stuber, —Principles of Mobile communications‖, Springer International 2nd Edition, 2007.*
2. *Lee , —Wireless and Mobile Communications‖, Mc Graw Hills, 3rd Edition, 2006.*
3. *Jon W.Mark and WeihuaZhqung, —Wireless communications and Networking‖, PHI, 2005.*
4. *R.Blake, —Wireless communication Technology‖, Thompson Asia Pvt.Ltd., 2004.*

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(23EC0438) LOW POWER VLSI DESIGN
(Professional Elective - V)

COURSE OBJECTIVES:

The objectives of this course

1. *To understand the principles of low voltage and low power design, including the limitations and role of Silicon-on-Insulator (SOI) technology in VLSI circuits.*
2. *To study the integration and isolation considerations in MOS and BiCMOS processes and explore trends in deep submicron technologies.*
3. *To analyze advanced MOSFET and bipolar device models, including characterization techniques for sub-micron devices in hybrid mode environments.*
4. *To design and evaluate low power CMOS and BiCMOS logic circuits, latches, and flip-flops with respect to performance and power efficiency.*
5. *To explore and apply special low power techniques such as power reduction in clock networks, delay balancing, low power buses, and SRAM optimization.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Analyse advanced CMOS and BiCMOS design processes for achieving low power consumption in VLSI circuits.*
2. *Evaluate various integration and isolation techniques employed to optimize low power VLSI designs.*
3. *Analyze the behavior and modeling of advanced MOSFET devices for sub-micron and deep sub-micron technologies.*
4. *Assess the performance characteristics of CMOS and BiCMOS logic gates through comparative evaluation.*
5. *Apply the concepts of CMOS and BiCMOS logic gates in the design and implementation of energy-efficient latches and flip-flops.*
6. *Utilize special low power techniques for optimizing clock networks and memory architectures in VLSI systems.*

UNIT-I

Fundamentals: Need for Low Power Circuit Design, Sources of Power Dissipation – Static and Dynamic Power Dissipation, Short Circuit Power Dissipation, Glitching Power Dissipation, Short Channel Effects –Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

UNIT-II

Low-Power Design Approaches: Low-Power Design through Voltage Scaling – VTCMOS circuits, MTCMOS circuits, Architectural Level Approach –Pipelining and Parallel Processing Approaches. Switched Capacitance Minimization Approaches: System Level Measures, Circuit Level Measures, Mask level Measures.

UNIT-III

Low-Voltage Low-Power Adders: Introduction, Standard Adder Cells, CMOS Adder's Architectures – Ripple Carry Adders, Carry Look Ahead Adders, Carry Select Adders, Carry Save Adders, Low-Voltage Low-Power Design Techniques – Trends of Technology and Power Supply Voltage, Low-Voltage Low-Power Logic Styles.

UNIT-IV

Low-Voltage Low-Power Multipliers: Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, Baugh Wooley Multiplier, Booth Multiplier, Introduction to Wallace Tree Multiplier.

UNIT-V

Low-Voltage Low-Power Memories: Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Precharge and Equalization Circuit, Low-Power SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

TEXT BOOKS:

1. *CMOS Digital Integrated Circuits – Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 2011.*
2. *Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.*

REFERENCES:

1. *Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011.*
2. *Low Power CMOS Design – AnanthaChandrakasan, IEEE Press/Wiley International, 1998.*
3. *Low Power CMOS VLSI Circuit Design – Kaushik Roy, Sharat C. Prasad, John Wiley & Sons,2000.*

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(23EC0439) WIRELESS SENSOR NETWORKS
(Professional Elective - V)

COURSE OBJECTIVES:

The objectives of this course

1. *To introduce the fundamental concepts and architecture of wireless sensor networks.*
2. *To explore various network architectures, optimization techniques, and design principles for wireless sensor networks.*
3. *To study MAC protocols, routing techniques, and addressing mechanisms for efficient sensor network communication.*
4. *To understand the infrastructure establishment of sensor networks, including topology control and synchronization.*
5. *To provide knowledge on sensor network platforms, programming challenges, and simulation tools.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Learn the fundamental concepts and architecture of wireless sensor networks.*
2. *Explore various network architectures, optimization techniques, and design principles for wireless sensor networks.*
3. *Gain knowledge of MAC protocols, routing techniques, and addressing mechanisms for efficient sensor network communication.*
4. *Understand the infrastructure establishment of sensor networks, including topology control and synchronization.*
5. *Grasp the knowledge on sensor network platforms, programming challenges, and simulation tools.*
6. *Evaluate the Applications and Deployment Challenges of Wireless Sensor Networks*

UNIT-I

Overview of Wireless Sensor Networks: Single-Node Architecture - Hardware Components- Network Characteristics- unique constraints and challenges, Enabling Technologies for Wireless Sensor Networks- Types of wireless sensor networks.

UNIT-II

Architectures: Network Architecture- Sensor Networks-Scenarios- Design Principle, Physical Layer and Transceiver Design Considerations, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT-III

Networking Sensors: MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts - SMAC, - B-MAC Protocol, IEEE 802.15.4 standard and ZigBee, the Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols Energy-Efficient Routing, Geographic Routing.

UNIT-IV

Infrastructure Establishment: Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

UNIT-V

Sensor Network Platforms and Tools : Sensor Node Hardware – Berkeley Motes,Programming Challenges, Node-level software platforms, Node level Simulators, State-centric programming.

TEXT BOOKS:

1. *Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks‖, John Wiley, 2005.*
2. *Feng Zhao & Leonidas J.Guibas, —Wireless Sensor Networks-An Information Processing Approach", Elsevier, 2007*

REFERENCES:

1. *Waltenegus Dargie , Christian Poellabauer, —Fundamentals Of Wireless Sensor Networks Theory And Practice‖, By John Wiley & Sons Publications, 2011*
2. *KazemSohraby, Daniel Minoli, &TaiebZnati, —Wireless Sensor Networks-Technology, Protocols, and Applications‖, John Wiley, 2007.*
3. *Anna Hac, —Wireless Sensor Network Designs‖, John Wiley, 2003*

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(23EC0440) 5G COMMUNICATIONS
(Professional Elective - V)

COURSE OBJECTIVES:

The objectives of this course

1. *To introduce the fundamental concepts of 5G spectrum, radio access technologies, and system requirements.*
2. *To understand the architecture and physical layer aspects of 5G networks, including MIMO and beamforming.*
3. *To explore advanced 5G radio-access technologies and their role in multi-user communication.*
4. *To study network slicing, SDN, NFV, and their applications in vehicular communications.*
5. *To analyze mobility management, interference control, and dynamic network reconfiguration in 5G.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understand the 5G radio spectrum and channel models, including spectrum sharing and propagation challenges.*
2. *Analyze the 5G network architecture, including the core network, RAN, and physical layer procedures.*
3. *Evaluate different 5G radio-access technologies, including new waveforms and non-orthogonal multiple access schemes.*
4. *Apply network slicing concepts and vehicular communication techniques for efficient 5G network deployment.*
5. *Develop strategies for mobility and handoff management to optimize network performance and minimize interference.*
6. *Design solutions for dynamic network reconfiguration and interference management to support seamless mobility in 5G environments.*

UNIT-I

5G Radio Spectrum: 5G spectrum landscape and requirements, Spectrum access modes and sharing scenarios, 5G spectrum technologies.

5G Channel Model: The 5G wireless Propagation Channels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling.

5G Use Cases and System Concept: Use cases and requirements, 5G system concept.

UNIT-II

Radio Interface Architecture: 5G architecture options, core network architecture, RAN architecture.

5G PHYSICAL LAYER: Physical channels and signals, 5G frame structure, physical layer procedures (MIMO, Power control, link adaptation, beam forming).

UNIT-III

5G Radio-Access Technologies: Access design principles for multi-user communications, multi-carrier with filtering: a new waveform, non-orthogonal schemes for efficient multiple access

UNIT-IV

Introduction to 5G Network Slicing: Network Slicing, E2E Slicing, SDN and NFV Slicing

Vehicular Communications: From V2V to AV2X, key standards, VC architectures, V2X Use cases

UNIT-V

Mobility and Handoff Management in 5G: Network deployment types, Interference management in 5G, Mobility management in 5G, Dynamic network reconfiguration in 5G.

TEXT BOOKS:

1. *Afif Osseiran, Jose F Monserrat, PatrickMarsch,―5G Mobile and Wireless Communications Technology‖, Cambridge University Press, 2016.*
2. *Saad Z. Asif, ―5G Mobile Communications Concepts and Technologies‖, CRC Press,*
3. *Taylor & Francis Group, First Edition, 2018.*
4. *Harri Holma, Antti Toskala, Takehiro Nakamura, ―5G Technology 3GPP NEW RADIO‖, John Wiley & Sons First Edition,2020.*

REFERENCES:

1. *Gordon L. Stuber, ―Principles of Mobile Communication‖, KLUWER ACADEMIC PUBLISHERS, 2nd Edition, 2002*
2. *Joseph C. Liberti,Theodore S. Rappaport, ―Smart Antennas for*
3. *Wireless Communications‖, Prentice Hall PTR, 1999*
4. *Ying Zhang, ―Network Function Virtualization Concepts and Applicability in 5G Networks‖, John Wiley & Sons, 2018.*

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(23CE0154) BUILDING MATERIALS AND SERVICES
(OPEN ELECTIVE - III)

COURSE OBJECTIVES:

The objectives of this course is to

1. *Understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminium, glass, paints, and plastics.*
2. *Analyze the composition, manufacturing process, and properties of cement and admixtures.*
3. *Apply knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery.*
4. *Evaluate masonry, mortars, finishing techniques, and formwork systems.*
5. *Assess various building services including plumbing, ventilation, air conditioning, acoustics, and fire protection.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Identify and classify construction materials and select materials appropriately for construction use*
2. *Analyze physical and laboratory test of cement and select appropriate admixtures based on desired performances*
3. *Identify and describe the functions, types, and structural aspects of essential building components such as lintels, arches, walls, vaults, staircases, floors, and roofs.*
4. *Apply appropriate materials and construction techniques in the design of building components including joinery ,doors and windows and foundations, considering functional and structural requirements*
5. *Design temporary supporting systems including formwork, scaffolding, shoring, and underpinning as per site conditions and structural needs*
6. *Apply principles of acoustics to evaluate sound absorption and develop suitable acoustic design solutions for different building types*

UNIT – I

Stones and Bricks, Tiles: Building Stones - Classifications and Quarrying - Properties - Structural Requirements - Dressing. Bricks - Composition of Brick Earth - Manufacture and Structural Requirements, Fly Ash, Ceramics. Timber, Aluminium, Glass, Paints and Plastics: Wood - Structure - Types and Properties - Seasoning - Defects; Alternate Materials for Timber - GI / Fiber - Reinforced Glass Bricks, Steel & Aluminium, Plastics.

UNIT – II

Cement & Admixtures: Types of Cement - Ingredients of Cement - Manufacture - Chemical Composition - Hydration - Field & Lab Tests - Fineness - Consistency - Initial & Final Setting – Soundness . Admixtures - Mineral & Chemical Admixtures - Uses

UNIT – III

Building Components: Lintels, Arches, Walls, Vaults - Stair Cases - Types of Floors, Types of Roofs - Flat, Curved, Trussed; Foundations - Types; Damp Proof Course; Joinery - Doors - Windows - Materials - Types.

UNIT – IV

Mortars, Masonry and Finishing's Mortars: Lime and Cement Mortars Brick Masonry - Types - Bonds; Stone Masonry - Types; Composite Masonry - Brick-Stone Composite; Concrete, Reinforced Brick. Finishers: Plastering, Pointing, Painting, Claddings - Types - Tiles - ACP form Work: Types: Requirements - Standards - Scaffolding - Design; Shoring, Underpinning.

