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

Bachelor of Technology
Department of Electrical and Electronics Engineering

INDUCTION PROGRAMME

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

B. Tech. – I Year I Semester

S.No.	Course Code	Subject	L/D	T	P	C
1.	23HS0840	Engineering Physics	3	0	0	3
2.	23HS0830	Linear Algebra & Calculus	3	0	0	3
3.	23EE0201	Basic Electrical & Electronics Engineering	3	0	0	3
4.	23ME0302	Engineering Graphics	1	0	4	3
5.	23CS0501	Introduction to Programming	3	0	0	3
6.	23CS0503	IT Workshop	0	0	2	1
7.	23HS0841	Engineering Physics Lab	0	0	2	1
8.	23EE0202	Electrical & Electronics Engineering Workshop	0	0	3	1.5
9.	23CS0502	Computer Programming Lab	0	0	3	1.5
10.	23HS0812	NSS/NCC/Scouts & Guides/Community Service	0	0	1	0.5
		Total	**13**	**0**	**15**	**20.5**

B. Tech. – I Year II Semester

S.No.	Course Code	Subject	L/D	T	P	C
1.	23HS0810	Communicative English	2	0	0	2
2.	23HS0801	Chemistry	3	0	0	3
3.	23HS0831	Differential Equations & Vector Calculus	3	0	0	3
4.	23CE0101	Basic Civil & Mechanical Engineering	3	0	0	3
5.	23EE0203	Electrical Circuit Analysis-I	3	0	0	3
6.	23HS0811	Communicative English Lab	0	0	2	1
7.	23HS0802	Chemistry Lab	0	0	2	1
8.	23ME0301	Engineering Workshop	0	0	3	1.5
9.	23EE0204	Electrical Circuit Analysis-I Lab	0	0	3	1.5
10.	23HS0813	Health and wellness, Yoga and Sports	0	0	1	0.5
		Total	**14**	**0**	**11**	**19.5**

B.Tech.IIYear-I Semester

S.No.	Course code	Subject	L	T	P	C
1	23HS0833	Complex Variables & Numerical Methods	3	0	0	3
2	23HS0814	Universal Human Values– Understanding Harmony and Ethical Human Conduct	2	1	0	3
3	23EE0207	Electromagnetic Field Theory	3	0	0	3
4	23EE0208	Electrical Circuit Analysis-II	3	0	0	3
5	23EE0209	DC Machines & Transformers	3	0	0	3
6	23EE0210	Electrical Circuit Analysis-II and Simulation Lab	0	0	3	1.5
7	23EE0211	DC Machines & Transformers Lab	0	0	3	1.5
8	23CS0553	Data Structures	0	1	2	2
9	23HS0805	Environmental Science	2	0	0	0
Total			**16**	**2**	**8**	**20**

B.Tech. II Year-II Semester

S.No.	Course code	Subject	L	T	P	C
1	23HS0848 23HS0850 23HS0851	Managerial Economics and Financial Analysis Organizational Behavior Business Environment	2	0	0	2
2	23EC0459	Analog Circuits	3	0	0	3
3	23EE0213	Power Systems-I	3	0	0	3
4	23EE0214	Induction and Synchronous Machines	3	0	0	3
5	23EE0215	Control Systems	3	0	0	3
6	23EE0216	Induction and Synchronous Machines Lab	0	0	3	1.5
7	23EE0217	Control Systems Lab	0	0	3	1.5
8	23CS0549	Python Programming	0	1	2	2
9	23HS0815	Design Thinking & Innovation	1	0	2	2
Total			**15**	**1**	**10**	**21**
Mandatory Community Service / Internship Project of 08 weeks duration during summer vacation						

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

III B.Tech. I Semester

S.No.	Course code	Subject	L	T	P	C
1	23EE0218	Power Electronics	3	0	0	3
2	23EC0447	Digital Circuits	3	0	0	3
3	23EE0219	Power Systems-II	3	0	0	3
4	23CS0548	Introduction to Quantum Technologies and Applications	3	0	0	3
5	23EC0448 23EE0220 23EE0221	**Professional Elective- I** 1. Signals and Systems 2. Electrical safety and Risk Management 3. Utilization of Electrical Energy	3	0	0	3
6		**Open Elective-I**	3	0	0	3
7	23EE0222	Power Electronics Lab	0	0	3	1.5
8	23EC0449	Analog and Digital Circuits Lab	0	0	3	1.5
9	23HS0818	**Skill Enhancement course** Soft Skills	0	1	2	2
10	23EC0417	Tinkering Lab	0	0	2	1
11	23EE0223	Evaluation of Community Service Internship	-	-	-	2
		Total	**18**	**1**	**10**	**26**

Open Elective – I

S.No.	Course Code	Subject	Offered by the Dept.
1	23CE0150	Green Buildings	CIVIL
2	23CE0151	Construction Technology and Management	
3	23ME0351	Sustainable Energy Technologies	ME
4	23EC0406	Electronic Circuits	ECE
5	23CS0551	Java Programming	CSE & Allied/IT
6	23CS0552	Introduction to Artificial Intelligence	
7	23CS0553	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	

Note:
1. A student is permitted to register for Honours or a Minor in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to their Minor from V Semester onwards.
2. A student shall not be permitted to take courses as Open Electives/Minor/Honours with content substantially equivalent to the courses pursued in the student's primary major.
3. A student is permitted to select a Minor program only if the institution is already offering a Major degree program in that discipline.

B.Tech. III Year-II Semester

S.No.	Course code	Subject	L	T	P	C
1	23EE0224	Electrical Measurements and Instrumentation	3	0	0	3
2	23EC0414	Microprocessors and Microcontrollers	3	0	0	3
3	23EE0225	Power System Analysis	3	0	0	3
4	23EE0226 23EE0227 23EE0228	**Professional Elective-II** 1. AI&ML for Electrical Engineering 2. Programmable Logic Controllers 3. Switch gear and Protection	3	0	0	3
5	23EC0450 23EE0229 23EE0230	**Professional Elective-III** 1. Communication systems 2. Electric Drives 3. Renewable and Distributed Energy Technologies	3	0	0	3
6		**Open Elective - II**	3	0	0	3
7	23EE0231	Electrical Measurements and Instrumentation Lab	0	0	3	1.5
8	23EC0416	Microprocessors and Microcontrollers Lab	0	0	3	1.5
9	23EE0232	**Skill Enhancement course** Applications of Soft Computing Tools in Electrical Engineering	0	1	2	2
10	23HS0816	**Audit Course** Technical Paper Writing & IPR	2	0	0	0
		Total	**20**	**1**	**8**	**23**
Mandatory Industry Internship of 08 weeks duration during summer vacation						

Open Elective – II

S.No.	Course Code	Subject	Offered by the Dept.
1	23CE0152	Disaster Management	Civil
2	23CE0153	Sustainability In Engineering Practices	
3	23ME0352	Automation and Robotics	ME
4	23EC0441	Digital Electronics	ECE
5	23CS0511	Operating Systems	CSE& Allied/IT
6	23CS0522	Machine Learning	
7	23HS0852	Optimization Techniques	Mathematics
8	23HS0858	Mathematical Foundation of Quantum Technology	
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	T	P	C
1	23EE0233	Power System Operation and Control	3	0	0	3
2	23HS0861 23HS0862 23HS0863	**Management Course- II Elective** 1.Business Ethics and Corporate Governance 2.E-Business 3.Management Science	2	0	0	2
3	23EC0419 23EE0234 23EE0235	**Professional Elective-IV** 1. Digital Signal Processing 2. Electric Vehicle Technology 3. HVDC & FACTS	3	0	0	3
4	23EE0236 23EE0237 23EE0238	**Professional Elective-V** 1. Modern Control Theory 2. Switched Mode Power Conversion 3. Electrical Distribution System	3	0	0	3
5		**Open Elective - III**	3	0	0	3
6		**Open Elective-IV**	3	0	0	3
7	23EE0239	**Skill Enhancement Course** Power Systems and Simulation Lab	0	0	4	2
8	23HS0820	**Audit Course** Gender Sensitization	2	0	0	0
9	23EE0240	**Internship** Evaluation of Industry Internship	-	-	-	2
		Total	**19**	**0**	**4**	**21**

Open Elective – III

S.No	Course Code	Subject	Offered by the Dept.
1	23CE0154	Building Materials and Services	CIVIL
3	23ME0353	3D Printing Technologies	ME
4	23EC0414	Microprocessors and Microcontrollers	ECE
5	23CS0512	Data Base Management Systems	CSE & Allied/IT
6	23CS0534	Cyber Security	
7	23HS0856	Wavelet transforms and its Applications	Mathematics
8	23HS0844	Smart Materials And Devices	Physics
9	23HS0846	Introduction to Quantum Mechanics	
10	23HS0808	Green Chemistry And Catalysis For Sustainable Environment	Chemistry
11	23HS0824	Employability Skills	Humanities

Open Elective – IV

S.No	Course Code	Subject	Offered by the Dept.
1	23CE0156	Geo-Spatial Technologies	CIVIL
2	23CE0157	Solid Waste Management	
3	23ME0354	Total Quality Management	ME
4	23EC0442	Transducers and Sensors	ECE
5	23CS0517	Computer Networks	CSE & Allied/IT
6	23CS0544	Internet of Things	
7	23CS0554	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	Title	L	T	P	C
1	23EE0241	Internship	-	-	08	4
2	23EE0242	Project	-	-	16	8

HONOURS in ELECTRIC VEHICLES (EEE Department)

S.No.	Course Code	Subject	Contact Hours per week		Credits
			L	P	
1	23EE0251	E - Mobility	3	-	3
2	23EE0252	Battery Management Systems	3	-	3
3	23EE0253	Special Machines for Electric Vehicles	3	-	3
4	23EE0254	Grid Interface of Electric Vehicles	3	-	3
5	23EE0255	EV Charging Technologies	3	-	3
6	23EE0256	Project on Electric Vehicles	-	6	3

MINORS in ENERGY SYSTEMS (EEE Department)

S.No.	Code	Course Name	Contact Hours per week			Credits
			L	T	P	
1	23EE0271	Energy Audit and Management	3	-	0	3
2	23EE0272	Energy Management in Building	3	-	0	3
3	23EE0273	Energy Storage Technologies	3	-	0	3
4	23EE0274	Energy Scenario and Energy Policy	3	-	0	3
5	23EE0275	Waste Energy Management	3	-	0	3
6	23EE0276	Project in Energy Systems	-	-	6	3

MINORS in MICRO GRID TECHNOLOGY (EEE Department)

S.No.	Code	Course Name	Contact Hours per week			Credits
			L	T	P	
1	23EE0277	Futuristic Power Systems	3	0	0	3
2	23EE0278	Power Electronic Converters for Energy Sources	3	0	0	3
3	23EE0279	Microgrid Power and Control Architecture	3	0	0	3
4	23EE0280	Microgrid System Design	3	0	0	3
5	23EE0281	Analysis of Smart Grid Systems	3	0	0	3
6	23EE0282	Project in Micro Grid Technology	0	0	6	3

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

I B.Tech – I Sem.