UNIT – V

Building Services: Plumbing Services: Water Distribution, Sanitary - Lines &Fittings; Ventilations: Functional Requirements Systems of Ventilations. Air-Conditioning - Essentials and Types; Acoustics - Characteristic - Absorption - Acoustic Design; Fire Protection - Fire Hazards - Classification of Fire Resistant Materials and Constructions

TEXT BOOKS:

1. *Arora & Bindra, Building Materials and Construction, Dhanpat Roy Publications, 4th Edition, 2010.*
2. *G C Sahu, Joygopal Jena, Building Materials and Construction, McGraw Hill Pvt Ltd,2nd Edition, 2022.*

REFERENCES:

1. *B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Building Construction, Laxmi Publications (P) Ltd., New Delhi, 12th edition, 2022.*
2. *P. C. Varghese, Building Materials, Prentice Hall of India, 2020.*
3. *N.Subramanian, Building Materials Testing and Sustainability, Oxford Higher Education, 2021.*
4. *R. Chudley, Construction Technology, Longman Publishing Group, 5th edition, 2011.*
5. *S. K. Duggal, Building Materials, Oxford & IBH Publishing Co. Ltd., New Delhi, 2022.*

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(23CE0155) ENVIRONMENTAL IMPACT ASSESSMENT
(Open Elective - III)

COURSE OBJECTIVES:

The objectives of this course

1. *Understand the principles, methodologies, and significance of Environmental Impact Assessment (EIA).*
2. *Analyze the impact of developmental activities on land use, soil, and water resources.*
3. *Evaluate the impact of development on vegetation, wildlife, and assess environmental risks.*
4. *Develop environmental audit procedures and assess compliance with environmental regulations.*
5. *Understand and apply environmental acts, notifications, and legal frameworks in EIA studies.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Evaluate different EIA methods and use cost/benefit analysis to help in project decision-making.*
2. *Identify the impacts of developmental activities on land, water, air, and biological environment, and suggest suitable mitigation measures.*
3. *Understand the impacts of developmental activities and deforestation on vegetation and wildlife.*
4. *Apply the principles of environmental risk assessment to identify potential risks and suggest appropriate mitigation strategies.*
5. *Apply environmental audit procedures and analyse audit data to prepare a report in accordance with environmental regulations.*
6. *Analyze environmental rules, EIA steps, and ISO 14000 to understand how they help in pollution control and reporting.*

UNIT – I

Concepts and Methodologies of EIA: Initial Environmental Examination, Elements of EIA, - Factors Affecting EIA, Impact Evaluation and Analysis, Preparation of Environmental Base Map, Classification of Environmental Parameters - Criteria for the Selection of EIA Methodology, EIA Methods, Ad-Hoc Methods, Matrix Methods, Network Method Environmental Media Quality Index Method, Overlay Methods and Cost/Benefit Analysis.

UNIT – II

Impact of Developmental Activities and Land Use: Introduction and Methodology for The Assessment of Soil and Ground Water, Delineation of Study Area, Identification of Activities. Procurement of Relevant Soil Quality, Impact Prediction, Assessment of Impact Significance, Identification and Incorporation of Mitigation Measures

EIA in Surface Water, Air and Biological Environment: Methodology for the Assessment of Impacts on Surface Water Environment, Air Pollution Sources, Generalized Approach for Assessment of Air Pollution Impact.

UNIT – III

Assessment of Impact on Vegetation, Wildlife and Risk Assessment: Introduction - Assessment of Impact of Development Activities on Vegetation and Wildlife, Environmental Impact of Deforestation – Causes and Effects of Deforestation - Risk Assessment and Treatment of Uncertainty - Key Stages in Performing Environmental Risk Assessment-Advantages of Environmental Risk Assessment.

UNIT – IV

Environmental Audit: Introduction - Environmental Audit & Environmental Legislation Objectives of Environmental Audit, Types of Environmental Audit, Audit Protocol, Stages of Environmental Audit, Onsite Activities, Evaluation of Audit Data and Preparation of Audit Report

UNIT – V

Environmental Acts and Notifications: The Environmental Protection Act, The Water Preservation Act, The Air (Prevention & Control of Pollution Act), Wild Life Act - Provisions in The EIA Notification, Procedure for Environmental Clearance, Procedure for Conducting Environmental Impact Assessment Report- Evaluation of EIA Report. Environmental Legislation Objectives, Evaluation of Audit Data and Preparation of Audit Report, Post Audit Activities, Concept of ISO and ISO 14000

TEXT BOOKS:

1. *Y. Anjaneyulu, Environmental Impact Assessment Methodologies, B.S.Publications, Hyderabad, 3rd edition, 2021*
2. *N.S. Raman, A.R.Gajbhiye, S.R.Khandeshwar, Environmental Impact Assessment, TechSar Pvt. Ltd., 2nd edition, 2014.*

REFERENCES:

1. K. Suresh Dhaneja, Environmental Science and Engineering, S.K., Katania & Sons Publication, New Delhi 2011.
2. V.S. Kulkarni, S.N. Kaul & R.K. Trivedy, A Handbook of Environment Impact Assessment, Scientific Publishers 2024.
3. H. S. Peavy, Rowe, D. R, Tchobanoglous,G, Environmental Engineering, McGraw Hill International Editions, New York, 7th edition, 2017.

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(23EE0263) SMART GRID TECHNOLOGIES

(Open Elective - III)

COURSE OBJECTIVES:

The objectives of this course

1. *To understand concept of smart grid and its advantages over conventional grid*
2. *To know smart metering techniques*
3. *To learn wide area measurement techniques*
4. *To understand the problems associated with integration of distributed generation & its solution through smart grid.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understanding the Concept and Evolution of Smart Grids.*
2. *Analyzing Wide Area Monitoring System.*
3. *Analyzing Of Synchrophasor Technology.*
4. *Applying Smart Metering and Advanced Metering Infrastructure (AMI) Concepts.*
5. *Evaluating Information and Communication Technology (ICT) Systems in Smart Grids.*
6. *Designing Smart Grid Applications and Cyber security Measures.*

UNIT-I

Introduction to Smart Grid : Evolution of Electric Grid – Need for Smart Grid – Difference between conventional & smart grid – Overview of enabling technologies – International experience in Smart Grid deployment efforts – Smart Grid road map for India – Smart Grid Architecture.

UNIT-II

Wide Area Monitoring System: Fundamentals of Synchro phasor Technology – concept and benefits of Wide Area Monitoring System – Structure and functions of Phasor Measuring Unit (PMU) and Phasor Data Concentrator (PDC) – Road Map for Synchro phasor applications (NAPSI) – Operational experience and Blackout analysis using PMU - Case study on PMU.

UNIT-III

Smart Meters: Features and functions of Smart Meters – Functional specification – category of Smart Meters – Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) drivers and benefits – AMI protocol – Demand Side Integration: Peak load, Outage and Power Quality management.

UNIT-IV

Information and Communication Technology: Overview of Smart Grid Communication system – Modulation and Demodulation Techniques: Radio Communication – Mobile Communication – Power Line Communication – Optical Fibre Communication – Communication Protocol for Smart Grid.

UNIT-V

Smart Grid Applications and Cyber Security: Applications : Overview and concept of Renewable Integration – Introduction to distributed generation - Role of Protective Relaying in Smart Grid – House Area Network – Advanced Energy Storage Technology: Flow battery – Fuel cell – SMES – Super capacitors – Plug – in Hybrid electric Vehicles - Cyber Security: Security issues in DG, Distribution Automation, AMI, Electric Vehicle Management Systems – Approach to assessment of smart grid cyber security risks – Methodologies. Cyber Security requirements – Smart Grid Information Model.

TEXT BOOKS:

1. *James Momoh, "SMART GRID : Fundamentals of Design and Analysis", John Wiley and Sons, New York, 2012.*
2. *Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", John Wiley & Sons, New Jersey, 2012.*

REFERENCES:

1. *Power Grid Corporation of India Limited, "Smart Grid Primer", 1st Edition, Power Grid Corporation of India Limited, Bangalore, India, 2013.*
2. *Fereidoon.P.Sioshansi, "Smart Grid – Integrating Renewable, Distributed and Efficient Energy", 1st Edition, Academic Press, USA, 2011.*
3. *Stuart Borlase, "Smart Grids: Infrastructure, Technology and Solutions", 1st Edition, CRC Press Publication, England, 2013.*
4. *Phadke A G, Thorp J S, "Synchronized Phasor Measurements and Their Applications", 1st Edition, Springer, Newyork, 2012.*

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(23ME0357) 3D PRINTING TECHNOLOGIES
(Open Elective - III)

COURSE OBJECTIVES:

The objectives of this course

1. *Familiarize techniques for processing of CAD models for rapid prototyping.*
2. *Explain fundamentals of rapid prototyping techniques.*
3. *Demonstrate appropriate tooling for rapid prototyping process.*
4. *Focus Rapid prototyping techniques for reverse engineering.*
5. *Train Various Pre – Processing, Processing and Post Processing errors in RP Processes.*
6. *Understand the software used STL file handling, post-processing steps, and real-world application challenges in 3D printing systems*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Use techniques for processing of CAD models for rapid prototyping.*
2. *Understand and apply fundamentals of rapid prototyping techniques.*
3. *Use appropriate tooling for rapid prototyping process.*
4. *Use rapid prototyping techniques for reverse engineering.*
5. *Identify Various Pre – Processing, Processing and Post Processing errors in RP processes.*
6. *Demonstrate STL file issues and evaluate the importance of various 3D printing software tools*

UNIT-I

Introduction to 3D Printing: Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

UNIT-II

Solid and Liquid Based RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Fusion Deposition Modelling (FDM), Laminated Object Manufacturing (LOM), Stereo lithography (SLA), Direct Light Projection System (DLP) and Solid Ground Curing (SGC).

UNIT-III

Powder Based & Other RP Systems: Powder Based RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Selective Laser Sintering (SLS), Direct Metal Laser Sintering (DMLS), Laser Engineered Net Shaping (LENS) and Electron Beam Melting (EBM).

Other RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Three

Dimensional Printing (3DP), Ballastic Particle Manufacturing (BPM) and Shape Deposition Manufacturing (SDM).

UNIT-IV

Rapid Tooling & Reverse Engineering:

Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.

Reverse Engineering (RE): Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development

UNIT-V

Errors in 3D Printing and Applications: Pre-processing, processing and post-processing errors, Part building errors in SLA, SLS, etc. Software: Need for software, MIMICS, Magics, SurgiGuide, 3-matic, 3D-Doctor, Simplant, Velocity2, VoXim, Solid View, 3DView, etc., software, Preparation of CAD models, Problems with STL files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP. Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

TEXT BOOKS:

1. *Chee Kai Chua and Kah Fai Leong, ―3D Printing and Additive Manufacturing Principles and Applications‖ 5/e, World Scientific Publications, 2017.*
2. *Ian Gibson, David W Rosen, Brent Stucker, ―Additive Manufacturing Technologies: 3D*
3. *Printing, Rapid Prototyping, and Direct Digital Manufacturing‖, Springer, 2/e, 2010.*

REFERENCES:

1. *Frank W.Liou, ―Rapid Prototyping & Engineering Applications‖, CRC Press, Taylor & Francis Group, 2011.*
2. *Rafiq Noorani, ―Rapid Prototyping: Principles and Applications in Manufacturing‖, John Wiley&Sons, 2006.*

ONLINE LEARNING RESOURCES:

1. *NPTEL Course on Rapid Manufacturing.*
2. *https://nptel.ac.in/courses/112/104/112104265/*
3. *https://www.centropiaggio.unipi.it/sites/default/files/course/material/2013-11-29%20-*
4. *%20FDM.pdf*
5. *https://lecturenotes.in/subject/197*
6. *https://www.cet.edu.in/noticefiles/258_Lecture%20Notes%20on%20RP- ilovepdfcompressed.pdf*
7. *https://www.vssut.ac.in/lecture_notes/lecture1517967201.pdf*
8. *https://www.youtube.com/watch?v=NkC8TNts4B4*

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(23CS0512) DATA BASE MANAGEMENT SYSTEMS
(Open Elective - III)

COURSE OBJECTIVES:

The objectives of this course

1. *Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra*
2. *Introduce the concepts of basic SQL as a universal Database language*
3. *Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization*
4. *Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understand the basic concepts of database management systems*
2. *Analyze a given database application scenario to use ER model for conceptual design of the database*
3. *Develop relational algebra expressions to query and optimize the database using SQL*
4. *Utilize SQL proficiently to address diverse query challenges*
5. *Employ normalization methods to enhance database structure*
6. *Assess and implement transaction processing, concurrency control and database*
7. *recovery protocols in databases.*

UNIT-I

Introduction to Databases: Database System Applications and Purpose, View of Data: Data Abstraction and Data Independence, Database Users and Administrators, DBMS Architecture and Data Models, ER Model: Entities, Attributes, Relationships, ER Diagrams, Reduction of ER Model to Tables

UNIT-II

Relational Model and Algebra: Structure of Relational Databases, Relational Model Concepts and Integrity Constraints, Relational Algebra: Selection, Projection, Set Operations, Joins, Tuple Relational Calculus, Introduction to SQL: DDL, DML, DCL, Advanced SQL: Sub queries, Joins, Views, Indexes

UNIT-III

Database Design and Normalization: Schema Design and Logical Database Design, Functional Dependencies, Normal Forms: 1NF, 2NF, 3NF, BCNF, Decomposition and Lossless Join, Dependency Preservation, Multi-Valued and Join Dependencies.

UNIT-IV

Transaction Management and Concurrency Control: Concept of a Transaction, ACID Properties, Serializability and Schedules, Concurrency Control: Lock-Based, Timestamp-Based Protocols, Deadlock Handling, Recovery Techniques: Log- Based, Shadow Paging

UNIT-V

Advanced Topics and NoSQL Databases: Distributed Databases and Parallel Databases, Introduction to NoSQL: Types – Document, Columnar, Key-Value, Graph, CAP Theorem, MongoDB: Basics and CRUD Operations, Big Data and New SQL Overview, Case Studies on Real-World Databases

TEXT BOOKS:

1. *Abraham Silberschatz, Henry F. Korth, S. Sudarshan – Database System Concepts, 7th Edition, McGraw Hill*
2. *Ramez Elmasri, Shamkant B. Navathe – Fundamentals of Database Systems, 7th Edition, Pearson Education*

REFERENCES:

1. *C.J. Date – An Introduction to Database Systems, 8th Edition, Addison-Wesley*
2. *Raghu Ramakrishnan, Johannes Gehrke – Database Management Systems, 3rd Edition, McGraw Hill*
3. *Pramod J. Sadalage & Martin Fowler – NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pearson*

ONLINE RESOURCES & COURSES:

1. *NPTEL – Database Management Systems by IIT Madras*
2. *Coursera – Databases by Stanford University*
3. *Khan Academy – Intro to SQL*
4. *MongoDB University – Free Courses on NoSQL Databases*
5. *W3Schools SQL Tutorial*
6. *GeeksforGeeks – DBMS Concepts and Practice Problems*

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(23CS0536) CYBER SECURITY
(Open Elective - III)

COURSE OBJECTIVES:

The objectives of this course

1. *To introduce the concept of cybercrime and its impact on information security, and provide an overview of cybercriminal behavior and various classifications of cybercrimes.*
2. *To explore the methodologies used by cybercriminals to plan and execute attacks, including techniques like social engineering, botnets, and cloud-related threats.*
3. *To understand the security risks associated with mobile and wireless devices, and examine countermeasures for securing mobile computing in organizational environments.*
4. *To familiarize students with the tools and techniques used in committing cybercrimes, such as phishing, malware, DoS/DDoS attacks, and code-based exploits.*
5. *To analyze the implications of cybercrime for organizations, including the cost of cyber attacks, intellectual property issues, and challenges posed by social computing and web-based threats.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understand the fundamentals of cybercrime and information security, and explain the legal and global perspectives, especially with reference to Indian IT Act 2000.*
2. *Analyze how cybercriminals plan and execute cyber offenses using techniques like social engineering, cyber stalking, and botnets, including threats posed by cloud computing.*
3. *Evaluate the security challenges of mobile and wireless devices and formulate measures to secure mobile environments within an organization.*
4. *Analyze Security Implications for Organizations.*
5. *Identify and explain various cyber attack tools and methods such as phishing, key loggers, Trojans, and SQL injection used in committing cybercrimes.*
6. *Assess the organizational implications of cybercrimes, including IPR issues, social media risks, and formulate strategies to mitigate security and privacy challenges*

UNIT-I

Introduction to Cybercrime: Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

UNIT II

Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing

UNIT-III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones,

Mobile Devices:

Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

UNIT-IV

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT-V

Cyber Security: Organizational Implications: Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

TEXT BOOKS:

1. *Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.*

REFERENCES:

1. *Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.*
2. *Introduction to Cyber Security, Chwan-Hwa(john) Wu,J.DavidIrwin.CRC Press T&F Group*

ONLINE LEARNING RESOURCES:

1. *http://nptel.ac.in/courses/106105031/40*
2. *http://nptel.ac.in/courses/106105031/39 2.*
3. *http://nptel.ac.in/courses/106105031/38*

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(23HS0856) WAVELET TRANSFORMS AND ITS APPLICATIONS
(Open Elective -III)
(Common to All Branches)

COURSE OBJECTIVES:
The objectives of this course

1. *To understand the wavelet transform as an alternative approach to Fourier Transform*
2. *To understand Multi Resolution Analysis and Wavelet concepts*
3. *To study the wavelet transform in both continuous and discrete domain*
4. *To understand the design of wavelets using Lifting scheme*
5. *To understand the applications of Wavelet transform*

COURSE OUTCOMES (COs):
On successful completion of this course, the students should be able to

1. *Understand wavelets and wavelet basis and characterize continuous and discrete wavelet transforms*
2. *Illustrate the multi resolution analysis ad scaling functions*
3. *Implement discrete wavelet transforms with multirate digital filters*
4. *Improve problem solving skills using discrete wavelet transform and filter banks.*
5. *Understand multi resolution analysis and identify various wavelets and evaluate their time – frequency resolution properties.*
6. *Design certain classes of wavelets to specification and justify the basis of the application of wavelet transforms to different fields.*

UNIT-I
Wavelets
Wavelets and Wavelet Expansion Systems - Wavelet Expansion- Wavelet Transform- Wavelet System- More Specific Characteristics of Wavelet Systems -Haar Scaling Functions and Wavelets - effectiveness of Wavelet Analysis -The Discrete Wavelet Transform- The Discrete-Time and Continuous Wavelet Transforms.

UNIT-II
A Multi resolution Formulation of Wavelet Systems
Signal Spaces -The Scaling Function –Multi resolution Analysis - The Wavelet Functions - The Discrete Wavelet Transform- A Parseval's Theorem - Display of the Discrete Wavelet Transform and the Wavelet Expansion.

UNIT-III
Filter Banks and the Discrete Wavelet Transform
Analysis - From Fine Scale to Coarse Scale- Filtering and Down-Sampling or Decimating -Synthesis - From Coarse Scale to Fine Scale -Filtering and Up-Sampling or Stretching - Input Coefficients - Lattices and Lifting - -Different Points of View.

UNIT-IV

Time-Frequency and Complexity

Multi resolution versus Time-Frequency Analysis- Periodic versus Non periodic Discrete Wavelet Transforms -The Discrete Wavelet Transform versus the Discrete-Time Wavelet Transform- Numerical Complexity of the Discrete Wavelet Transform.

UNIT-V

Bases and Matrix Examples

Bases, Orthogonal Bases, and Biorthogonal Bases -Matrix Examples - Fourier Series Example - Sine Expansion Example - Frames and Tight Frames - Matrix Examples -Sine Expansion as a Tight Frame Example.

TEXT BOOKS:

1. *C. Sidney Burrus, Ramesh A. Gopinath, ―Introduction to Wavelets and Wavelets Transforms‖, Prentice Hall, (1997).*
2. James S. Walker, ―A Primer on Wavelets and their Scientific Applications‖, CRC Press, (1999).

REFERENCES:

1. *Raghuveer Rao, ―Wavelet Transforms‖, Pearson Education, Asia*
2. *C. S. Burrus, Ramose and A. Gopinath, Introduction to Wavelets and Wavelet Transform, Prentice Hall Inc.*

WEB REFERENCES:

1. *http://users.rowan.edu/~polikar/WAVELETS/WTtutorial.html*
2. *http://www.wavelet.org/*
3. *http://www.math.hawaii.edu/~dave/Web/Amara's%20Wavelet%20Page.htm*
4. *https://jqichina.wordpress.com/wp-content/uploads/2012/02/ten-lectures-of-waveletsefbc88e5b08fe6b3a2e58d81e8aeb2efbc891.pdf*

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(23HS0844) SMART MATERIALS AND DEVICES
(Open Elective-III)
(Common to all branches of Engineering)

COURSE OBJECTIVES:

The objectives of this course

1. *To provide exposure to smart materials and their engineering applications.*
2. *To impart knowledge on the basics and phenomenon behind the working of smart materials*
3. *To explain the properties exhibited by smart materials*
4. *To educate various techniques used to synthesize and characterize smart materials*
5. *To identify the required smart material for distinct applications/devices*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Identify key discoveries that led to modern applications of shape memory materials, describe the two phases in shape memory alloys.*
2. *Describe how different external stimuli (light, electricity, heat, stress, and magnetism) influence smart material properties.*
3. *Summarize various types of synthesis of smart materials*
4. *Analyze the suitable method for synthesis of smart materials*
5. *Analyze various characterization techniques used for smart materials*
6. *Interpret the importance of smart materials in various devices*

UNIT-I
Introduction to Smart Materials

Historical account of the discovery and development of smart materials, Shape memory materials, chromoactive materials, magnetorheological materials, photoactive materials, Polymers and polymer composites (Basics).

UNIT-II
Properties of Smart Materials

Optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials.

UNIT-III
Synthesis of Smart Materials

Chemical route: Chemical vapour deposition, Sol-gel technique, Hydrothermal method, Mechanical alloying and Thin film deposition techniques: Sputtering and Spray pyrolysis.

UNIT-IV
Characterization Techniques

Powder X-ray diffraction, Raman spectroscopy (RS), UV-Visible spectroscopy, Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Atomic force microscopy (AFM).

UNIT- V

Smart Materials based Devices

Devices based on smart materials: Shape memory alloys in robotic hands, piezoelectric based devices, MEMS and intelligent devices.