L	T	P	C
3	0	0	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)

After the completion of the course student should 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. ***Summarize** various types of polarization of dielectrics.*
4. ***Classify** the magneticmaterials and understand the concept of Hysteresis curve.*
5. ***Explain** fundamentals of quantum mechanics and apply it to one dimensional motion of Particles and understand the behaviour of free electrons in 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 byLaue’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 dependentwave 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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

	L	T	P	C
I B. Tech. – I Sem.	3	0	0	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, studens 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, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobian, 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)

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
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	L	T	P	C
I B. Tech. – I Sem.	3	0	0	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. *Remember 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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	L	T	P	C
I B. Tech. – I Sem.	**1**	**0**	**4**	**3**

(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 related 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 Isometricand Perspective projections.*

COURSE OUTCOMES

Upon completion of the course, the 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 solidsin **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 shapeof 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*).

TEXTBOOK

1. N. D. Bhatt, *Engineering Drawing,* Charotar Publishing House, 2016.
2. K.L. Narayana and P. Kannaiah, *Engineering Drawing*, Tata McGraw Hill, 2013.
3. Dhananjay Jolhe, *Engineering Drawing with an Introduction to AutoCAD*, TataMcGraw Hill, 2017.

REFERENCES

1. M.B.Shah and B.C. Rana, *Engineering Drawing*, Pearson Education Inc,2009.

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I B.Tech – I Sem.

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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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I B.Tech – I Sem.

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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, studens 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)

After the completion of the course student should 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 usingdiffraction 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’sMethod.
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 Torsionalpendulum.
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's experiment.

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

REFERENCES

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

Web Resources

- www.vlab.co.in
- 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, studens 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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I B.Tech – I Sem.

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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, studens 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.

TEXTBOOKS

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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(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, studens 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 societal issues 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 vivavoce on the subject.

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

I B.Tech – II Sem.

L	T	P	C
2	0	0	2

(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, studens 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 listeningto 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 isdiscussed
Reading: Reading a text in detail by making basic inferences -recognizing and interpretingspecific 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 ofrelevant 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 aSuperior 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

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

I B.Tech – II Sem.

L	T	P	C
3	0	0	3

(23HS0801) CHEMISTRY

(Common to CSM, CAD, CAI, CCC, CIC CSE, CSIT, ECE & EEE 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)

After the completion of the course student should 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 O_2 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, amperoetric 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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

	L	T	P	C
I B. Tech. – II Sem.	**3**	**0**	0	**3**

(23HS0831) 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, studens 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 with R.H.S term of the types eax ,sinax, cosax, polynomials in xn ,eax V(x), 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*, PearsonPublishers, 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.

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

I B.Tech – II Sem.

L	T	P	C
3	0	0	3

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

PART A: BASIC CIVIL ENGINEERING

COURSE OBJECTIVES

The objectives of this course is to

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

After the completion of the course, student should 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).

TEXTBOOKS

1. M.S.Palanisamy, *Basic Civil Engineering*, Tata Mcgraw Hill publications (India) Pvt.Ltd. Fourth Edition.
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 2019. FifthEdition.
2. Santosh Kumar Garg, *Hydrology and Water Resources Engineering*, KhannaPublishers, Delhi. 2016
3. Santosh Kumar Garg, *Irrigation Engineering and Hydraulic Structures*, KhannaPublishers, 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 is to

1. *Get familiarized with the scope and importance of Mechanical Engineering in differentsectors 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:

After the completion of the course student should 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 itsapplications.*
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 andSociety- 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 Engineeringsystems. 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. G. Shanmugam and M.S.Palanisamy, *Basic Civil and the Mechanical Engineering*, 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. S.S. Rattan, *A Tear book of Theory of Machines* Tata McGraw Hill Publications,(India) Pvt. Ltd.

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

I B.Tech – II Sem.

L	T	P	C
3	0	0	3

(23EE0203) ELECTRICAL CIRCUIT ANALYSIS -I

COURSE OBJECTIVES

The objectives of this course is to

To develop an understanding of the fundamental laws, elements of electrical circuits and to apply circuit analysis to DC and AC circuits.

COURSE OUTCOMES:

After the completion of the course student should be able to

CO1: Remembering the basic electrical elements and different fundamental laws.
CO2: Understand the network reduction techniques, transformations, concept of self- inductance and mutual inductance, phasor diagrams, resonance and network theorems.
CO3: Apply the concepts to obtain various mathematical and graphical representations.
CO4: Analyse nodal and mesh networks, series and parallel circuits, steady state response, different circuit topologies (with R, L and C components).
CO5: Evaluation of Network theorems,
CO6: Evaluation of electrical, magnetic and single-phase circuits.

UNIT I INTRODUCTION TO ELECTRICAL CIRCUITS

Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent and independent), Kirchoff's laws, Network reduction techniques (series, parallel, series - parallel, star-to-delta and delta-to-star transformation), source transformation technique, nodal analysis and mesh analysis to DC networks with dependent and independent voltage and current sources, node and mesh analysis.

UNIT II MAGNETIC CIRCUITS

Basic definition of MMF, flux and reluctance, analogy between electrical and magnetic circuits, Faraday's laws of electromagnetic induction – concept of self and mutual inductance, Dot convention – coefficient of coupling and composite magnetic circuit, analysis of series and parallel magnetic circuits.

UNIT III SINGLE PHASE CIRCUITS

Characteristics of periodic functions, Average value, R.M.S. value, form factor, representation of a sine function, concept of phasor, phasor diagrams, node and mesh analysis. Steady state analysis of R, L and C circuits to sinusoidal excitations-response of pure resistance, inductance, capacitance, series RL circuit, series RC circuit, series RLC circuit, parallel RL circuit, parallel RC circuit.

UNIT IV RESONANCE AND LOCUS DIAGRAMS

Series Resonance: Characteristics of a series resonant circuit, Q-factor, selectivity and bandwidth, expression for half power frequencies; Parallel resonance: Q-factor, selectivity and bandwidth; Locus diagram: RL, RC, RLC with R, L and C variables.

UNIT V NETWORK THEOREMS (DC & AC EXCITATIONS)

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem

TEXTBOOKS

1. Engineering Circuits Analysis, Jack Kemmerly, William Hayt and Steven Durbin, Tata Mc Graw Hill Education, 2005, sixth edition.
2. Network Analysis, M. E. Van Valkenburg, Pearson Education, 2019, Revised Third Edition

REFERENCES

1. Fundamentals of Electrical Circuits, Charles K. Alexander and Mathew N.O. Sadiku, Mc Graw Hill Education (India), 2013, Fifth Edition
2. Electric Circuits (Schaum's outline Series), Mahmood Nahvi, Joseph Edminister, and K. Rao, Mc Graw Hill Education, 2017, Fifth Edition.
3. Electric Circuits, David A. Bell, Oxford University Press, 2009, Seventh Edition.
4. Introductory Circuit Analysis, Robert L Boylestad, Pearson Publications, 2023, Fourteenth Edition.
5. Circuit Theory: Analysis and Synthesis, A. Chakrabarti, Dhanpat Rai & Co., 2018, Seventh Revised Edition.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc23_ee81/preview
2. https://nptel.ac.in/courses/108104139
3. https://nptel.ac.in/courses/108106172
4. https://nptel.ac.in/courses/117106108

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

I B.Tech – II Sem.

L	T	P	C
0	0	2	1

(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, studens will be able to

1. *Understand the different aspects of the English language proficiency with emphasison LSRW skills.*
2. *Apply communication skills through various language learning activities.*
3. *Analyze the English speech sounds, stress, rhythm, intonation and syllable divisionfor 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.

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

I B.Tech – II Sem.	L	T	P	C
	0	0	2	1

(23HS0802) CHEMISTRY LAB
(**Common to CSM, CAD, CAI, CCC, CIC CSE, CSIT, ECE & EEE branches**)

COURSE OBJECTIVES

The objectives of this course

1. Verify the fundamental concepts with experiments.

COURSE OUTCOMES (COs)

After the completion of the course student should 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 nanomaterial’s 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 6th Edition"* Pearson Publications.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR (AUTONOMOUS)

I B.Tech – II Sem.

L	T	P	C
0	0	3	1.5

(23ME0301) ENGINEERING WORKSHOP
(Common to All Branches of Engineering)

COURSE OBJECTIVES

The objectives of this course is to

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

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 woodworking and make following joints.
   a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridlejoint
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 followingfitting 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 jointswith 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*, MediaPromoters and Publishers, Mumbai., 14th edition,2007
2. H. S. Bawa, *Workshop Practice*, Tata-McGraw Hill, 2004.
3. Soni P.M. & Upadhyay P.A.; AtulPrakashan, *Wiring Estimating, Costing and Contracting;* 2021-22.

SIDDHARTHINSTITUTEOFENGINEERING&TECHNOLOGY::PUTTUR
(AUTONOMOUS)

I B.Tech – II Sem.	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

(23EE0204) ELECTRICAL CIRCUIT ANALYSIS-I LAB

COURSE OBJECTIVES

The objectives of this course is to

To impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics. It also gives practical exposure to the usage of different circuits with different conditions.

COURSE OUTCOMES

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

CO1: *Understand the concepts of network theorems, node and mesh network.*
CO2: *Understand series and parallel resonance and Locus diagrams.*
CO3: *Apply various theorems to compare practical results obtained with theoretical calculations.*
CO4: *Determine self, mutual inductances and coefficient of coupling values, parameters of choke coil.*
CO5: *Analyse different circuit characteristics with the help of fundamental laws and various configurations.*
CO6: *Create locus diagrams of RL, RC series circuits and examine series and parallel resonance.*

LIST OF EXPERIMENTS

1. Verification of Kirchhoff's circuit laws.
2. Verification of node and mesh analysis.
3. Verification of network reduction techniques.
4. Determination of cold and hot resistance of an electric lamp
5. Determination of Parameters of a choke coil.
6. Determination of self, mutual inductances, and coefficient of coupling
7. Series and parallel resonance
8. Locus diagrams of R-L (LVariable) and R-C (CVariable) series circuits
9. Verification of Superposition theorem
10. Verification of Thevenin's and Norton's Theorems
11. Verification of Maximum power transfer theorem
12. Verification of Compensation theorem
13. Verification of Reciprocity and Milliman's Theorems

REFERENCES

1. Engineering Circuits Analysis, Jack Kemmerly, William Hayt and Steven Durbin, Tata Mc Graw Hill Education, 2005, sixth edition.
2. Network Analysis, M. E. Van Valkenburg, Pearson Education, 2019, Revised Third edition

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

I B.Tech – II Sem.

L	T	P	C
0	0	1	0.5

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

COURSE OBJECTIVES
The objectives of this course is to

The main objective of introducing this course is to make the students maintain their mental andphysical 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, studens 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. HumanKinetics, 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.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

II B. Tech. – I Sem.

L	T	P	C
3	0	0	3

(23HS0833) COMPLEX VARIABLES AND NUMERICAL METHODS

COURSE OBJECTIVES

The objectives of this course

1.To study the techniques of complex variables and functions together with their derivatives, Contour integration and transformations.