TEXT BOOKS:

1. *YaserDahman, Nanotechnology and Functional Materials for Engineers-, Elsevier, 2017.*
2. *E. Zschech,C. Whelan, T. Mikolajick, Materials for Information Technology: Devices, Interconnects and Packaging Springer-Verlag London Limited 2005.*

REFERENCES:

1. *Gauenzi,P., Smart Structures, Wiley, 2009.*
2. *Mahmood Aliofkhazraei, Handbook of functional nanomaterials, Vol (1&2), Nova Publishers, 2014.*
3. *Handbook of Smart Materials, Technologies, and Devices: Applications of Industry,4.0,Chaudhery Mustansar Hussain, Paolo Di Sia, Springer,2022.*
4. *Fundamentals of Smart Materials, Mohsen Shahinpoor, Royal Society of Chemistry, 2020.*

NPTEL course link: https://onlinecourses.nptel.ac.in/noc22_me17/preview

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(23HS0846) INTRODUCTION TO QUANTUM MECHANICS
(Open Elective - III)
(Common to all branches of Engineering)

COURSE OBJECTIVES:

The objectives of this course

1. *To understand the fundamental differences between classical and quantum mechanics..*
2. *To study wave-particle duality, uncertainty principle, and their implications.*
3. *To learn and apply Schrödinger equations to basic quantum systems.*
4. *To use operator formalism and mathematical tools in quantum mechanics.*
5. *To explore angular momentum, spin and their quantum mechanical representations.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Explain the key principles of quantum mechanics and wave-particle duality.*
2. *Apply Schrödinger equations to solve one-dimensional quantum problems*
3. *Analyze various types of operators.*
4. *Solve quantum mechanical problems using operator and matrix methods*
5. *Evaluate quantum states using Dirac notation and expectation values.*
6. *Analyze angular momentum and spin systems using Pauli matrices and operators.*

UNIT- I

PRINCIPLES OF QUANTUM MECHANICS

Introduction: Limitations of classical Mechanics, black body radiation and origin of quantum theory of radiation.Wave-particle duality: de Broglie Hyphothesis, Heisenberg uncertainty principle. Postulates of quantum mechanics, Physical significance of wave function (ψ), Orthogonal, Normalized and Orthonormal functions. Schrödinger time independent and time dependent wave equation, Solution of the time dependent Schrödinger equation, Concept of stationary states.

UNIT- II

ONE DIMENSIONAL PROBLEMS AND SOLUTIONS

Potential step – Reflection and Transmission at the interface. Potential well: Square well potential with rigid walls, Square well potential with finite walls. Potential barrier and Periodic potential and Harmonic oscillator- Energy eigen functions and eigen values.

UNIT-III

OPERATOR FORMALISM

Operators, Operator Algebra, Eigen values and Eigen vectors, Matrix representation of wave functions and linear operators.

UNIT- IV

MATHEMATICAL TOOLS FOR QUANTUM MECHANICS

The concept of row and column matrices, Matrix algebra,Hermitian operators – definition. Dirac's bra and ket notation, Expectation values, Heisenberg (operator) representation of harmonic oscillator, Ladder operators and their significance.

UNIT- V

ANGULAR MOMENTUM AND SPIN

Angular momentum operators: Definition. Eigen functions and Eigen values of AM operators. Matrix representation of angular momentum operators, System with spin half(1/2), Spin angular momentum, Pauli's spin matrices. Clebsch-Gordon coefficients. Rigid Rotator: Eigen functions and Eigen values.

TEXT BOOKS:

1. *Quantum Mechanics. Vol 1, A. MessaiaNoth-Holland Pub. Co., Amsterdam,(1961).*
2. *A Text Book of Quantum Mechanics. P.M.Mathews and K.Venkatesam, Tata McGraw Hill, New Delhi,(1976).*
3. *Introduction to Quantum Mechanics. R.H.Dicke and J.P.Witke, Addison-Wisley Pub.Co.Inc.,London, (1960).*
4. *Quantum Mechanics. S.L.Gupta, V.Kumar, H.V.Sarama and R.C.Sharma, Jai PrakashNath& Co, Meerut, (1996).*

REFERENCES:

1. *Quantum Mechanics. L.I. Schiff, McGraw Hill Book Co., Tokyo, (1968).*
2. *Introduction to Quantum Mechanics. Richard L. Liboff, Pearson Education Ltd (Fourth Edn.) 2003.*

NPTEL courses link :

1. *https://archive.nptel.ac.in/courses/115/101/115101107/*
2. *https://archive.nptel.ac.in/courses/122/106/122106034/*
3. *https://nptel.ac.in/courses/115106066*

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(23HS0808) GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT
(Open Elective - III)

COURSE OBJECTIVES:

The objectives of this course

1. *To understand principle and concepts of green chemistry.*
2. *To understand the types of catalysis and industrial applications.*
3. *To apply green solvents in chemical synthesis.*
4. *To enumerate different sourced of green energy.*
5. *To apply alternative greener methods foe chemical reactions*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understand the basic concept and principle of green chemistry. [L2]*
2. *Analyze the concept of green chemistry in the catalytic industry. [L4]*
3. *Understand the importance of green synthesis. [L2]*
4. *Evaluate various recycling methods for green solvents to promote eco-friendly and cost-effective chemical processes.*
5. *Analyze the emerging green technologies in green chemistry. [L4]*
6. *Apply alternative green methods for green chemistry. [L3]*

UNIT – I
PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY

Introduction, Green chemistry Principles, sustainable development and green chemistry, E factor, atom economy, atom economic Reactions: Rearrangement and addition reactions and atom un- economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling

UNIT – II
CATALYSIS AND GREEN CHEMISTRY

Introduction, Types of catalysis, Heterogeneous catalysis: Basics of Heterogeneous Catalysis, Zeolite and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal Catalysts with Phosphine Ligands, Greener Lewis Acids, and Phase transfer catalysis, Bio- catalysis and Photo-catalysis with examples.

UNIT – III
GREEN SOLVENTS IN CHEMICAL SYNTHESIS

Green Solvents: Concept, Tools and techniques for solvent selection, supercritical fluids: Super critical carbon dioxide, super critical water, Polyethylene glycol (PEG), Ionic liquids, Recycling of green solvents.

UNIT – IV
EMERGING GREENER TECHNOLOGIES

Biomass as renewable resource, Energy: Energy from Biomass, Solar Power, Chemicals from Renewable Feedstock's, Chemicals from Fatty Acids, Polymers from Renewable Resources, Alternative Economies: The Syngas Economy, The Biorefinery, Design for energy efficiency, Mechanochemical synthesis.

UNIT – IV
ALTERNATIVE GREENER METHODS

Photochemical Reactions - Examples, Advantages and Challenges, Photoredox catalysis, single electron transfer reactions (SET), Examples of Photochemical Reactions, Microwave-assisted Reactions and Sonochemical reactions, examples and applications.

TEXT BOOKS:

1. *M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, 2002.*
2. *Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition, Oxford University Press, USA*

REFERENCES:

1. *Green Chemistry for Environmental Sustainability, First Edition, Sanjay K. Sharma and AckmezMudhoo, CRC Press, 2010.*
2. *Edited by AlvisePerosa and Maurizio Selva , Hand Book of Green chemistry Volume 8:*
3. *Green Nanoscience, wiley-VCH, 2013.*

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(23HS0824) EMPLOYABILITY SKILLS
(Open Elective - III)

COURSE OBJECTIVES:

The objectives of this course

1. *To encourage all round development of the students by focusing on productive skills*
2. *To make the students aware of Goal setting and writing skills*
3. *To enable them to know the importance of presentation skills in achieving desired goals.*
4. *To help them develop organizational skills through group activities*
5. *To function effectively with heterogeneous teams*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understand the importance of goals and try to achieve them.*
2. *Explain the significance of self-management.*
3. *Apply the knowledge of writing skills in preparing eye-catchy resumes.*
4. *Analyse various forms of Presentation skills.*
5. *Judge the group behaviour appropriately.*
6. *Develop skills required for employability.*

UNIT-I

Goal Setting and Self-Management: Definition, importance, types of Goal Setting – SMART Goal Setting – Advantages-Motivation – Intrinsic and Extrinsic Motivation – Self-Management - Knowing about self – SWOC Analysis.

UNIT-II

Writing Skills: Definition, significance, types of writing skills – Resume writing Vs CV Writing -E-Mail writing, Cover Letters - E-Mail Etiquette -SoP (Statement of Purpose).

UNIT-III

Technical Presentation Skills: Nature, meaning & significance of Presentation Skills – Planning, Preparation, Presentation, Stage Dynamics –Anxiety in Public speaking (Glossophobia)- PPT & Poster Presentation.

UNIT-IV

Group Presentation Skills: Body Language – Group Behaviour - Team Dynamics – Leadership Skills – Personality Manifestation- Group Discussion-Debate –Corporate Etiquette.

UNIT-V

Job Cracking Skills: Nature, characteristics, importance & types of Interviews – Job Interviews – Skills for success – Job searching skills - STAR method - FAQs- Answering Strategies – Mock Interviews.

TEXT BOOKS:

1. *Sabina Pillai, Agna Fernandez. Soft Skills & Employability Skills,2014.Cambridge Publisher.*
2. *Alka Wadkar. Life Skills for Success, Sage Publications, 2016.*

REFERENCES:

1. *Gangadhar Joshi. Campus to Corporate Paperback , Sage Publications. 2015*
2. *Sherfield Montogomery Moody, Cornerstone Developing Soft Skills, Pearson Publications. 4 Ed. 2008*
3. *Shikha Kapoor. Personality Development and Soft Skills - Preparing for Tomorrow .1 Edition, Wiley, 2017.*
4. *M. Sen Gupta, Skills for Employability, Innovative Publication, 2019.*
5. *Steve Duck and David T McMahan, The Basics f Communication Skills A Relational Perspective, Sage press, 2012.*

ONLINE LEARNING RESOURCES:

1. *https://youtu.be/gkLsn4ddmTs*
2. *https://youtu.be/2bf9K2rRWwo*
3. *https://youtu.be/FchfE3c2jzc*
4. *https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ*
5. *https://www.youtube.com/c/skillopedia/videos*
6. *https://onlinecourses.nptel.ac.in/noc25_hs96/preview*
7. *https://onlinecourses.nptel.ac.in/noc21_hs76/preview*
8. *https://archive.nptel.ac.in/courses/109/107/109107172/#*
9. *https://archive.nptel.ac.in/courses/109/104/109104107/*

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(23CE0156) GEO-SPATIAL TECHNOLOGIES
(Open Elective - IV)

COURSE OBJECTIVES:

The objectives of this course is to

1. *Understand raster-based spatial analysis techniques, including query, overlay, and cost-distance analysis.*
2. *Analyse vector-based spatial analysis techniques such as topology, overlay, and proximity analysis.*
3. *Apply network analysis techniques for geocoding, shortest path analysis, and location-allocation problems.*
4. *Evaluate surface and geostatistical analysis methods, including terrain modelling, watershed analysis, and spatial interpolation.*
5. *Assess GIS customization, Web GIS, and mobile mapping techniques for real world applications.*

COURSE OUTCOMES (COs)

On successful completion of the course, students will be able to

1. *Apply raster-based spatial operations such as map algebra, reclassification, and cost-distance analysis to solve basic spatial problems.*
2. *Find and explain spatial relationships in vector data using overlay and buffer tools.*
3. *Construct and evaluate network models to determine optimal paths, service areas, and facility locations using time and distance constraints.*
4. *Work with network data to find shortest routes, service areas, and best locations for facilities.*
5. *Understand and explain terrain features and data patterns using elevation and interpolation methods*
6. *Assess the role of customization, Web GIS, and location-based services in developing efficient and user-specific GIS applications using scripting and big data tools.*

UNIT – I

Raster Analysis: Raster Data Exploration - Query Analysis - Local Operations - Map Algebra, Reclassification, Logical and Arithmetic Overlay Operations - Neighbourhood - Operations - Aggregation, Filtering - Extended Neighbourhood - Operations - Zonal Operations - Statistical Analysis - Cost-Distance Analysis - Least Cost Path.