2. To introduce the tools of differentiation and integration of functions of numerical methods that is used in various techniques dealing engineering problems

COURSE OUTCOMES (COs)

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

1. Analyze limit, continuity and differentiation of functions of complex variables and Understand Cauchy-Riemann equations, analytic functions and various properties of analytic functions.

2.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.

3.Apply numerical methods to solve algebraic and transcendental equations

4.Develop the mathematical skills of the students in the areas of numerical methods.

5.Derive interpolating polynomials using interpolation formulae

6.Solve differential and integral equations numerically

UNIT I

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 II

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.

UNIT III

Solution of Algebraic & Transcendental Equations

Introduction-Bisection Method-Iterative method, Regula-falsi method and Newton Raphson method **System of Algebraic equations**: Jacobi and Gauss Siedal method.

UNIT IV

Interpolation

Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae. Curve fitting: Fitting of straight line, second-degree and Exponential curve by method of least square

UNIT V

Solution of Initial value problems to Ordinary differential equations

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's and modified Euler's methods-Runge-Kutta methods (second and fourth order).

TEXT BOOKS:

1. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 2017, 44th Edition
2. S S Sastry, Introductory Methods of Numerical Analysis, PHI Learning PrivateLimited.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2018, 10thEdition.
2. B.V.Ramana, Higher Engineering Mathematics, by Mc Graw Hill publishers
3. R.K.Jainand, S.R.K.Iyengar, Advanced Engineering Mathematics, Alpha Science International Ltd., 2021 5th Edition (9th reprint).

ONLINE LEARNING RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc17_ma14/preview
2. https://onlinecourses.nptel.ac.in/noc20_ma50/preview
3. http://nptel.ac.in/courses/111105090

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR (AUTONOMOUS)

II B. Tech. – I Sem.

L	T	P	C
2	1	0	3

(23HS0814) UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT

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
Lecture4: 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 PS3 Exploring 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 fulfil Human Goal

UNIT IV Harmony in the Nature/Existence (4 lectures and 2 tutorials for practicesession)
Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment 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
a. 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
b. The Teacher's Manual
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

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

II B.Tech.– I Sem.

L	T	P	C
3	0	0	3

(23EE0207) ELECTROMAGNETIC FIELD THEORY

COURSE OBJECTIVES

The objectives of this course

1. *To learn the laws concerning static magnetic fields: Coulomb's law, Gauss's law and the laws concerning static magnetic fields: Biot savart law, Ampere circuital law*
2. *To learn the equations concerned with static electric fields*
3. *To learn the equations concerned with static magnetic fields*
4. *To find the difference between the behaviors of conductors and dielectrics in electric fields*
5. *To determine the energy stored and energy density in static electric field and magnetic field*

COURSE OUTCOMES (COs)

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

1. *Remember the concepts of vector algebra, vector calculus, Coulomb's law, Gauss's law ,electrostatic fields and Potential Gradient*
2. *Understand the concepts of conductors, behavior of conductor in electric fields, dielectrics, capacitance, Electric Dipole and Polarization*
3. *Apply Ohm's law in point form, Biot-Savart's law, Biot-Savart's law and its applications Ampere's circuital law and Maxwell's third equation*
4. *Evaluate the magnetic force, Lorentz Force Equation , moving charges in a magnetic field*
5. *Analyze self and mutual inductances, self-inductance of different cables, mutual inductance between different wires*
6. *Analyze time varying fields, Faraday's laws, Maxwell's fourth equation, Poynting theorem*

UNIT I

Vector Analysis:

Vector Algebra: Scalars and Vectors, Unit vector, Vector addition and subtraction, Position and distance vectors, Vector multiplication, Components of a vector.

Coordinate Systems: Rectangular, Cylindrical and Spherical coordinate systems.

Vector Calculus: Differential length, Area and Volume.Del operator, Gradient of a scalar, Divergence of a vector and Divergence theorem (definition only). Curl of a vector and Stoke's theorem (definition only), Laplacian of a scalar

Electrostatics:

Coulomb's law and Electric field intensity (EFI) – EFI due to Continuous charge distributions (line and surface charge), Electric flux density, Gauss's law (Maxwell's first equation,$\nabla . \vec{D} = \rho_v$), Applications of Gauss's law, Electric Potential, Work done in moving a point charge in an electrostatic field (second Maxwell's equation for static electric fields,$\nabla \times \vec{E} = 0$), Potential gradient, Laplace's and Poison's equations.

UNIT II

Conductors – Dielectrics and Capacitance:

Behaviour of conductor in Electric field, Electric dipole and dipole moment – Potential and EFI due to an electric dipole, Torque on an Electric dipole placed in an electric field, Current density-conduction and convection current densities, Ohm's law in point form, Behaviour of conductors in an electric field, Polarization, dielectric constant and strength, Continuity equation and relaxation time, Boundary conditions between conductor to dielectric, dielectric to dielectric and conductor to free space, Capacitance of parallel plate, coaxial and spherical capacitors, Energy stored and density in a static electric field, Coupled and decoupled capacitors.

UNIT III

Magneto statics, Ampere's Law and Force in magnetic fields:

Biot-Savart's law and its applications viz. Straight current carrying filament, circular, square, rectangle and solenoid current carrying wire – Magnetic flux density and Maxwell's second Equation , Ampere's circuital law and its applications viz. MFI due to an infinite sheet, long filament, solenoid, toroidal current carrying conductor, point form of Ampere's circuital law, Maxwell's third equation .

Magnetic force, moving charges in a magnetic field – Lorentz force equation, force on a current element in a magnetic field, force on a straight and a long current carrying conductor in a magnetic field, force between two straight long and parallel current carrying conductors, Magnetic dipole, Magnetic torque, and moment.

UNIT IV

Self and mutual inductance:

Self and mutual inductance – determination of self-inductance of a solenoid, toroid, coaxial cable and mutual inductance between a straight long wire and a square loop wire in the same plane – Energy stored and energy density in a magnetic field.

UNIT V

Time Varying Fields:

Faraday's laws of electromagnetic induction, Maxwell's fourth equation integral and point forms of Maxwell's equations, statically and dynamically induced EMF, Displacement current, Modification of Maxwell's equations for time varying fields, Poynting theorem and Poynting vector.

Textbooks:

1. "Elements of Electromagnetics" by Matthew N O Sadiku, Oxford Publications, 7th edition, 2018.
2. "Engineering Electromagnetics" by William H. Hayt& John. A. Buck Mc. Graw-Hill, 9th Editon.2017.

Reference Books:

1. "Introduction to Electro Dynamics" by D J Griffiths, Prentice-Hall of India Pvt. Ltd, 5th edition,2023.
2. "Electromagnetic Field Theory" by Yaduvir Singh, Pearson India, 3rd edition, 2017.
3. "Fundamentals of Engineering Electromagnetics" by Sunil Bhooshan, Oxford University Press, 2012.
4. Schaum's Outline of Electromagneticsby Joseph A. Edminister, MahamoodNavi, 5th Edition,2019.

Web Resources:

1. https://archive.nptel.ac.in/courses/108/106/108106073/
2. https://nptel.ac.in/courses/117103065

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

II B.Tech. – I Sem.

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3	0	0	3

(23EE0208) ELECTRICAL CIRCUIT ANALYSIS-II

COURSE OBJECTIVES

The objectives of this course

1. *To learn three phase balanced and unbalanced circuits.*
2. *To learn Transient response of R-L, R-C and R-L-C circuits.*
3. *To learn the solution using differential equation approach, Laplace transforms approach and Fourier series approach.*
4. *To learn Network Parameters and Interconnection of Two Port networks in various configurations.*
5. *To learn various configurations of filters.*

COURSE OUTCOMES (COs)

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

1. *Understand three phase balanced and unbalanced circuits, different circuit configurations and it's mathematical modeling.*
2. *Remember the concepts of Laplace transforms, formulation of various circuit topologies.*
3. *Apply Laplace transforms to solve various electrical network topologies*
4. *Compute the parameters of a two-port network.*
5. *Analyze three phase circuits, transient response of various network topologies, electric circuits with periodic excitations.*
6. *Design suitable electrical circuits and various filters for different applications*

UNIT I

Analysis of three phase balanced circuits:
Phase sequence, star and delta connection of sources and loads, relation between line and phase quantities, analysis of balanced three phase circuits, measurement of active and reactive power.

Analysis of three phase unbalanced circuits:
Loop method, Star-Delta transformation technique, two-wattmeter method for measurement of three phase power.

UNIT II

Laplace transforms – Definition and Laplace transforms of standard functions– Shifting theorem – Transforms of derivatives and integrals,Inverse Laplace transforms and applications.

Transient Analysis: Transient response of R-L, R-C and R-L-C circuits (Series and parallel combinations) for D.C. and sinusoidal excitations – Initial conditions - Solution using differential equation approach and Laplace transform approach.

UNIT III

Network Parameters: Impedance parameters, Admittance parameters, Hybrid parameters, Transmission (ABCD) parameters, conversion of Parameters from one form to other, Conditions for Reciprocity and Symmetry, Interconnection of Two Port networks in Series, Parallel and Cascaded configurations- problems.

UNIT IV

Analysis of Electric Circuits with Periodic Excitation: Fourier series and evaluation of Fourier coefficients, Trigonometric and complex Fourier series for periodic waveforms, Application to Electrical Systems – Effective value and average value of non-sinusoidal periodic waveforms, power factor, effect of harmonics.

UNIT V

Filters: Classification of filters-Low pass, High pass, Band pass and Band Elimination filters, Constant-k filters -Low pass and High Pass, Design of Filters.

Textbooks:

1. Engineering Circuit Analysis, William Hayt and Jack E. Kemmerly, 8th Edition McGraw-Hill, 2013
2. Fundamentals of Electric Circuits, Charles K. Alexander, Mathew N. O. Sadiku, 7th Edition, Tata McGraw-Hill, 2022

Reference Books:

1. Network Analysis, M. E. Van Valkenburg, 3rd Edition, PHI, 2019.
2. Network Theory, N. C. Jagan and C. Lakshminarayana, 3rd Edition, B. S. Publications,2019.
3. Circuits and Networks Analysis and Synthesis, A. Sudhakar, Shyam Mohan S. Palli, 5th Edition, Tata McGraw-Hill, 2017.
4. Engineering Network Analysis and Filter Design (Including Synthesis of One Port Networks)- Durgesh C. KulshreshthaGopal G. Bhise, Prem R. Chadha ,Umesh Publications 2012.
5. Circuit Theory: Analysis and Synthesis, A. Chakrabarti, DhanpatRai& Co., 2018, 7th Revised Edition.

Web Resources:

1. https://archive.nptel.ac.in/courses/117/106/117106108/
2. https://archive.nptel.ac.in/courses/108/105/108105159/

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

II Year B.Tech. EEE – I Semester

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3	0	0	3

(23EE0209) DC MACHINES & TRANSFORMERS

COURSE OBJECTIVES

The objectives of this course

1. *To learn the construction and principle of operation of DC machines.*
2. *To learn characteristics and testing of different DC machines.*
3. *To learn the construction and principle of operation of single phase transformers.*
4. *To determine the efficiency of transformer by conducting various tests.*
5. *To learn the Polyphase connections of three phase transformers.*

COURSE OUTCOMES (COs)

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

1. *Understand the process of voltage build-up in DC generators and characteristics.*
2. *Understand the process of torque production, starting and speed control of DC motors and illustrate their characteristics.*
3. *Obtain the equivalent circuit of single-phase transformer, auto transformer*
4. *Determine its efficiency & regulation of single phase transformer*
5. *Apply various testing methods for transformers and speed control of DC motors*
6. *Analyze various configurations of three-phase transformers.*

UNIT I

DC Generators:

Construction and principle of operation of DC machines – EMF equation for generator – Excitation techniques– characteristics of DC generators –applications of DC Generators, Back-emf and torque equations of DC motor – Armature reaction and commutation, Applications.

UNIT II

Starting, Speed Control and Testing of DC Machines:

Characteristicsof DC motors – losses andefficiency – applications of DC motors. Necessity of a starter – starting by 3-point and 4-point starters – speed control by armature voltage and field current control – testing of DC machines – brake test, Swinburne's test –Hopkinson's test–Field Test.

UNIT III

Single-phase Transformers:

Introduction to single-phase Transformers (Construction and principle of operation)–emf equation – operation on no-load and on load –lagging, leading and unity power factors loads –phasor diagrams– equivalent circuit –regulation – losses and efficiency – effect of variation of frequency and supply voltage on losses – all day efficiency, Applications.

UNIT IV

Testing of Transformers:

Open Circuit and Short Circuit tests – Sumpner's test – separation of losses–– Parallel operation with equal and unequal voltage ratios– auto transformer – equivalent circuit – comparison with two winding transformers.

UNIT V

Three-Phase Transformers:

Poly phase connections- Y/Y, Y/Δ, Δ/Y, Δ/Δ, open Δ and Vector groups – third harmonics in phase voltages– Parallel operation–three winding transformers- transients in switching –off load and on load tap changers–Scott connection.

Textbooks:

1. Electrical Machinery by Dr. P S Bimbhra, Fully Revised Edition 2021 Khanna Publishers.
2. Performance and analysis of AC machines by M.G. Say, CBS, 2002.

Reference Books:

1. Electrical Machines by D. P.Kothari, I .J .Nagarth, McGraw Hill Publications, 5th edition 2017.
2. Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill education 2011.
3. Generalized Theory of Electrical Machines by Dr. P S Bimbhra, 7th Edition, Khanna Publishers, 2021.
4. Theory & Performance of Electrical Machines by J.B.Gupta, S.K.Kataria& Sons,2007.
5. Electric Machinery by Fitzgerald, A.E.,Kingsley, Jr.,C.,&Umans, S. D, 7th edition, McGraw-Hill Education, 2014.

Web Resources:

1. nptel.ac.in/courses/108/105/108105112
2. nptel.ac.in/courses/108/105/108105155

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

II B.Tech. – I Sem.

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(23EE0210) ELECTRICAL CIRCUIT ANALYSIS-II AND SIMULATION LAB

COURSE OBJECTIVES

The objectives of this course

1. *To study the fundamentals of Kirchhoff's current law and voltage law.*
2. *To learn the measurement of voltage, current, power and impedance of any circuit.*
3. *To learn two port network parameters.*
4. *To learn the transient response of RL, RC and RLC circuits.*
5. *To learn simulation of electrical circuits using software tools.*

COURSE OUTCOMES (COs)

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

1. *Understand the power calculations in three phase circuits.*
2. *Analyze the time response of given network.*
3. *Determination of two port network parameters.*
4. *Simulate and analyze electrical circuits using software tools*
5. *Apply various theorems to solve different electrical networks using simulation tools*
6. *Analysis of transient response of RL, RC and RLC circuits.*
   Verification of self-inductance and mutual inductance

List of Experiments:

Any 10 of the following experiments are to be conducted:

1. Measurement of Active Power and Reactive Power for balanced loads.
2. Measurement of Active Power and Reactive Power for unbalanced loads.
3. Determination of Z and Y parameters.
4. Determination of ABCD and hybrid parameters
5. Verification of Kirchhoff's current law and voltage law using simulation tools.
6. Verification of mesh and nodal analysis using simulation tools.
7. Verification of super position and maximum power transfer theorems usingsimulation tools.
8. Verification of Reciprocity and Compensation theorems using simulation tools.
9. Verification of Thevenin's and Norton's theorems using simulation tools.
10. Verification of series and parallel resonance using simulation tools.
11. Simulation and analysis of transient response of RL, RC and RLC circuits.
12. Verification of self-inductance and mutual inductance by using simulation tool

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II B.Tech. – I Sem.

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(23EE0211) DC MACHINES & TRANSFORMERS LAB

COURSE OBJECTIVES

The objectives of this course

1. *To learn starting and speed control methods of DC Machines.*
2. *To learn performance characteristics of DC machines.*
3. *To learn various tests on DC machines.*
4. *To draw the equivalent circuit of transformer.*
5. *To learn predetermined efficiency and regulation of transformer.*

COURSE OUTCOMES (COs)

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

1. Demonstrate starting and speed control methods of DC Machines.
2. Apply theoretical concepts to determine the performance characteristics of DC Generators.
3. Apply theoretical concepts to determine the performance characteristics of DC Motors.
4. Analyze the parallel operation of single phase transformers
5. Determine the performance parameters of single-phase transformer.
6. Analyze the performance analysis of transformers using various tests

List of Experiments:

Any 10 of the following experiments are to be conducted:

1. Speed control of DC shunt motor by Field Current and Armature Voltage Control.
2. Brake test on DC shunt motor- Determination of performance curves.
3. Swinburne's test - Predetermination of efficiencies as DC Generator and Motor.
4. Hopkinson's teston DC shunt Machines.
5. Load test on DC compound generator-Determination of characteristics.
6. Load test on DC shunt generator-Determination of characteristics.
7. Fields test on DC series machines-Determination of efficiency.
8. Brake test on DC compound motor-Determination of performance curves.
9. OC & SC tests on single phase transformer.
10. Sumpner's test on single phase transformer.
11. Scott connection of transformers.
12. Parallel operation of Single-phase Transformers.
13. Separation of core losses of a single-phase transformer.

Reference:

1. https://ems-iitr.vlabs.ac.in/List%20of%20experiments.html

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

II B.Tech. –I Sem.	**L**	**T**	**P**	**C**
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(23CS0553) DATA STRUCTURES
(Skill Enhancement Course)

COURSE OBJECTIVES

The objectives of this course

1. *To provide the knowledge of basic data structures and their implementations.*
2. *To understand how to assess the choice of data structures and algorithm design methods impacts the performance of programs*
3. *To choose the appropriate data structure and algorithm design method for a specified application.*
4. *To solve problems using data structures such as linear lists, stacks, queues, binary trees, binary search trees, and graphs and writing programs for these solutions.*
5. *To efficiently implement the different data structures and solutions for specific problems*

COURSE OUTCOMES (COs)

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

1. *Understand the role of data structures in organizing and accessing data*
2. *Apply the linked lists concepts for dynamic data storage*
3. *Apply the stack mechanism to develop stack applications*
4. *Understand the queue and dynamic data structure techniques*
5. *Analyze the dequeue operations on deques and their applications*
6. *Apply the tree techniques for processing hierarchical data structure*

UNIT-1

Introduction to Data Structures: Definition and importance of Data structures, Abstract data types (ADTs) and its specifications, Arrays: Introduction, 1-D, 2-D Arrays, accessing elements of array, Row Major and Column Major storage of Arrays, Searching Techniques: Linear & Binary Search, Sorting Techniques: Bubble sort, Selection sort, Quick sort.

Sample experiments:

1. Program to find min & max element in an array.
2. Program to implement matrix multiplication.
3. Find an element in given list of sorted elements in an array using Binary search.
4. Implement Selection and Quick sort techniques.

UNIT-II

Linked Lists: Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.

Sample experiments:

1. Write a program to implement the following operations using SLL.
   a. Insert b. Deletion c. Traversal

2. Write a program to store name, roll no, and marks of students in a class using circulardouble linked list.
3. Write a program to perform addition of given two polynomial expressions using linked list.

UNIT-III

Stacks: Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc.

Sample experiments:

1. Implement stack operations using
   a. Arrays b. Linked list
2. Convert given infix expression into post fix expression using stacks.
3. Evaluate given post fix expression using stack.
4. Write a program to reverse given linked list using stack.

UNIT-IV

Queues: Introduction to queues: properties and operations, Circular queues, implementing queues using arrays and linked lists,Applications of queues scheduling, etc.

Deques: Introduction to deques (double-ended queues), Operations on deques and their applications

Sample experiments:

1. Implement Queue operations using
   a. Arrays b. Linked list
2. Implement Circular Queue using
   a. Arrays b. Linked list
3. Implement Deque using linked list.

UNIT-V

Trees: Introduction to Trees, Binary trees and traversals, Binary Search Tree – Insertion, Deletion & Traversal

Sample experiments:

1. Implement binary tree traversals using linked list.
2. Write program to create binary search tree for given list of integers. Perform in-order traversal of the tree. Implement insertion and deletion operations.

TEXT BOOKS

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

REFERECE BOOKS

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching and Graph Algorithms" by Robert Sedgewick.

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

II B.Tech. – I Sem.

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ENVIRONMENTAL SCIENCE (23HS0805)
(Common to all)

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. *To make the students to get awareness about the environment and its components.*
2. *To understand the importance of protecting natural ecosystems.*
3. *To understand various types of pollutions and their effects.*
4. *To understand the various engineering techniques to protect the environment.*
5. *To make awareness about the social issues and laws of environmental protection.*
6. *To 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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

II B. Tech. – II Sem.

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(23HS0848) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
(Humanities Elective-I)

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 preparingfinancial statements.*

COURSE OUTCOMES (COs)

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

1. *Define the concepts related to Managerial Economics, financial accounting and management*
2. *Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets.*
3. *Apply the Concept of Production cost and revenues for effective Business decision*
4. *Analyze how to invest their capital and maximize returns.*
5. *Evaluate the capital budgeting techniques.*
6. *Develop the accounting statements and evaluate the financial performance of businessentity .*

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 requirement

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.

Reference Books:

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.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

II B. Tech. – II Sem.

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(23HS0850) ORGANISATIONAL BEHAVIOUR
(Humanities Elective-I)

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.
2. Understand the nature and concept of Organizational behavior.
3. Apply theories of motivation to analyse the performance problems.
4. Analyse the different theories of leadership.
5. Evaluate group dynamics.
6. Develop as powerful leader.

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 –Locke's goal setting theory–Alderfer's ERG 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-Women and Corporate leadership.