UNIT – II

Vector Analysis: Non-Topological Analysis - Attribute Database Query, Structured Query Language, Co-Ordinate Transformation, Summary Statistics, Calculation of Area, Perimeter and Distance - Topological Analysis - Reclassification, Aggregation, Overlay Analysis: Point-In-Polygon, Line-In-Polygon, Polygon-On-Polygon - Clip, Erase, Identity, Union, Intersection - Proximity Analysis - Buffering

UNIT – III

Network Analysis: Network - Introduction - Network Data Model - Elements of Network - Building A Network Database - Geocoding - Address Matching - Shortest Path in A Network - Time and Distance Based Shortest Path Analysis - Driving Directions - Closest Facility Analysis - Catchment / Service Area Analysis – Location - Allocation Analysis

UNIT – IV

Surface and Geostatistical Analysis: Surface Data - Sources of X, Y, Z Data - DEM, TIN - Terrain Analysis - Slope, Aspect, Viewshed, Watershed Analysis: Watershed Boundary, Flow Direction, Flow Accumulation, Drainage Network, Spatial Interpolation: IDW, Spline, Kriging, Variogram

UNIT – V

Customisation, Web GIS, Mobile Mapping: Customisation of GIS: Need, Uses, Scripting Languages - Embedded Scripts - Use of Python Script - Web GIS: Web GIS Architecture, Advantages of Web GIS, Web Applications - Location Based Services: Emergency and Business Solutions - Big Data Analytics.

TEXT BOOKS:

1. *Kang – Tsung Chang, Introduction to Geographical Information System, Tata McGraw Hill, 9th edition, 2019.*
2. *Lo, C.P. and Yeung, Albert K.W., Concepts and Techniques of Geographic Information Systems, Prentice Hall, 3rd edition, 2007.*

REFERENCES:

1. *Michael N. Demers, Fundamentals of Geographic Information Systems, John Wiley & sons publishers, 4th edition, 2009*
2. *Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasaraju, An Introduction to Geographical Information Systems, Pearson Education, 4th edition, 2012*
3. *John Peter Wilson, The Handbook of Geographic Information Science, Blackwell Publishing Ltd, 1st edition, 2008.*

ONLINE LEARNING RESOURCES:

https:/onlinecourses.nptel.ac.in/noc19_cs76/preview
https://archive.nptel.ac.in/courses/105/105/105105202/

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(23CE0157) SOLID WASTE MANAGEMENT
(Open Elective - IV)

COURSE OBJECTIVES

The objectives of this course is

1. *Understand the types, sources, and characteristics of solid waste, along with regulatory frameworks.*
2. *Analyse engineering systems for solid waste collection, storage, and transportation.*
3. *Apply resource and energy recovery techniques for sustainable solid waste management.*
4. *Evaluate landfill design, construction, and environmental impact mitigation strategies*
5. *Assess hazardous waste management techniques, including biomedical and e-waste disposal.*

COURSE OUTCOMES

On successful completion of this course, students will be able to

1. *Categorize and can perform sampling of solid waste*
2. *Plan for solid waste management for collection, storage and processing*
3. *Device system for biological conversion of solid waste into useful end products.*
4. *Device system for thermal conversion of solid waste into useful end products.*
5. *Design system for landfilling of solid waste*
6. *Effectively plan for various categories of solid waste such as biomedical waste, E-waste, nuclear waste, industrial waste management*

UNIT – I

Solid Waste: Definitions - Types of Solid Wastes - Sources of Solid Wastes - Characteristics and Perspectives - Properties of Solid Wastes - Sampling of Solid Wastes - Elements of Solid Waste Management - Integrated Solid Waste Management - Solid Waste Management Rules 2016.

UNIT – II

Engineering Systems for Solid Waste Management: Solid Waste Generation - On-Site Handling - Storage and Processing - Collection of Solid Wastes - Stationary Container System and Hauled Container Systems - Route Planning - Transfer and Transport - Processing Techniques

UNIT – III

Engineering Systems for Resource and Energy Recovery: Processing Techniques - Materials Recovery Systems - Recovery of Biological Conversion Products - Composting - Pre and Post Processing - Types of Composting - Critical Parameters - Problems with Composing - Recovery of Thermal Conversion Products - Pyrolysis - Gasification - RDF - Recovery of Energy From Conversion Products - Materials and Energy Recovery Systems

UNIT – IV

Landfills: Evolution of Landfills - Types and Construction of Landfills - Design Considerations - Life of Landfills - Landfill Problems - Lining of Landfills - Types of Liners - Leachate Pollution and Control - Monitoring Landfills - Landfills Reclamation

UNIT – V

Hazardous Waste Management: Sources and Characteristics - Effects on Environment - Risk Assessment - Disposal of Hazardous Wastes - Secured Landfills - Incineration - Monitoring - Biomedical Waste Disposal - E-Waste Management - Nuclear Wastes - Industrial Waste Management

TEXT BOOKS:

1. *Tchobanoglous G, Theisen H and Vigil SA, Integrated Solid Waste Management, Engineering Principles and Management Issues, McGraw-Hill, 2014.*
2. *Vesilind PA, Worrell W and Reinhart D, Solid Waste Engineering, Brooks/Cole Thomson Learning Inc., 2002.*

REFRENCES:

1. *Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, Environmental Engineering, McGraw Hill Inc., New York, 1985.*
2. *Qian X, Koerner RM and Gray DH, Geotechnical Aspects of Landfill Design and Construction, Prentice Hall, 2002.*

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(23EE0264) ELECTRIC VEHICLES
(Open Elective-III)

COURSE OBJECTIVES:

The objectives of this course

1. *Remember and understand the differences between conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs.*
2. *Analyze various EV configurations, parameters of EV systems and Electric vehicle dynamics.*
3. *Analyze the basic construction, operation and characteristics of fuel cells and battery charging techniques in HEV systems.*
4. *Design and analyze the various control structures for Electric vehicle.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *To understand and differentiate between Conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs.*
2. *Understand Various dynamics of Electric Vehicles*
3. *To remember and understand various configurations in parameters of EV system and dynamic aspects of EV*
4. *To analyze fuel cell technologies in EV and HEV systems*
5. *To analyze the battery charging and controls required of EVs*
6. *Classify different energy management strategies.*

UNIT-I

Introduction to EV Systems and Energy Sources: Past, Present and Future of EV - EV Concept- EV Technology- State-of-the Art of EVs- EV configuration- EV system- Fixed and Variable gearing- Single and multiple motor drive- In- wheel drives- EV parameters: Weight, size, force and energy, performance parameters. Electro mobility and the environment- History of Electric power trains- Carbon emissions from fuels- Green houses and pollutants- Comparison of conventional, battery, hybrid and fuel cell electric systems.

UNIT-II

EV Propulsion and Dynamics: Choice of electric propulsion system- Block diagram- Concept of EV Motors- Single and multi- motor configurations- Fixed and variable geared transmission- In-wheel motor configuration- Classification - Electric motors used in current vehicle applications - Recent EV Motors- Vehicle load factors- Vehicle acceleration.

UNIT-III

Fuel Cells: Introduction of fuel cells- Basic operation- Model - Voltage, power and efficiency- Power plant system – Characteristics- Sizing - Example of fuel cell electric vehicle - Introduction to HEV- Brake specific fuel consumption - Comparison of Series-Parallel hybrid systems- Examples.

UNIT-IV

Battery Charging and Control: Battery charging: Basic requirements- Charger architecture- Charger functions- Wireless charging- Power factor correction.

Control: Introduction- Modeling of electro mechanical system- Feedback controller design approach- PI controller‘s designing- Torque-loop, Speed control loop compensation- Acceleration of battery electric vehicle.

UNIT-V

Energy Storage Technologies: Role of Energy Storage Systems- Thermal- Mechanical-Chemical-Electrochemical- Electrical - Efficiency of energy storage systems- Super capacitors-Superconducting Magnetic Energy Storage (SMES)- SOC- SoH -fuel cells - G2V- V2G- Energy storage in Micro-grid and Smart grid- Energy Management with storage systems- Battery SCADA

TEXT BOOKS:

1. *C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001,1st Edition*
2. *Ali Emadi, ―Advanced Electric Drive Vehicles‖, CRC Press, 2017,1st Edition*

REFERENCES:

1. *Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2021, 3rd Edition.*
2. *Francisco Díaz-González, Andreas Sumper, Oriol Gomis-Bellmunt,‖ Energy Storage in Power Systems‖ Wiley Publication, ISBN: 978-1-118-97130-7, Mar 2016,1st Edition*
3. *A.G.Ter-Gazarian, ―Energy Storage for Power Systems‖, the Institution of Engineering and Technology (IET) Publication, UK, (ISBN – 978-1-84919-219-4), Second Edition, 2011.*
4. *Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, ―Modern Elelctric, Hybrid Elelctric and Fuel Cell Vehicles: Fundamentals, Theory and Design‖, CRC Press, 2004,1st Edition*
5. *James Larminie, John Lowry, ―Electric Vehicle Technology Explained‖, Wiley, 2003,2nd Edition.*

ONLINE LEARNING RESOURCES:

1. *https://nptel.ac.in/courses/108/102/108102121/*
2. *https://nptel.ac.in/syllabus/108103009*

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(23ME0351) TOTAL QUALITY MANAGEMENT
(Open Elective-IV)

COURSE OBJECTIVES:

The objectives of this course

1. *To introduce the fundamental concepts, definitions, and dimensions of quality and Total Quality Management (TQM).*
2. *To explore the evolution of quality management through historical perspectives and contributions of quality gurus.*
3. *To explain the core principles of TQM including customer satisfaction, employee involvement, and continuous improvement.*
4. *To analyze the various TQM tools such as Benchmarking, QFD, FMEA, Six Sigma, and their role in quality enhancement.*
5. *To provide an understanding of quality systems like ISO 9000, ISO 14000, QS 9000, and the processes for their implementation.*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Define and explain the basic concepts of quality, quality costs, and the scope of Total Quality Management.*
2. *Summarize the philosophies and contributions of TQM pioneers and evaluate barriers and enablers for TQM implementation.*
3. *Apply TQM principles such as employee empowerment, customer satisfaction, and supplier partnerships to real-world business scenarios.*
4. *Analyze the application of tools like QFD, FMEA, Six Sigma, and Benchmarking in improving product and process quality.*
5. *Evaluate and formulate quality systems like ISO 9000 and ISO 14000, and design documentation and auditing processes.*
6. *Apply the tools and technics of the quality management to manufacturing and service process and to provide quality components at lowest cost*

UNIT-I

Introduction: Definition of Quality, Dimensions of Quality, Definition of Total quality management, Quality Planning, Quality costs – Analysis, Techniques for Quality costs, Basic concepts of Total Quality Management.

UNIT-II

Historical Review: Historical Review: Quality council, Quality statements, Strategic Planning, Deming Philosophy, Barriers of TQM Implementation, Benefits of TQM, Characteristics of successful quality leader, Contributions of Gurus of TQM, Case studies.

UNIT-III

TQM Principles: Customer Satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment teams, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures Basic Concepts, Strategy, Performance Measure Case studies.

UNIT-IV

TQM Tools: Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA, The seven tools of quality, Process capability, Concept of Six Sigma, New Seven management tools, Case studies.

UNIT-V

Quality Systems: Need for ISO 9000 and Other Quality Systems, ISO 9000: 2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept, Requirements and Benefits, Case Studies.