UNIT-IV

Group Dynamics - Introduction –Meaning, scope, definition, Nature-Types of groups -Determinants of group behavior -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 2011*
2. *P Subba Ran, Organisational Behaviour, Himalya Publishing House 2017*

Reference Books:

1. *McShane, Organizational Behaviour, TMH 2009*
2. *Nelson, Organisational Behaviour, Thomson, 2009.*
3. *Robbins, P. Stephen, Timothy A. Judge, Organisational Behaviour, Pearson 2009.*
4. *Aswathappa, Organisational Behaviour, Himalaya, 2009*

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(AUTONOMOUS)

II B. Tech. – II Sem.

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(23HS0851) BUSINESS ENVIRONMENT
(Humanities Elective-I)

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.*
2. *Understand various types of business environment.*
3. *Apply the knowledge of Money markets in future investment.*
4. *Analyse India's Trade Policy.*
5. *Evaluate fiscal and monitory policy.*
6. *Develop a personal synthesis and approach for identifying business opportunities.*

UNIT-I

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

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.

TEXT BOOKS

1. *Francis Cherunilam (2009), International Business: Text and Cases, Prentice Hall of India.*
2. *K. Aswathappa, Essentials of Business Environment: Texts and Cases & Exercises 13th Revised Edition.HPH2016*

REFERENCES

1. *K. V. Sivayya, V. B. M Das (2009), Indian Industrial Economy, Sultan Chand Publishers, NewDelhi, India.*
2. *Sundaram, Black (2009), International Business Environment Text and Cases, Prentice Hall of India, New Delhi, India.*
3. *Chari. S. N (2009), International Business, Wiley India.*
4. *E. Bhattacharya (2009), International Business, Excel Publications, New Delhi.*

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II B. Tech. – II Sem.	**L**	**T**	**P**	**C**
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(23EC0459) ANALOG CIRCUITS

COURSE OBJECTIVES

The objectives of this course

1. *To understand the applications of P-N junction diode, analyze and design various electronic devices and circuits using BJT.*
2. *To understand the characteristics of BJT amplifiers at low frequencies, Feedback amplifiers, Oscillators, and Operational Amplifiers.*
3. *Analyze various circuit characteristics by using timers, Phase locked loops and operational amplifiers.*

COURSE OUTCOMES (COs)

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

1. *Understand the concepts of diode clipping and clamping circuits, different amplifier configurations, operation of oscillator circuits, operational amplifiers, timers, ADC and DAC. (L2)*
2. *Analyze and design various electronic devices and circuits using BJT (L4)*
3. *Apply the above concepts for different circuit design.(L3)*
4. *Analyze various circuit characteristics by using Amplifiers, Transistors, Comparators, Wave form generators, ADC and DAC.(L4)*
5. *Analyze various circuit characteristics by using timers, Phase locked loops and operational amplifiers. (L4)*
6. *valuate different system configurations by using various amplifier, transistor and waveform generators.(L5)*

UNIT-I

Diode clipping and clamping circuits: Diode clippers, clipping at two independent levels, Transfer characteristics of clippers, clamping circuit operation.

DC biasing of BJTs: Load lines, Operating Point, Bias Stability, Collector-to-Base Bias, Self-Bias, Stabilization against Variations in V_{BE} and β for the Self-Bias Circuit, Bias Compensation, Thermal Runaway, Thermal Stability.

UNIT-II

Small Signals Modeling of BJT: Analysis of a Transistor Amplifier Circuit using h-parameters, Simplified CE Hybrid Model, Analysis of CE, CC, CB Configuration using Approximate Model, Frequency Response of CE and CC amplifiers.

Feedback Amplifiers: Classification of Amplifiers, the Feedback Concept, General Characteristics of Negative-Feedback Amplifiers, Effect of Negative Feedback upon Output and Input Resistances, Voltage-Series Feedback, Current-Series Feedback, Current-Shunt Feedback, Voltage-Shunt Feedback.

UNIT- III

Oscillator Circuits: Barkhausen Criterion of oscillation, Oscillator operation, R-C phase shift oscillator, Wien bridge Oscillator, Crystal Oscillator.

Operational Amplifiers: Introduction, Basic information of Op-Amp, Ideal Operational Amplifier, Block Diagram Representation of Typical Op-Amp, OP-Amps Characteristics: Introduction, DC and AC characteristics, 741 op-amp & its features.

UNIT-IV

OP-AMPS Applications: Introduction, Basic Op-Amp Applications, Instrumentation Amplifier, AC Amplifier, V to I and I to V Converter, Sample and Hold Circuit, Log and Antilog Amplifier, Multiplier and Divider, Differentiator, integrator.

Comparators and Waveform Generators: Introduction, Comparator, Square Wave Generator, Monostable Multivibrator, Triangular Wave Generator, Sine Wave Generators.

UNIT-V

Timers and Phase Locked Loop: Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger, PLL block schematic, principles and description of individual blocks, 565 PLL, Applications of VCO (566).

Digital To Analog And Analog To Digital Converters: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, A-D Converters – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC Specifications.

TEXTBOOKS

1. Electronic Devices and Circuits- J. Millman, C.Halkias, Tata Mc-Graw Hill, 2nd Edition, 2010.
2. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition, 2003.

REFERENCES

1. Electronic Devices and Circuit Theory – Robert L.Boylestad and Lowis Nashelsky, Pearson Edition, 2021.
2. Electronic Devices and Circuits–G.K. Mithal, Khanna Publisher, 23rd Edition, 2017.
3. Electronic Devices and Circuits – David Bell, Oxford, 5th Edition, 2008.
4. Electronic Principles–Malvino, Albert Paul, and David J. Bates, McGraw-Hill/Higher Education, 2007.
5. Operational Amplifiers and Linear Integrated Circuits – Gayakwad R.A, Prentice Hall India, 2002.
6. Operational Amplifiers and Linear Integrated Circuits –Sanjay Sharma, Kataria & Sons, 2nd Edition, 2010.
7. Design of Analog CMOS Integrated Circuits - Behzad Razavi

Web Resources:

1. https://nptel.ac.in/courses/122106025.
2. https://nptel.ac.in/courses/108102112.

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

II B.Tech. – II Sem.

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(23EE0213) POWER SYSTEMS-I

COURSE OBJECTIVES

The objectives of this course

1. *To understand Structure, essential components and their layout in thermal power station.*
2. *To understand Selection of site for hydro power generation.*
3. *To learn about Various aspects and issues involved in Nuclear power generation*
4. *To study the working of substations and distribution systems.*
5. *To understand Cost of generation and tariff methods.*

COURSE OUTCOMES (COs)

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

1 *Estimate the probable quantity of coal needed to create the number of units produced for the thermal power plant at the cost per kWh generated, and Analyse the quantity of units generated, the cost of production, and the amount of river water needed to produce hydel power.*
2 *Recognize the operation and functioning of nuclear power facilities.*
3 *To analyse the different substations located throughout distribution networks*
4 *To comprehend ideas regarding subsurface cables and insulating materials.*
5 *Examine a range of economic factors pertaining to the production and distribution of power.*
6 *Evaluation of the tariffs to be charged to consumers.*

UNIT I

Hydroelectric Power Stations:

Selection of site, general layout of a hydroelectric power plant with brief description of major components and principle of operation

Thermal Power Stations:

Selection of site, general layout of a thermal power plant. Brief description of components: boilers, super heaters, economizers and electrostatic precipitators, steam turbines: impulse and reaction turbines, condensers, feed water circuit, cooling towers and chimney.

UNIT II

Nuclear Power Stations:

Location of nuclear power plant, working principle, nuclear fission, nuclear fuels, nuclear chain reaction, nuclear reactor components: moderators, control rods, reflectors and coolants, types of nuclear reactorsand brief description of PWR, BWR and FBR. Radiation: radiation hazards and shielding, nuclear waste disposal.

UNIT III

Substations:

Air Insulated Substations – indoor & outdoor substations, substations layouts of 33/11 kV showing the location of all the substation equipment.Bus bar arrangements in the sub-stations: simple arrangements like single bus bar, sectionalized single bus bar, double bus bar

with one and two circuit breakers, main and transfer bus bar system with relevant diagrams.
Gas Insulated Substations (GIS) – advantages of gas insulated substations, constructional aspects of GIS, comparison of air insulated substations and gas insulated substations.

UNIT IV

Distribution Systems:

Classification of Distribution systems, A.C Distribution, Overhead versus Underground system,Connection schemes of Distribution system, Requirements of Distribution system, Design considerations in Distribution system.

Underground Cables:

Types of cables, construction, types of insulating materials, calculation of insulation resistance, stress in insulation and power factor of cable.Capacitance of single and 3-Core belted Cables.

Grading of cables: capacitance grading and intersheath grading.

UNIT V

Economic Aspects & Tariff:

Economic Aspects – load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, plant capacity factor and plant use factor, base and peak load plants.

Tariff Methods– Costs of generation and their division into fixed, semi-fixed and running costs, desirable characteristics of a tariff method, tariff methods: simple rate, flat rate, block-rate, two-part, three–part, and power factor tariff methods, Time of Day (ToD) tariff and Time of Use (ToU) tariff.

Textbooks:

1. S. N. Singh, Electric Power Generation, Transmission and Distribution, PHI Learning Pvt Ltd, New Delhi, 2nd Edition, 2012
2. J. B. Gupta, Transmission and Distribution of Electrical Power, S. K. Kataria and sons,10th Edition, 2021

Reference Books:

1. I.J.Nagarath& D.P. Kothari, Power System Engineering, McGraw-Hill Education, 3rd Edition, 2019.
2. C.L.Wadhwa,Generation, Distribution and Utilization of Electrical Energy, New Age International Publishers, 6th Edition, 2018.
3. V. K. Mehta and Rohit Mehta, Principles of Power System, S. Chand, 7th Edition, 2021.
4. Turan Gonen, Electric Power Distribution System Engineering, McGraw-Hill, 3rd edition, 2014.
3. Handbook of switchgear, BHEL, McGraw-Hill Education, 2007.

Web Resources:

1. https://nptel.ac.in/courses/108102047

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

II B.Tech. – II Sem.

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3	0	0	3

(23EE0215) CONTROL SYSTEMS

COURSE OBJECTIVES

The objectives of this course

1. *To make the students familiarize various representations of systems.*
2. *To make the students analyze the stability of linear systems in time domain and frequency domain.*
5. *To make the students analyze the stability of linear systems in frequency domain.*
6. *To make the students design compensator based on the time and frequency domain Specifications.*
7. *To develop linear models mainly state variable model and Transfer function model*

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. Principle of operation of DC and AC Servo motor, Transfer function of DC servo motor - AC servo motor, 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, P, PI, PID Controllers.

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.

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 – Lag, Lead, Lag-Lead Compensator design .

UNIT V
STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS
Concepts of state, state variables and state model, state models - differential equations & Transfer function models - Block diagrams. Diagonalization, Transfer function from state model, Solving the Time invariant state Equations- State Transition Matrix and it's Properties. System response through State Space models. The concepts of controllability and observability, Duality between 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, 7th edition, 2021.

Reference Books:

1. Control Systems Principles & Design by M.Gopal, 4th Edition, Mc Graw Hill Education, 2012.
2. Automatic Control Systems by B. C. Kuo and Farid Golnaraghi, John wiley and sons, 9th edition, 2014.
3. Feedback and Control Systems, Joseph J Distefano III, Allen R Stubberud & Ivan J Williams, 2nd Edition, Schaum's outlines, Mc Graw 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.

Web Resources:

1. https://nptel.ac.in/courses/108102043
2. https://nptel.ac.in/courses/108106098.

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

II B.Tech. – II Sem.

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(23EE0214) INDUCTION AND SYNCHRONOUS MACHINES

COURSE OBJECTIVES

The objectives of this course

1. *To understand constructional details, principle of operation and the importance of slip ring Induction motors*
2. *To understand various speed control methods of induction motors*
3. *To understand behavior of single-phase induction motors*
4. *The understand the construction and working principal of synchronous machines*
5. *To understand the performance characteristics of synchronous motor*

COURSE OUTCOMES (COs)

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

1 *To understand constructional details, principle of operation and the performance of Slip ring Induction motors*

2 *To understand different speed control methods of 3-Phase induction motors*

3 *To understand constructional details, principal and operation of single phase motors*

4 *To understand the starting methods of single phase motors and its applications*

5 *To understand constructional details, principal and operation of salient and non salient pole alternators and its applications*

6 *To understand the effect of excitation on current and power factor of Synchronous motors*

UNIT I

1. phase induction motors:

Construction of Squirrel cage and Slipring induction motors– production of rotating magnetic field – principle of operation – rotor emf and rotor frequency – rotor current and power factor at standstill and during running conditions– rotor power input, rotor copper loss and mechanical power developed and their inter-relationship –equivalent circuit – phasor diagram, Applications.

UNIT II

Performance of 3-Phase induction motors:

Torque equation – expressions for maximum torque and starting torque – torque-slip characteristics – double cage and deep bar rotors –No load, Brake test and Blocked rotor tests – circle diagram for predetermination of performance- methods of starting –starting current and torque calculations -speed control of induction motor with V/f control method, rotor resistance control and rotor emf injection technique –crawling and cogging – induction generator operation.

UNIT III

Single Phase Motors:

Single phase induction motors – constructional features – double revolving field theory, Cross field theory – equivalent circuit- starting methods: capacitor start capacitor run, capacitor start induction run, split phase & shaded pole, AC series motor, Applications.

UNIT IV

Synchronous Generator:

Constructional features of non-salient and salient pole type alternators- armature windings – distributed and concentrated windings – distribution& pitch factors – E.M.F equation – armature reaction – voltage regulation by synchronous impedance method – MMF method and Potier triangle method –two reaction analysis of salient pole machines -methods of synchronization- Slip test – Parallel operation of alternators.

UNIT V

Synchronous Motor:

Synchronous motor principle and theory of operation – Effect of excitation on current and power factor– synchronous condenser –expression for power developed –hunting and its suppression – methods of starting, Applications.

Textbooks:

1. Electrical Machinery, Dr. P.S. Bhimbra, Khanna Publishing, 2021,First Edition.
2. Performance and analysis of AC machines by M.G. Say, CBS, 2002.

Reference Books:

1. Electrical machines, D.P. Kothari and I.J. Nagrath, McGraw Hill Education, 2017,Fifth Edition.
2. Theory & Performance of Electrical Machines by J.B.Gupta, S.K.Kataria& Sons,15th edition, 2022..
3. Electric Machinery, A.E.Fitzgerald, Charles kingsley, Stephen D.Umans, McGraw-Hill, 2020, Seventh edition.

Web Resources:

1. https://nptel.ac.in/courses/108/105/108105131
2. https://nptel.ac.in/courses/108106072

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

II B.Tech. – II Sem.

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(23EE0217) CONTROL SYSTEMS LAB

COURSE OBJECTIVES

The objectives of this course

1. *To study the effects of feedback control on system performance*
2. *To determine the transfer functions of Electrical Machine.*
3. *To design of controllers/compensators to achieve desired specifications.*
4. *To study the characteristics of servo mechanisms used in automatic control applications.*
5. *To learn the MATLAB applications to control systems.*

COURSE OUTCOMES (COs)

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

1. *Understand how to use feedback control system to determine transfer function of DC servo motor and any other given circuit with R, L and C components*
2. *Model the systems and able to design the controllers and compensators.*
3. *Get the knowledge about the effect of poles and zeros location on transient and steady state behavior of second order systems and implement through software tools*
4. *Determine the performance and time domain specifications of first and second order systems.*
5. *Understand the stability analysis*
6. *Understand the functioning of PID controllers*

List of Experiments:

Any 10 of the Following Experiments are to be conducted.

1. Time response of Second order system
2. Characteristics of Synchros
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions and application of speed control of motor.
4. Effect of feedback on DC servo motor
5. Transfer function of DC Machine
6. Effect of P, PD, PI, PID Controller on a second order system
7. Lag and lead compensation – Magnitude and phase plot
8. Temperature controller using PID
9. Characteristics of magnetic amplifiers
10. Characteristics of AC servo motor
11. Linear system analysis (Time domain analysis, Error analysis) using MATLAB.
12. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB
13. State space model for classical transfer function using MATLAB – Verification.

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

II B.Tech. – II Sem.

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(23EE0216) INDUCTION AND SYNCHRONOUS MACHINES LAB

COURSE OBJECTIVES

The objectives of this course:

1. *To deal with the detailed analysis of poly phase induction motors & Synchronous generators and motors*
2. *To understand operation, construction and types of single-phase motors and their applications in house hold appliances and control systems.*
3. *To introduce the concept of parallel operation of synchronous generators.*
4. *To understand speed control methods in induction motors.*
5. *To understand the V and Inverted V curves of a three-phase synchronous motors.*

COURSE OUTCOMES (COs)

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

1. Analyze various performance characteristics of 3-phase and 1-phase induction motors
2. Evaluate the performance of 3-phase Induction Motor by obtaining the circle diagram and equivalent circuit of 3-phase Induction Motor and single phase induction motor
3. Adapt the power factor improvement methods for single phase Induction Motor
4. Pre-determine the regulation of 3-phase alternator
5. Determine the synchronous machine reactance of 3-phase alternator
6. Determine the regulation of three-phase alternator by Potier triangle method

List of Experiments:

Any 10 experiments of the following are required to be conducted

1. Brake test on three phase Induction Motor.
2. Circle diagram of three phase induction motor.
3. Speed control of three phase induction motor by V/f method.
4. Equivalent circuit of single-phase induction motor.
5. Power factor improvement of single-phase induction motor by using capacitors.
6. Load test on single phase induction motor.
7. Regulation of a three -phase alternator by synchronous impedance &MMF methods.
8. Regulation of three-phase alternator by Potier triangle method.
9. V and Inverted V curves of a three-phase synchronous motor.
10. Determination of X_d, X_q & Regulation of a salient pole synchronous generator.
11. Determination of efficiency of three phase alternator by loading with three phase induction motor.
12. Parallel operation of three-phase alternator under no-load and load conditions.
13. Determination of efficiency of a single-phase AC series Motor by conducting Brake test.

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B. Tech-EEE

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(AUTONOMOUS)

II B.Tech. – II Sem.

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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 Basic knowledge of python programming and installation of Anaconda using Jupyter Notebook.
2. **Apply** the functions on libraries, usage of string and list operations.
3. **Apply** the concept of Dictionaries for analyzing the data with key and value.
4. **Apply** the concept of Tuples and Sets to perform operations on sets of data.
5. **Analyze** the file concepts and oops paradigms.
6. **Apply** the concepts of JSON and XML for data processing.

UNTI-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

Reference Books:

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**

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

II B.Tech. – II Sem.

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(23HS0815) DESIGN THINKING & INNOVATION

COURSE OBJECTIVES

The objectives of this course

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.*
2. *Explain the fundamentals of Design Thinking and innovation*
3. *Apply the design thinking techniques for solving problems in various sectors.*
4. *Analyse to work in a multidisciplinary environment*
5. *Evaluate the value of creativity*
6. *Formulate specific problem statements of real time issues*

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.

Reference Books:

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

COMMUNITY SERVICE PROJECT

……Experiential learning through community engagement

- *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;

1. *To sensitize the students to the living conditions of the people who are around them,*
2. *To help students to realize the stark realities of society.*
3. *To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability*
4. *To make students aware of their inner strength and help them to find new /out of box solutions to social problems.*
5. *To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.*
6. *To help students to initiate developmental activities in the community in coordination with public and government authorities.*
7. *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

EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

- Positive impact on students’ academic learning
- Improves students’ ability to apply what they have learned in “the real world”
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development.
- Improved ability to understand complexity and ambiguity

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 programmesto 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 agency representative and the teacher- mentor, who is required to periodically visit thestudents and guide them.

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B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR

(AUTONOMOUS)

III B. Tech. – I Sem.

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(23EE0218) POWER ELECTRONICS

(Professional Core)

COURSE OBJECTIVES:

1. *Learn how power electronic devices work, including diodes, thyristors, MOSFETs, IGBTs, and new devices like GaN and SiC.*
2. *Understand how different power converters operate, such as rectifiers, inverters, choppers, and AC voltage controllers, with different types of electrical loads.*
3. *Study how to control and analyze power converter circuits, including switching methods, waveform generation, and voltage/current control.*
4. *Apply formulas and solve problems related to voltage, current, and power in real-life applications like industrial systems and renewable energy.*

COURSE OUTCOMES:

At the end of the course the student shall be able to

1. *Understand the I-V Characteristics and Gate Drive Requirements of Power Devices Including Diodes, Thyristors, MOSFETs, and IGBTs.*
2. *Design Single-Phase and Three-Phase Rectifiers with Different Load Conditions and Evaluate Power Factor and Source Inductance Effects.*
3. *Apply Duty Ratio Control and Analyze Steady-State Waveforms of Buck, Boost, and Buck- Boost Converters.*
4. *Evaluate the operation of three-phase bridge inverters (VSI) in 180° and 120° conduction modes, with associated waveforms.*
5. *Explain the modes of operation of Triac and its behavior with resistive and inductive loads.*
6. *Analyze the Operation of Inverters, AC Voltage Controllers, and Cyclo Converters with Various Load Conditions and Commutation Techniques.*

UNIT I

Power Switching Devices:

Diode, Thyristor, MOSFET, IGBT: I-V Characteristics; Firing circuit for thyristor; Voltage and current commutation of a thyristor; Gate drive circuits for MOSFET, IGBT and GTO. Introduction to Galium Nitride and Silicon Carbide Devices.

UNIT II

Rectifiers:

Single-phase half-wave and full-wave rectifiers, Single-phase full-bridge thyristor rectifier with R-load and highly inductive load; Three-phase full-bridge thyristor rectifier with R-load and highly inductive load; Input current wave shape, power factor and effect of source inductance; Analysis of rectifiers with filter capacitance, Dual Converter -Numerical problems.