TEXT BOOKS:

1. *Dale H Besterfield, Total Quality Management, Fourth Edition, Pearson Education, 2015.*
2. *Subburaj Ramaswamy, Total Quality Management, Tata Mcgraw Hill Publishing Company Ltd., 2005.*
3. *Joel E.Ross , Total Quality Management, Third Eition, CRC Press, 2017.*

REFERENCES:

1. *Narayana V and Sreenivasan N.S, Quality Management – Concepts and Tasks, New Age International, 1996.*
2. *Robert L.Flood, Beyond TQM, First Edition, John Wiley & Sons Ltd, 1993.*
3. *Richard S. Leavenworth & Eugene Lodewick Grant, Statistical Quality Control, Seventh Edition, Tata Mcgraw Hill, 2015*
4. *Samuel Ho, TQM – An Integrated Approach, Kogan Page Ltd, USA, 1995.*

Online Learning Resources:

- https://www.youtube.com/watch?v=VD6tXadibk0
- https://www.investopedia.com/terms/t/total-quality-management-tqm.asp
- https://blog.capterra.com/what-is-total-quality-management/
- https://nptel.ac.in/courses/110/104/110104080/
- https://onlinecourses.nptel.ac.in/noc21_mg03/preview
- https://nptel.ac.in/courses/110/104/110104085/
- https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-mg39/

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(23CS0558) INTRODUCTION TO COMPUTER NETWORKS
(Open Elective-IV)

COURSE OBJECTIVES:

The objectives of this course

1. *Understand the basic concepts of Computer Networks.*
2. *Introduce the layered approach for design of computer networks*
3. *Expose the network protocols used in Internet environment*
4. *Explain the format of headers of IP, TCP and UDP*
5. *Familiarize with the applications of Internet*
6. *Elucidate the design issues for a computer network*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Identify the software and hardware components of a computer network*
2. *Design software for a computer network*
3. *Develop error, routing, and congestion control algorithms*
4. *Assess critically the existing routing protocols*
5. *Explain the functionality of each layer of a computer network*
6. *Choose the appropriate transport protocol based on the application requirements*

UNIT-I

Computer Networks and the Internet: What Is the Internet? The Network Edge, The Network Core, Delay, Loss, and Throughput in Packet Switched Networks (Textbook 2), Reference Models, Example Networks, Guided Transmission Media, Wireless Transmission(Textbook 1)

UNIT-II

The Data Link Layer, Access Networks, and LANs: Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols (Textbook 1) Introduction to the Link Layer, Error- Detection and -Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks

Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page Request (Textbook 2)

UNIT-III

The Network Layer: Routing Algorithms, Internetworking, The Network Layer in The Internet (Textbook 1)

UNIT-IV

The Transport Layer Connectionless Transport: UDP (Textbook 2), The Internet Transport Protocols: TCP, Congestion Control (Textbook 1)

UNIT-V

Principles of Network Applications: Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS— The Internet's Directory Service, Peer-to-Peer Applications Video Streaming and Content Distribution Networks (Textbook 2)

TEXT BOOKS:

1. *Andrew S.Tanenbaum, David j. wether all, Computer Networks, 5th Edition, PEARSON.*
2. *James F. Kurose, Keith W. Ross, ―Computer Networking: A Top-Down Approach‖, 6th edition, Pearson, 2019.*

REFERENCES:

1. *Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication.*
2. *Youlu Zheng, Shakil Akthar, ―Networks for Computer Scientists and Engineers‖, Oxford Publishers, 2016.*

ONLINE LEARNING RESOURCES:

1. *https://nptel.ac.in/courses/106105183/25*
2. *http://www.nptelvideos.in/2012/11/computer-networks.html*
3. *https://nptel.ac.in/courses/106105183/3*

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(23CS0545) INTERNET OF THINGS
(Open Elective-IV)

COURSE OBJECTIVES:

The objectives of this course

1. *Understand the basics of Internet of Things and protocols.*
2. *Discuss the requirement of IoT technology*
3. *Introduce some of the application areas where IoT can be applied.*
4. *Understand the vision of IoT from a global perspective, understand its applications, determine its market perspective using gateways, devices and data management*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. Understand general concepts of Internet of Things.
2. Apply design concept to IoT solutions
3. Analyze various M2M and IoT architectures
4. Evaluate design issues in IoT applications
5. Create IoT solutions using sensors, actuators and Devices
6. Demonstrate the use of communication protocols and data handling techniques in IoT systems

UNIT-I

Introduction to IoT: Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates

UNIT-II

Prototyping IoT Objects using Microprocessor/Microcontroller: Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi.

UNIT-III

IoT Architecture and Protocols: Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks- Thing Speak.

UNIT-IV

Device Discovery and Cloud Services for IoT: Device discovery capabilities- Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT.

UNIT-V

UAV IoT: Introduction toUnmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller(ESC), GPS, IMU, Ultra sonic sensors; UAV Software –Arudpilot, Mission Planner, Internet of Drones(IoD)- Case study FlytBase.

TEXT BOOKS:

1. *Vijay Madisetti and ArshdeepBahga, ― Internet of Things (A Hands-on-Approach)‖, 1st Edition, VPT, 2014.*
2. *Handbook of unmanned aerial vehicles, K Valavanis;George J Vachtsevanos, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.*

REFERENCES:

1. *Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, ― From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence‖, 1st Edition, Academic Press, 2014.*
2. *ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.*
3. *The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.*
4. *Francis daCosta, ―Rethinking the Internet of Things: A Scalable Approach to Connecting Everything‖, 1st Edition, Apress Publications, 2013*
5. *Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 9781-4493- 9357-1*
6. *DGCA RPAS Guidance Manual, Revision 3 – 2020*
7. *Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs, John Baichtal*

ONLINE LEARNING RESOURCES:

1. *https://www.arduino.cc/*
2. *https://www.raspberrypi.org/*
3. *https://nptel.ac.in/courses/106105166/5*
4. *https://nptel.ac.in/courses/108108098/4*

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(23CS0557) INTRODUCTION TO QUANTUM COMPUTING
(Open Elective-IV)

COURSE OBJECTIVES*:*
The objectives of this course

1. The course is *introduced for students to*
2. *To introduce the principles and mathematical foundations of quantum computation.*
3. *To understand quantum gates, circuits, and computation models.*
4. *To explore quantum algorithms and their advantages over classical ones.*
5. *To develop the ability to simulate and write basic quantum programs.*
6. *To understand real-world applications and the future of quantum computing in AI, cryptography, and optimization.*

COURSE OUTCOMES (COs):
On successful completion of this course, students will be able to

1. *Explain the fundamental concepts of quantum mechanics used in computing.*
2. *Construct and analyze quantum circuits using standard gates.*
3. *Apply quantum algorithms like Deutsch-Jozsa, Grover's, and Shor's.*
4. *Analyze bays classifier algorithm*
5. *Develop simple quantum programs using Qiskit or similar platforms.*
6. *Analyze applications and challenges of quantum computing in real-world domains*

UNIT- I
Fundamentals of Quantum Mechanics and Linear Algebra
Classical vs Quantum Computation, Complex Numbers, Vectors, and Matrices, Hilbert Spaces and Dirac Notation, Quantum States and Qubits, Superposition and Measurement, Tensor Products and Multi-Qubit Systems.

UNIT -II
Quantum Gates and Circuits Quantum Logic Gates: Pauli, Hadamard, Phase, Controlled Gates and CNOT, Unitary Operations and Reversibility, Quantum Circuit Representation, Quantum Teleportation, Simulation of Quantum Circuits.

UNIT- III
Quantum Algorithms and Complexity Quantum Parallelism and Interference, Deutsch and Deutsch-Jozsa Algorithms, Grover's Search Algorithm, Shor's Factoring Algorithm, Quantum Fourier Transform, Complexity Classes: BQP, P, NP, and QMA.

UNIT- IV

Quantum Programming and Simulation Platforms Introduction to Qiskit and IBM Quantum Experience, Writing Quantum Circuits in Qiskit, Measuring Qubits and Results, Classical-Quantum Hybrid Programs, Noisy Intermediate-Scale Quantum (NISQ) Systems, Limitations and Current State of Quantum Hardware.

UNIT- V

Applications and Future of Quantum Computing

Quantum Machine Learning: Basics and Models, Quantum Cryptography and Quantum Key Distribution, Quantum Algorithms in AI and Optimization, Quantum Advantage and Supremacy, Ethical and Societal Impact of Quantum Technologies, Future Trends and Research Directions.

TEXT BOOKS:

1. *Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 10th Anniversary Edition, 2010.*
2. *Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.*
3. *Chris Bernhardt, Quantum Computing for Everyone, MIT Press, 2019.*

REFERENCES:

1. *David McMahon, Quantum Computing Explained, Wiley, 2008.*
2. *Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.*
3. *Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.*

ONLINE LEARNING RESOURCES:

1. IBM Quantum Experience and Qiskit Tutorials
2. Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley
3. EdX – The Quantum Internet and Quantum Computers
4. YouTube – Quantum Computing for the Determined by Michael Nielsen
5. Qiskit Textbook – IBM Quantum

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(23HS0857) FINANCIAL MATHEMATICS
(Open Elective -IV)
(Common to All Branches)

COURSE OBJECTIVES:
The objectives of this course

1. *To provide mathematical foundations for financial modelling, risk assessment and asset pricing.*
2. *To introduce stochastic models and their applications in pricing derivatives and interest rate modelling.*
3. *To develop analytical skills for fixed-income securities, credit risk, and investment strategies.*
4. *To equip students with computational techniques for pricing financial derivatives.*

COURSE OUTCOMES
On successful completion of this course, the students should be able to

1. *Explain fundamental financial concepts, including arbitrage, valuation, and risk.*
2. *Apply stochastic models, including Brownian motion and Stochastic Differential Equations (SDEs), in financial contexts.*
3. *Analyze mathematical techniques for pricing options and financial derivatives.*
4. *Apply model credit risk concept in various contexts, such as loan portfolios*
5. *Evaluate interest rate models and bond pricing methodologies.*
6. *Utilize computational techniques such as Monte Carlo simulations for financial modeling.*

UNIT-I
Asset Pricing and Risk Management
Fundamental financial concepts: Returns, arbitrage, valuation, and pricing. Asset/Liability management, investment income, capital budgeting, and contingent cash flows. One-period model: Securities, payoffs, and the no-arbitrage principle. Option contracts: Speculation and hedging strategies, CAP Model, Efficient market hypothesis.

UNIT-II
Stochastic Models in Finance
Random Walks and Brownian Motion. Introduction to Stochastic Differential Equations (SDEs): Drift and diffusion. Ito calculus: Ito‘s Lemma, Ito Integral, and Ito Isometry.

UNIT-III
Interest Rate and Credit Modelling
Interest rate models and bond markets. Short-rate models: Vasicek, Cox-Ingersoll-Ross (CIR), Hull & White models, Credit risk modelling: Hazard function and hazard rate.

UNIT-IV

Fixed-Income Securities and Bond Pricing

Characteristics of fixed-income products: Yield, duration, and convexity. Yield curves, forward rates, and zero-coupon bonds. Stochastic interest rate models and bond pricing PDE. Yield curve fitting and calibration techniques, Mortgage Backed Securities.

UNIT-V

Exotic Options and Computational Finance

Stochastic volatility models and the Feynman-Kac theorem. Exotic options: Barriers, Asians, and Look backs. Monte Carlo methods for derivative pricing, Black-Scholes-Merton model: Derivation and applications.

TEXT BOOKS:

1. *Ales Cerny, Mathematical Techniques in Finance: Tools for Incomplete Markets, Princeton University Press.*
2. *S.R. Pliska, Introduction to Mathematical Finance: Discrete-Time Models, Cambridge University* Press.

REFERENCES:

1. *Ioannis Karatzas & Steven E. Shreve, Methods of Mathematical Finance, Springer, New York.*
2. *John C. Hull, Options, Futures, and Other Derivatives, Pearson.*

WEB REFERENCES

1. *MIT– Mathematics for Machine Learning https://ocw.mit.edu.*
2. *Coursera – Financial Engineering and Risk Management (Columbia University) https://www.coursera.org/*
3. *National Stock Exchange (NSE) India – Financial Derivatives https://www.nseindia.com/*

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(23HS0845) SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS
(Open Elective-IV)
(Common to all branches of Engineering)

COURSE OBJECTIVES:

The objectives of this course

1. *To provide exposure to various kinds of sensors and actuators and their engineering applications.*
2. *To impart knowledge on the basic laws and phenomenon behind the working of sensors and actuators*
3. *To explain the operating principles of various sensors and actuators*
4. *To educate the fabrication of sensors*
5. *To explain the required sensor and actuator for interdisciplinary application*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Classify different types of Sensors and Actuators along with their characteristics.*
2. *Summarize various types of Temperature and Mechanical sensors.*
3. *Illustrates various types of optical and mechanical sensors*
4. *Analyze various types of Optical and Acoustic Sensors*
5. *Explain various types of Magnetic and Electromagnetic Sensors.*
6. *Interpret the importance of smart materials in various devices*

UNIT- I

Introduction to Sensors and Actuators

Sensors: Types of sensors: temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only).