UNIT III

DC-DC Converters:

Elementary chopper with an active switch and diode, concepts of duty ratio, control strategies and average output voltage: Power circuit, analysis and waveforms at steady state, duty ratio control and average output voltage of Buck, Boost and Buck- Boost Converters.

UNIT IV

Inverters:

Single phase Voltage Source inverters – operating principle - steady state analysis, Simple forced commutation circuits for bridge inverters – Voltage control techniques for inverters and Pulse width modulation techniques, single phase current source inverter with ideal switches, basic series inverter, single phase parallel inverter – basic principle of operation only, Three phase bridge inverters (VSI) – 180 degree mode – 120 degree mode of operation - Numerical problems.

UNIT V

AC Voltage Controllers & Cyclo Converters:

AC voltage controllers – Principle of phase control – Principle of integral cycle control - Single phase two SCRs in anti-parallel – With R and RL loads – modes of operation of Triac – Triac with R and RL loads – RMS load voltage, current and power factor - wave forms – Numerical problems. Cyclo converters - Midpoint and Bridge connections - Single phase to single phase step-up and step-down cyclo converters with Resistive and inductive load, Principle of operation, Waveforms, output voltage equation.

TEXT BOOKS:

1. *M. H. Rashid, Power Electronics: Circuits, Devices and Applications, 2nd edition, Prentice Hall of India, 1998.*
2. *P.S. Bimbhra, Power Electronics, 4th Edition, Khanna Publishers, 2010.*
3. *M. D. Singh & K. B. Kanchandhani, Power Electronics, Tata Mc Graw Hill Publishing Company, 1998.*

REFERENCE BOOKS:

1. *Ned Mohan, Power Electronics, Wiley, 2011.*
2. *Robert W. Erickson and Dragan Maksimovic, Fundamentals of Power Electronics 2nd Edition, Kluwer Academic Publishers, 2004.*
3. *Vedam Subramanyam, Power Electronics, New Age International (P) Limited, 1996.*
4. *V. R. Murthy, Power Electronics, 1st Edition, Oxford University Press, 2005.*
5. *P. C. Sen, Power Electronics, Tata Mc Graw-Hill Education, 1987.*
6. *J. M. D. Murphy , Power Electronic Control of Alternating Current Motors.*

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B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

III B. Tech. – I Sem.

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(23EC0447) DIGITAL CIRCUITS
(Professional Core)

COURSE OBJECTIVES:

The objectives of this course

1. *To Learn Boolean algebra, logic simplification techniques, and combinational circuit design.*
2. *To analyze combinational circuits like adders, subtractors, and code converters.*
3. *To explore combinational logic circuits and their applications in digital design.*
4. *To understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.*
5. *To gain knowledge about programmable logic devices and digital IC's.*

COURSE OUTCOMES (COs):

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

1. *Apply Boolean algebra to analyze and simplify logic expressions.*
2. *Design combinational circuits from simplified expressions.*
3. *Analyze combinational circuits like adders, subtractors, and code converters*
4. *Explore combinational logic circuits and their applications in digital design*
5. *Understand sequential logic circuits, including latches, flip-flops, counters, and shift registers*
6. *Gain knowledge about programmable logic devices and digital IC's.*

UNIT-I

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, ExNOR operations, Minimization of Switching Functions: Karnaugh map method, Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

UNIT-II

Introduction to Combinational Design 1: Binary Adders, Subtractors and BCD adder, Code converters - Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.

UNIT-III

Combinational Logic Design 2: Decoders, Encoders, Priority Encoder, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

UNIT-IV

Sequential Logic Design: Latches, Flip-flops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, set up and hold times, Ripple counters, Shift registers.

UNIT-V
Programmable Logic Devices:ROM, Programmable Logic Devices (PLA and PAL).
Digital IC's: Decoder (74x138), Priority Encoder (74x148), multiplexer (74x151) and de-multiplexer (74x155), comparator (74x85).

TEXT BOOKS:

1. *Digital Design, M.Morris Mano & Michel D. Ciletti, 5th Edition, Pearson Education, 1999.*
2. *Switching theory and Finite Automata Theory, ZviKohavi and NirahK.Jha, 2nd Edition, Tata McGraw Hill, 2005.*

REFERENCE BOOKS:

1. *Fundamentals of Logic Design, Charles H Roth,Jr., 5th Edition, Brooks/coleCengage Learning, 2004.566), low pass filter, monolithic PLL and applications of PLL.*

R23

B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

III B. Tech. – I Sem.

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(23EE0219) POWER SYSTEMS-II
(Professional Core)

COURSE OBJECTIVES:

1. *To study about line parameters and constants.*
2. *To study the performance of transmission lines.*
3. *To know about overhead line insulators, corona, sag and tension in transmission line.*
4. *To study about symmetrical components and different types of faults in power system.*

COURSE OUTCOMES:

At the end of the course the student shall be able to

1. *Analyse the transmission lines and obtain the transmission line parameters and Constants.*
2. *Analyse transmission line performance.*
3. *Design transmission lines to meet the day to day power requirements.*
4. *Understand the types of insulators and Grading of insulators for overhead transmission system.*
5. *Understand corona, sag and tension in transmission lines*
6. *Apply load compensation techniques to control reactive power.*

UNIT I

Transmission Line Parameters:

Types of Conductors - Calculation of Resistance for Solid Conductors, Bundle Conductors, Skin effect, Proximity effect, Concept of GMR & GMD- Transposition of Power lines- Calculation of inductance for single phase and three phase, Single and Double circuit lines, Symmetrical and asymmetrical conductor configurations with and without transposition. Calculation of Capacitance for 2 wire and 3 wire systems, effect of ground on Capacitance, Capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical Problems

UNIT II

Performance of Transmission Lines:

Classification of Transmission Lines-Short, medium and long line and their models representation - Nominal-T, Nominal-π and A, B, C, D Constants for symmetrical networks, Numerical Problems and solutions for estimating regulation and efficiency of all types of lines. Ferranti effect and Charging Current

UNIT III

Overhead Line Insulators:

Types of Insulators, String efficiency and Methods for improvement, – Voltage Distribution, Calculation of String efficiency, Capacitance Grading and Static Shielding., Numerical Problems.

UNIT IV

Sag and Tension: Sag and Tension Calculations with equal and unequal heights of towers, Effect of wind and ice on weight of conductor, Stringing chart, Sag template and its applications Numerical Problems.

Corona: Corona- factors affecting corona, critical voltages and Power loss due to Corona. Radio Interference

UNIT V

Voltage Control and Power Factor Improvement:

Methods of voltage control, shunt and series capacitors/Inductors, tap changing transformers, synchronous phase modifiers, power factor improvement methods.

Compensation in Power Systems: Concepts of Load compensation Load ability characteristics of overhead lines – Uncompensated transmission line – Symmetrical line – Radial line with asynchronous load – Compensation of lines.

TEXT BOOKS:

1. *C.L. Wadhwa, Electrical Power Systems, New Age International Pub. Co, Third Edition, 2001.*
2. *D.P. Kothari and I.J. Nagrath, Modern Power System Analysis, Tata Mc Graw Hill Pub. Co.,New Delhi, Fourth edition, 2011.*
3. *B.R.Gupta, Power System Analysis and Design, S.ChandPublishing.1998.*

REFERENCE BOOKS:

1. *A. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar, A Text book on Power System Engineering, Dhanpat Rai Publishing Company (P) Ltd, 2008.*
2. *John J. Grainger & W.D. Stevenson, Power System Analysis, Mc Graw Hill International,1994.*
3. *Hadi Sadat, Power System Analysis, Tata Mc Graw Hill Pub. Co. 2002.*
4. *W.D. Stevenson, Elements of Power system Analysis, McGraw Hill International Student Edition.*

ONLINE LEARNING RESOURCE:

1. https://onlinecourses.nptel.ac.in/noc22_ee17/preview

R23

B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR

(AUTONOMOUS)

III B. Tech. – I Sem.

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(23CS0548) INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS

COURSE OBJECTIVES :

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 (CO):

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 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.

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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, Visionvs 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, PsiQuantum,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

TEXTBOOKS:

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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B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

III B. Tech. – I Sem.

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(23EC0448) SIGNALS AND SYSTEMS
(Professional Elective -I)

COURSE OBJECTIVES:

The objectives of this course

1. *To understand the basic properties of signal & systems and LTI systems.*
2. *To learn Fourier series representation of periodic signals.*
3. *To study representation of signals in continuous and discrete time Fourier transform*
4. *To analyze the sampling theorem and characterize signals & systems in time & frequency domain.*
5. *To apply Laplace transform and Z transform to study about the stability of systems.*

COURSE OUTCOMES (COs):

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

1. *Explain the basic properties of signal & systems and LTI systems.*
2. *Apply Fourier series to represent periodic signals.*
3. *Represent signals in continuous and discrete time Fourier transform.*
4. *Analyze the sampling theorem and characterize signals & systems in time & frequency domain.*
5. *Analyse the stability of systems by applying Laplace transform.*
6. *Analyse the stability of systems by applying Z transform.*

UNIT I

Signals and Systems : Continuous and Discrete Time Signals, Transformations of the Independent Variable, Elementary Signals-Unit Impulse, Unit Step Functions, Ramp Signal, Rectangular function, Signum Function, Sinc& Sa Function, Exponential and Sinusoidal Signals, Classification of Signals & Systems, Continuous and Discrete Time Systems, Basic System Properties, Linear Time Invariant (LTI) Systems, Discrete-Time LTI Systems, Convolution Sum, Continuous Time LTI Systems, Convolution Integral, Properties of LTI Systems, Causal LTI Systems described by Differential and Difference Equations, Singularity Functions.

UNIT II

Fourier series representation of periodic signals: Response of LTI Systems to Complex Exponentials. Fourier Series Representation of Continuous Time Periodic Signals, Trigonometric, Polar, Exponential fourier Series & related problems, Convergence of the Fourier Series, Properties of Continuous Time Fourier Series, Fourier Series Representation of Discrete Time Periodic Signals, Properties of Discrete Time Fourier Series, Fourier Series and LTI Systems.

UNIT II

The Continuous-Time Fourier Transform: Representation of aperiodic Signals, Continuous Time Fourier Transform, Fourier Transform for Periodic Signals, Properties of the Continuous Time Fourier Transform, Systems characterized by Linear constant coefficient differential equations, Discrete Time Fourier Transform - Representation of Aperiodic Signals, Discrete Time Fourier Transform, Frequency Response, Systems Characterized by Linear Constant-Coefficient Difference Equations.

UNIT IV

Time & Frequency Characterization of Signals and Systems : The Magnitude Phase Representation of the Fourier Transform, Magnitude Phase Representation of the Frequency Response of LTI Systems, Time-Domain Properties of Ideal Frequency Selective Filters, Time Domain and Frequency Domain Aspects of Non-ideal Filters, Examples of Continuous time filters and Discrete time filters described by differential equations, First-Order and Second-Order Continuous and Discrete-Time Systems, Examples of Time and Frequency Domain Analysis of Systems, **Sampling**: Representation of a Continuous Time Signal by Its Samples, Sampling Theorem, Reconstruction of a Signal from Its Samples Using Interpolation, Effect of under sampling: Aliasing, Discrete Time Processing of Continuous-Time Signals.