Actuators: Functional diagram of actuators, Types of actuators and their basic principle of working: Pneumatic, Electromagnetic, Piezo-electric and Piezo-resistive actuators, Applications of Actuators.

UNIT- II

Temperature and Mechanical Sensors

Temperature Sensors: Types of temperature sensors and their basic principle of working: Thermo-resistive sensors: Thermistors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors

Mechanical Sensors: Types of Mechanical sensors and their basic principle of working: Force sensors: Strain gauges, Tactile sensors, Pressure sensors: Piezoresistive, Variable Reluctance Sensor (VRP).

UNIT- III

Optical and Acoustic Sensors

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo resistors based sensors, Photomultipliers, Infrared sensors: thermal, Passive Infra-Red, Fiber based sensors and Thermopiles

Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones

UNIT-IV

Magnetic and Electromagnetic Sensors

Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magnetostrictive sensors and actuators.

UNIT- V

Chemical and Radiation Sensors

Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors.

Radiation Sensors: Principle and working of Ionization detectors, Scintillation detectors, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)

TEXT BOOKS:

1. *Sensors and Actuators – Clarence W. de Silva, CRC Press, 2nd Edition, 2015.*
2. *Sensors and Actuators, D.A.Hall and C.E.Millar, CRC Press, 1999.*

REFERENCES:

1. *Sensors and Transducers- D.Patranabhis, Prentice Hall of India (Pvt) Ltd. 2003.*
2. *Measurement, Instrumentation, and Sensors Handbook-John G.Webster, CRC press 1999.*
3. *Sensors – A Comprehensive Sensors- Henry Bolte, John Wiley.*
4. *Handbook of modern sensors, Springer, Stefan Johann Rupitsch.*

NPTEL course link: https://onlinecourses.nptel.ac.in/noc21_ee32/preview

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(23HS0809) CHEMISTRY OF NANOMATERIALS AND APPLICATIONS
(Open Elective-IV)

COURSE OBJECTIVES:

The objectives of this course

1. *To understand basics and characterization of nano materials.*
2. *To understand synthetic methods of nano materials.*
3. *To apply various techniques for characterization of nano materials*
4. *To understand Studies of Nano-structured Materials*
5. *To enumerate the applications of advanced nano materials in engineering*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1	*Understand the basic concepts and classification of nanomaterials. [L2]*
2	*Analyze the synthesis of a nanomaterial's using various methods comparing and evaluating their effectiveness. [L4]*
3	*Apply various instrumental methods to cauterize nanomaterials and interpret the result. [L3]*
4	*Apply the BET method for surface area and porosity analysis of nanomaterials and porous solids. [L3]*
5	*Apply knowledge of synthesis, properties and applications of various nanomaterials. [L3]*
6	*Evaluate the applications of nanomaterials in various fields and their benefits in day to Day Life. [L5]*

UNIT-I

BASICS AND CHARACTERIZATION OF NANOMATERIALS

Introduction**,** Scope of nanoscience and nanotechnology, nanoscience in nature, classification of nanostructured materials, importance of nanomaterials.

UNIT-II:

SYNTHESIS OF NANOMATERIALS

Top-Down approach**,** Inert gas condensation, arc discharge method, aerosol synthesis, plasma arc technique, ion sputtering, laser ablation, laser pyrolysis, and chemical vapour deposition method, electrodeposition method, high energy ball milling method.

Synthetic Methods**:** Bottom-Up approach**,** Sol-gel synthesis, microemulsions or reverse micelles, co-precipitation method, solvothermal synthesis, hydrothermal synthesis, microwave heating synthesis and sonochemical synthesis.

UNIT-III

TECHNIQUES FOR CHARACTERIZATION

Diffraction technique, spectroscopy techniques, electron microscopy techniques for the characterization of nanomaterials, BET method for surface area analysis, dynamic light scattering for particle size determination.

UNIT-IV

STUDIES OF NANO-STRUCTURED MATERIALS

Synthesis, properties and applications of the following nanomaterials -fullerenes, carbon nanotubes, 2D-nanomaterial (Graphene), core-shell, magnetic nanoparticles, thermoelectric materials, non-linear optical materials.

UNIT-V

ADVANCED ENGINEERING APPLICATIONS OF NANOMATERIALS

Applications of Nano Particle: Nanorods and Nano wires in Water treatment, sensors, electronic devices, medical domain.Applications of Nano Particle in Civil engineering-Enhancing concrete properties, chemical engineering-Drug delivery, metallurgy and mechanical engineering-Enhanced material properties, food science, agriculture, pollutants degradation.

TEXT BOOKS:

1. *NANO: The Essentials: T Pradeep, MaGraw-Hill, 2007.*
2. *Textbook of Nanoscience and nanotechnology: B S Murty, P Shankar, BaldevRai, BB Rath and James Murday, Univ. Press, 2012.*

REFERENCES:

1. *Concepts of Nanochemistry; LudovicoCademrtiri and Geoffrey A. Ozin& Geoffrey A. Ozin, Wiley-VCH, 2011.*
2. *Nanostructures &Nanomaterials; Synthesis, Properties & Applications: Guozhong Cao, Imperial College Press, 2007.*

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(23HS0825) LITERARY VIBES
(Open Elective - IV)

COURSE OBJECTIVES:

The objectives of this course

1. *To inculcate passion for aesthetic sense and reading skills*
2. *To encourage respecting others' experiences and creative writing*
3. *To explore emotions, communication skills and critical thinking*
4. *To educate how books serve as the reflection of history and society*
5. *To provide practical wisdom and duty of responding to events of the times*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Identify genres, literary techniques and creative uses of language in literary texts.*
2. *Explain the relevance of themes found in literary texts to contemporary, personal and cultural values and to historical forces*
3. *Apply knowledge and understanding of literary texts when responding to others' problems and their own and make evidence-based arguments*
4. *Analyze the underlying meanings of the text by using the elements of literary texts*
5. *Evaluate their own work and that of others critically*
6. *Develop as creative, effective, independent and reflective students who are able to make informed choices in process and performance*

UNIT-I

Poetry

1. Ulysses- Alfred Lord Tennyson
2. Ain't I woman?-Sojourner Truth
3. The Second Coming-W.B. Yeats
4. Where the Mind is Without Fear-Rabindranath Tagore

UNIT-II

Drama: *Twelfth Night*- William Shakespeare

1. Shakespeare -life and works
1. Plot & sub-plot and Historical background of the play
2. Themes and Criticism
3. Style and literary elements
4. Characters and characterization

UNIT-III:

Short Story

1. The Luncheon - Somerset Maugham
2. The Happy Prince-Oscar Wild

3. Three Questions – Leo Tolstoy
4. Grief –Antony Chekov

UNIT-IV

Prose: Essay and Autobiography

1. My struggle for an Education-Booker T Washington
2. The Essentials of Education-Richard Livingston
3. The story of My Life-Helen Keller
4. Student Mobs-JB Priestly

UNIT-V

Novel: Hard Times- Charles Dickens

1. Charles Dickens-Life and works
2. Plot and Historical background of the novel
3. Themes and criticism
4. Style and literary elements
5. Characters and characterization

TEXT BOOKS:

1. *Charles Dickens.Hard Times.(Sangam Abridged Texts) Vantage Press, 1983*
2. *DENT JC.William Shakespeare. Twelfth Night. Oxford University Press,2016.*

REFERENCES:

1. *WJ Long.History of English Literature, Rupa Publications India; First Edition (4 October 2015).*
2. *RK Kaushik And SC Bhatia. Essays, Short Stories and One Act Plays, Oxford University Press .2018.*
3. *Dhanvel, SP. English and Soft Skills, Orient Blackswan,2017.*
4. *New Horizon, Pearson publications, New Delhi 2014*
5. *Vimala Ramarao, Explorations Volume-II, Prasaranga Bangalore University,2014.*
6. *Dev Neira, Anjana & Co. Creative Writing: A Beginner's Manual.Pearson India, 2008.*

ONLINE RESOURCES:

1. *https://www.litcharts.com/poetry/alfred-lord-tennyson/ulysses*

   https://www.litcharts.com/lit/ain-t-i-a-woman/summary-and-analysis
2. *https://englishliterature.education/articles/poetry-analysis/the-second-coming-by-w-b-yeats-critical-analysis-summary-and-line-by-line-explanation/#google_vignette*
3. *https://sirjitutorials.com/where-the-mind-is-without-fear-poem-notes-explanation/*

   https://www.litcharts.com/lit/twelfth-night/themes
4. *https://smartenglishnotes.com/2021/11/28/the-luncheon-summary-characters-themes-and-irony/*

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(23EC0445) RF SYSTEM DESIGN TOOLS
(**Skill Enhancement course**)

COURSE OBJECTIVES:
The objectives of this course

1. *To introduce RF design software and tools for designing and simulating RF systems.*
2. *To understand impedance matching techniques and the role of scattering parameters in RF circuit design.*
3. *To explore the design of RF power amplifiers, filters, oscillators, mixers, and voltage- controlled oscillators (VCOs).*
4. *To analyze microstrip transmission lines, their discontinuities, and their applications in RF systems.*
5. *To study the design, simulation, and measurement of antennas and microwave integrated circuits.*

COURSE OUTCOMES:
On successful completion of this course, students will be able to

1. *Utilize RF design software and tools to simulate and analyze RF circuits and components.*
2. *Design and implement impedance matching networks such as L-match, Pi-match, and T-match circuits.*
3. *Develop and evaluate RF amplifiers, filters, oscillators, and mixers for high-frequency applications.*
4. *Analyze microstrip transmission lines and measure their characteristics using S-parameters and Smith charts.*
5. *Design and simulate various types of antennas, including microstrip patch antennas, Yagi- Uda antennas, and horn antennas.*
6. *Design and simulate radiation characteristics (radiation pattern, gain, VSWR, return loss) of various antennas including Microstrip Patch, Yagi Uda, and Horn antennas using antenna simulation tools.*

Basic Concepts in RF Design: Introduce any RF design software and orient students with the tools of the laboratory. Practice the tool to use it for significant design.Introduction to RF Design, Time Variance and Nonlinearity, Effects of nonlinearity, Passive impedance transformation, Scattering parameters, impedance matching, L match,Pi match, T match, Passive IC Components- Resistors, capacitors Inductors, Schottky Diode, RF Switch.

RF Power Amplifiers and Filters: RF Power amplifier design examples, Gain equalizers, Voltage controlled oscillators, Phase locked loops, Linearized PLL models, PLL design examples, High frequency oscillators, Loop filters, lumped filter. LPF, HPF and BPF.

LNA, VCO and Mixers: General considerations, Problem of input matching, Low Noise Amplifiers design in various topologies, Gain Switching, Band Switching, Voltage Controlled

Oscillators, Mixers-General considerations, Passive down conversion mixers, Active down conversion mixers, Up conversion mixers.

Microstrip transmission lines and discontinuities: S parameters of a Microstrip Transmission Line, Smith Chart, Analysis of Microstrip Transmission Line standing wave patterns at various frequencies, Different types of Transmission lines like CPW, Microstrip and Co-axial cable. Different types of Microstrip discontinuities like Bend, T, Via, Gap etc., Microstrip Ring Resonator.

Antennas and Microwave Integrated Circuits: Radiation Pattern, Gain, S Parameters, Return loss and VSWR. Design considerations of Microstrip Patch Antenna and Microstrip Array, Yagi Uda Antenna and Horn Antenna. Hybrid Microwave Integrated Circuits, Monolithic Microwave Integrated Circuits, Microwave Integrated Circuits: MMIC Amplifier.

Any twelve experiments are to be done:

1. Design and simulate Impedance matching circuits like L-Matching, Pi Matching and T- Matching.
2. Design and Simulate a Schottky Diode and RF Switch.
3. Design and simulate a RF BJT Amplifier and LNA.
4. Design and simulate a Power Amplifier and Gain Equalizer.
5. Analyse and measure the gain of a Power Amplifier and equalise its gain using an Equalizer.
6. Design and simulate a High Frequency Oscillator and Lumped Filter.
7. Measurement of insertion loss, -3dB Cut of frequency of LPF,HPF and BPF.
8. Design and Simulate a VCO and RF Mixer.
9. Measure the S parameters of a Micro strip Transmission Line and plot the normalised impedance on a smith chart
10. Analysis of Microstrip Transmission Line standing wave pattern at various frequencies.
11. Study of different types of Transmission lines like CPW, Microstrip and Co-axial and find/measure its Insertion Loss (S21 and S12)
12. Study of different types of Microstrip discontinuities like Bend, T, Via , Gap etc and find/measure its Insertion loss.
13. Determine the Bandwidth and Quality Factor of a Microstrip Ring Resonator.
14. Design and simulate the Radiation Pattern,gain, $S_{11}$and VSWRof a Microstrip Patch Antenna and Microstrip Array.
15. Design and simulate the Radiation Pattern, gain, $S_{11}$and VSWR of a Yagi Uda Antenna and Horn Antenna.
16. Design and Simulate a MMIC Amplifier.

Equipment Required

1. RF Circuit Design and Simulation Software
2. RF Training System
3. Antenna Measurement System with Antenna Design Software.

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(23EC0446) INDUSTRIAL IOT AND AUTOMATION
(**Skill Enhancement course**)

COURSE OBJECTIVES:
The objectives of this course

1. *To introduce the fundamentals of Industrial IoT (IIoT), its architecture, and its differences from traditional IoT.*
2. *To understand the components of IIoT, including sensors, actuators, and control systems, and their integration with embedded platforms.*
3. *To explore communication technologies such as ZigBee, Bluetooth, NFC, RFID, and MQTT for IIoT applications.*
4. *To study data visualization techniques, dashboard creation, and web-based connectivity for IIoT systems.*
5. *To learn data retrieval techniques, machine-to-machine (M2M) communication, and cloud integration for IIoT applications.*
6. *To implement automation using PLCs, SCADA, and real-time control systems for industrial applications.*

COURSE OUTCOMES (COs):
On successful completion of this course, students will be able to

1. *Explain the fundamental concepts of IIoT, its architecture, and the challenges associated with industrial automation.*
2. *Demonstrate the integration of sensors and actuators with Raspberry Pi/NodeMCU for real-time monitoring and control.*
3. *Implement communication protocols such as MQTT, ZigBee, and Bluetooth to enable seamless IIoT connectivity.*
4. *Develop web-based dashboards for real-time visualization and remote monitoring of IIoT devices.*
5. *Retrieve, analyze, and transmit industrial data using web-based interactions and M2M communication.*
6. *Implement PLC-based automation, ladder logic programming, and SCADA for supervisory control in industrial environments.*

(All the modules need to be conducted and minimum one project to be done)

MODULE 1: Introduction & Architecture
What is IIoT and connected world? The difference between IoT and IIoT, Architecture of IIoT, IOT node, Challenges of IIOT. Practice

1. Introduction to Arduino, Introduction to raspberry Pi.
https://www.youtube.com/watch?v=AQdLQV6vhbk

MODULE 2: IIOT Components

Fundamentals of Control System, introductions, components, closed loop & open loop system.
Introduction to Sensors (Description and Working principle): What is sensor? Types of sensors, working principle of basic Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11).Digital switch, Electro Mechanical switches.

Practice

1. Measurement of temperature & pressure values of the process using raspberry pi/node mcu.
2. Modules and Sensors Interfacing (IR sensor, Ultrasonic sensors, Soil moisture sensor) using Raspberry pi/node mcu.
3. Modules and Actuators Interfacing (Relay, Motor, Buzzer) using Raspberry pi/node mcu.

MODULE 3: Communication Technologies of IIoT

Communication Protocols: IEEE 802.15.4, ZigBee, Bluetooth, BLE, NFC, RFIDIndustry standards communication technology (MQTT), wireless network communication.

Practice

1. Demonstration of MQTT communication.

MODULE 4: Visualization and Data Types of IIoT

Connecting an Arduino/Raspberry pi to the Web: Introduction, setting up the Arduino/Raspberry pi development environment, Options for Internet connectivity with Arduino, Configuring your Arduino/Raspberry pi board for the IoT.

Practice

1. Visualization of diverse sensor data using dashboard (part of IoT‘s _control panel‘)
2. Sending alert message to the user. ways to control and interact with your environment)

MODULE 5: Retrieving Data

Extraction from Web: Grabbing the content from a web page, Sending data on the web, Troubleshooting basic Arduino issues, Types of IoT interaction, Machine to Machine interaction (M2M).

Practice

1. Device control using mobile Apps or through Web pages.
2. Machine to Machine communication.

MODULE 6: Control & Supervisory Level of Automation

Programmable logic controller (PLC), Real-time control system, Supervisory Control & Data Acquisition (SCADA).

Practice

1. Digital logic gates programming using ladder diagram.
2. Implementation of Boolean expression using ladder diagram.
3. Simulation of PLC to understand the process control concept.

Projects:

IIoT based smart energy meter Smart Agriculture system
Automation using controller via Bluetooth Temperature controlled Fan/cooler using controller Automatic

streetlight
Smart Baggage Tracker

TEXT BOOKS:

1. *The Internet of Things in the Industrial Sector, Mahmood, Zaigham (Ed.) (Springer Publication)*
2. *Industrial Internet of Things: Cybermanufacturing System, Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer Publication)*
3. *Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)*

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(23HS0820) GENDER SENSITIZATION
(Audit Course)

COURSE OBJECTIVES:

The objectives of this course

1. *To enable students to understand the gender related issues, vulnerability of women and men*
2. *To familiarize them about constitutional safeguard for gender equality*
3. *To expose the students to debates on the politics and economics of work*
4. *To help students reflect critically on gender violence*
5. *To make them understand that gender identities and gender relations are part of culture as they shape the way daily life is lived in the family as well as wider community and the workplace.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understand the basic concepts of gender and its related terminology*
2. *Identify the biological, sociological, psychological and legal aspects of gender.*
3. *Use the knowledge in understanding how gender discrimination works in our society and how to counter it.*
4. *Analyze the gendered division of labour and its relation to politics and economics.*
5. *Appraise how gender-role beliefs and sharing behaviour are associated with more well-being in all culture and gender groups.*
6. *Develop students' sensibility with regard to issues of gender in contemporary India*

UNIT-I

UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

UNIT-II

GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and its Consequences-Declining Sex Ratio- Demographic Consequences-Gender Spectrum.

UNIT-III

GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- ―My Mother doesn‘t Work.‖ ―Share the Load.‖-Work: Its Politics and Economics -Fact and Fiction- Unrecognized and Unaccounted work -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming.

UNIT-IV

GENDER-BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment - Domestic Violence - Different forms of violence against women - Causes of violence, impact of violence against women - Consequences of gender-based violence.

UNIT-V

GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language- Just Relationships.

TEXT BOOKS:

1. *A.Suneetha, Uma Bhrugubanda, et al. Towards a World of Equals: A Bilingual Textbook on Gender‖, Telugu Akademi, Telangana, 2015.*
2. *Butler, Judith. Gender Trouble: Feminism and the Subversion of Identity. UK Paperback Edn. March 1990.*

REFERENCES:

1. Wtatt, Robin and Massood, Nazia, Broken Mirrors: The dowry Problems in India,London : Sage Publications, 2011
2. Datt, R. and Kornberg, J.(eds),Women in Developing Countries, Assessing Strategies for Empowerment, London: Lynne Rienner Publishers, 2002
3. Brush, Lisa D., Gender and Governance, New Delhi, Rawat Publication, 2007
4. Singh, Direeti, Women and Politics World Wide, New Delhi, Axis Publications, 2010
5. Raj Pal Singh, Anupama Sihag, Gender Sensitization: Issues and Challenges (English, Hardcover), Raj Publications, 2019
6. A.Revathy& Murali, Nandini, A Life in Trans Activism(Lakshmi Narayan Tripathi). The University of Chicago Press, 2016

Online Resources

1. **Understanding Gender:**
   Chrome- extension://kdpelmjpfafjppnhbloffcjpeomlnpah
   https://www.arvindguptatoys.com/arvindgupta/k amla-gender1.pdf
   https://onlinecourses.swayam2.ac.in/nou24_hs53/preview
2. **Gender Roles And Relations:**
   https://www.plannedparenthood.org/learn/gender-identity/sex-gender-identity/what-are-gender-roles-and-stereotypes
   https://www.verywellmind.com/understanding-gender-roles-and-their-effect-on-our-relationships-7499408

https://onlinecourses.swayam2.ac.in/cec23_hs29/preview

3. **Gender And Labour:**

https://www.economicsobservatory.com/what-explains-the-gender-division-of-labour-and-how-can-it-be-redressed
https://onlinecourses.nptel.ac.in/noc23_mg67/preview

4. **Gender-Based Violence:**

https://eige.europa.eu/gender-based-violence/what-is-gender-based-violence?language_content_entity=en
https://www.worldbank.org/en/topic/socialsustainability/brief/violence-against-women-and-girls
https://onlinecourses.swayam2.ac.in/nou25_ge38/preview

5. **GENDER AND CULTURE**

https://gender.study/psychology-of-gender/culture-impact-gender-roles-identities/https://sociology.iresearchnet.com/sociology-of-culture/gender-and-culture/https://archive.nptel.ac.in/courses/109/106/109106136/
Abdulali Sohaila.―I Fought For My Life…and Won.‖ Available online (at:http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/)

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(23EC0426) INTERNSHIP

COURSE OBJECTIVES:

The objectives of this course

1. *To enable students to apply theoretical concepts learned in their coursework (such as circuit design, communication systems, microelectronics, signal processing, etc.) to real-world engineering problems in the industry.*
2. *To provide exposure to the latest technologies, tools, and practices used in the electronics and communication industry.*
3. *To allow students to gain experience in the design, testing, and troubleshooting of electronic systems and communication networks.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Apply appropriate workplace behaviors in a professional setting.*
2. *Demonstrate content knowledge appropriate to job assignment.*
3. *Exhibit evidence of increased content knowledge gained through practical experience.*
4. *Describe the nature and function of the organization in which the internship experience takes place.*
5. *Explain how the internship placement aligns with the broader career field.*
6. *Evaluate the internship experience in terms of their personal, educational and career needs.*

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(23EC0454) PROJECT

COURSE OBJECTIVES:

The objectives of this course

1. *To apply theoretical concepts and principles from electronics, communication systems, digital signal processing, microelectronics, and other core areas to solve real-world problems.*
2. *Encourage hands-on experience in the design, development, and testing of electronics and communication systems.*
3. *Foster the development of critical thinking and problem-solving skills through the identification, analysis, and resolution of engineering challenges related to electronics and communication systems.*

COURSE OUTCOMES (COs):

On successful completion of this course, students will be able to

1. *Understand the basic concepts & broad principles of Industrial projects.*
2. *Understand concepts of Project and Production Management.*
3. *Get capable of self education and clearly understand the value of achieving perfection in project implementation & completion.*
4. *Apply the theoretical concepts to solve industrial problems with teamwork and multidisciplinary approach.*
5. *Enable the students to implement project planning in their Industrial in-plant training work.*
6. *Demonstrate professionalism with ethics; present effective communication skills and relate engineering issues to broader societal context.*