UNIT V

Laplace and z-Transforms : The Laplace Transform, Region of Convergence for Laplace Transforms, Inverse Laplace Transform, Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot, Properties of the Laplace Transform, Some Laplace Transform Pairs, Analysis and Characterization of LTI Systems Using the Laplace Transform, System Function Algebra and Block Diagram Representations, Unilateral Laplace Transform, Z-Transform - Region of Convergence for the z-Transform, Inverse z-Transform, Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot, Properties of the z-Transform, Some Common z-Transform Pairs, Analysis and Characterization of LTI Systems Using z-Transforms, System Function Algebra and Block Diagram Representations, Unilateral z-Transforms

TEXT BOOKS:

1. *Signals and Systems, Alan V. Oppenheim, Alan S. Willsky, & S. Hamid, 2nd Edition, Pearson Higher Education, 1997.*
2. *Principles of Linear Systems and Signals, B.P. Lathi, 2nd Edition, Oxford University Press,2011.*

REFERENCE BOOKS:

1. *Signals & Systems, Simon Haykin and B. Van Veen, 2nd Edition, John Wiley, 2003.*
2. *Signals and systems, Narayana Iyer and K Satya Prasad, 1st Edition, CENGAGE Learning,2011.*

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

III B. Tech. – I Sem.

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(23EE0220) ELECTRICAL SAFETY AND RISK MANAGEMENT
(Professional Elective -I)

COURSE OBJECTIVE:

1. *Learn the basics of electrical safety, types of electric shocks, and how to prevent accidents in homes, workplaces, and industrial areas.*
2. *Understand how to safely install and handle electrical equipment, including using safety gear and following proper procedures.*
3. *Know the importance of earthing and grounding to protect people and equipment from electrical faults.*
4. *Learn about safety rules, laws, and management practices, including the Indian Electricity Rules and the Electricity Act, 2003, to follow safety standards at all levels.*

COURSE OUTCOMES:

At the end of the course the student shall be able to

1. *Explain the objectives and precautions of Electrical Safety, effects of Shocks and their Prevention.*
2. *Summarize the Safety aspects during Installation of Plant and Equipment.*
3. *Describe the electrical safety in residential, commercial and agricultural installation*
4. *Describe the various Electrical Safety in Hazardous Areas, Equipment Earthing and System neutral earthing.*
5. *Explain the principles and importance of safety management in electrical systems.*
6. *Analyze the legal and safety implications of compliance with IE Rules and Acts in Real-world electrical systems.*

UNIT-I

Introduction to Electrical Safety, Shocks and Their Prevention:

Terms and definitions, objectives of safety and security measures, Hazards associated with electric current and voltage, who is exposed, principles of electrical safety, Approaches to prevent Accidents, scope of subject electrical safety. Primary and secondary electrical shocks, possibilities of getting electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over‘s, prevention of shocks, safety precautions against contact shocks, flash shocks, burns, residential buildings and shops.

UNIT-II

Safety During Installation of Plant and Equipment:

Introduction, preliminary preparations, preconditions for start of installation work, during, risks during installation of electrical plant and equipment, safety aspects during installation, field quality and safety during erection, personal protective equipment for erection personnel, installation of a large oil immersed power transformer, installation of outdoor switchyard equipment, safety during installation of electrical rotating machines, drying out and insulation resistance measurement of rotating machines.

UNIT-III

Electrical Safety In Residential, Commercial and Agricultural Installations:

Wiring and fitting – Domestic appliances – water tap giving shock – shock from wet wall – fan firing shock – multi-storied building – Temporary installations – Agricultural pump installation – Do‘s and Don‘ts for safety in the use of domestic electrical appliances.

UNIT-IV

Electrical Safety in Hazardous Areas: Hazardous zones – class 0,1 and 2 – spark, flashovers and corona discharge and functional requirements – Specifications of electrical plants, equipments for hazardous locations – Classification of equipment enclosure for various hazardous gases and vapours – classification of equipment/enclosure for hazardous locations.

Equipment Earthing and System Neutral Earthing: Introduction, Distinction between system grounding and Equipment Grounding, Equipment Earthing, Functional Requirement of earthing system, description of a earthing system, , neutral grounding(System Grounding), Types of Grounding, Methods of Earthing Generators Neutrals.

UNIT-V

Safety Management of Electrical Systems:

Principles of Safety Management, Management Safety Policy, Safety organization, safety auditing, Motivation to managers, supervisors, employees.

Review of IE Rules and Acts and Their Significance: Objective and scope – ground clearances and section clearances – standards on electrical safety - safe limits of current, voltage –Rules regarding first aid and fire fighting facility.

The Electricity Act, 2003, (Part1, 2, 3,4 & 5)

TEXT BOOKS:

1. *S. Rao, Prof. H.L. Saluja, Electrical safety, fire safety Engineering and safety management, Khanna Publishers. New Delhi, 1988.*

REFERENCE:

1. *Pradeep Chaturvedi, "Energy management policy, planning and utilization", Concept Publishing company, New Delhi, 1997.*

ONLINE LEARNING RESOURCE:

1. *www.apeasternpower.com/downloads/elecact2003.pdf*

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR

(AUTONOMOUS)

III B. Tech. – I Sem.

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(23EE0221) UTILIZATION OF ELECTRICAL ENERGY
(Professional Elective -I)

COURSE OBJECTIVE:

1. *To present the basic concepts on utilization of electrical energy on various applications.*
2. *To study the basic principles of light control and types of light schemes.*
3. *To study about the various characteristics of electrical drives and to select the particular electrical drive for the given application.*
4. *To provide knowledge on electrical traction.*

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. *Apply the appropriate electric drives for various industrial applications.*
2. *Understand the different types of heating and welding techniques.*
3. *Design an illumination system for the proper lighting system.*
4. *Understand the basic principle and different braking techniques of electric traction.*
5. *Understand the basic principle and applications of the electrolytic process.*
6. *Explain the processes involved in the extraction and refining of metals using electrolysis.*

UNIT I

Electric Drives:

Type of electric drives – rating and choice of motor - starting and running characteristics – particular applications of electric drives - types of industrial loads - Continuous - intermittent and variable loads.

UNIT II

Electric Heating & Welding:

Introduction: Advantages and methods of electric heating - resistance heating - induction heating and dielectric heating.

Electric welding: Classification- resistance and arc welding - electric welding equipment - comparison between AC and DC Welding.

UNIT III

Illumination:

Introduction - terms used in illumination - laws of illumination - sources of light. Discharge lamps – mercury vapor and sodium vapor lamps–comparison between tungsten filament lamps and fluorescent tubes–compact fluorescent lamp–LED-Basic principles of light control-Types and design of good lighting system and practice - flood lighting.

UNIT IV

Electric Traction:

Traction systems: System of electric traction and track electrification - Review of existing electric traction systems in India - Special features of traction motor - Speed-time curves for different services - methods of electric braking - plugging - rheostatic braking - regenerative braking. Introduction to Magnetic Levitation vehicles.

UNIT V

Electrolytic Process:

Introduction - Basic principles - Faradays laws of electrolysis - Energy efficiency – Electrodeposition -Factors governing deposition Processes - Deposition of Alloys – Extraction and refining of metals. Fuel Cells.

Text Books:

1. *C.L Wadhwa, Generation Distribution and Utilization of Electrical Energy, New age International Publishers.*
2. *J. B. Gupta, Utilization of Electrical Power and Electric Traction, S. K. Kataria and sons, 2002.*
3. *G. C. Garg (2005), Utilization of Electrical Power & Electric traction, 8th edition, Khanna publishers, New Delhi.*
4. *N. V. Suryanarayana, Utilization of Electrical Power including Electric drives and Electric traction, New Age International (P) Limited, Publishers, 1996.*

Reference Books:

1. *Partab, Art & Science of Utilization of electrical Energy, 2nd edition, Dhanpat Rai & Sons, New Delhi.*
2. *Openshaw Taylor, Utilization of Electric Energy, Orient Longman,1971.*

Online Learning Resources:

1. https://nptel.ac.in/courses/108105060
2. https://nptel.ac.in/courses/112105221
3. https://vssut.ac.in/lecture_notes/lecture1426861925.pdf
4. https://vpmpee.wordpress.com/uee-3340903/

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

III B. Tech. – I Sem.

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(23EE0222) POWER ELECTRONICS LAB
(Professional Core)

COURSE OBJECTIVES:

1. *To analyze various characteristics of power electronic devices with gate firing circuits.*
2. *To learn the operation of single-phase half & fully-controlled converters with different types of loads.*
3. *To acquire practical knowledge about the operation of various inverters with different types of loads.*
4. *To understand the Different Commutation Techniques.*

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. *Analyze the Characteristics of Power Semiconductor Devices and their Role in Power Converters.*
2. *Design and Implement Gate Firing Circuits for SCR-based Power Converters.*
3. *Evaluate the Performance of Single-phase and Three-phase Power Converters with R and RL Loads.*
4. *Apply Different Commutation Techniques to Analyze Inverter for Efficient Power Control.*
5. *Analyze and demonstrate the operation of single-phase cycloconverters with resistive and inductive loads.*
6. *Analyze the operation of a single-phase dual converter with RL loads.*

Choose Any Ten From The Following List:

1. Study of Characteristics of SCR, MOSFET & IGBT.
2. Gate firing circuits for SCR's: (a) R triggering (b) R-C triggering.
3. Single Phase AC Voltage Controller with R and RL Loads.
4. Single Phase fully controlled bridge converter with R and RL loads
5. Forced Commutation circuits (Class A, Class B, Class C, Class D & Class E).
6. DC Jones chopper with R and RL Loads.
7. Single Phase Parallel inverter with R and RL loads.
8. Single Phase Cycloconverter with R and RL loads.
9. Single Phase Half controlled converter with R and RL load.
10. Single Phase Fully controlled converter with R and RL load.

11. Three Phase half-controlled bridge converter with R, RL-load.
12. Three Phase fully controlled bridge converter with R, RL-load.
13. Single Phase series inverter with R and RL loads.
14. Single Phase Bridge converter with R and RL loads.
15. Single Phase dual converter with RL loads.

References:

1. *O.P. Arora, Power Electronics Laboratory: Theory, Practice and Organization (Narosa series in Power and Energy Systems), Alpha Science International Ltd., 2007.*
2. *M. H. Rashid, Simulation of Electric and Electronic circuits using PSPICE, M/s PHI Publications.*
3. *PSPICE A/D user's manual Microsim, USA.*
4. *PSPICE reference guide Microsim, USA. 5. MATLAB and its Tool Books user's manual and Math works, USA.*

Online Learning Resources/Virtual Labs:

1. http://vlabs.iitb.ac.in/vlabs-ev/labs/mit_bootcamp/power_electronics/labs/index.php

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B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR

(AUTONOMOUS)

III B. Tech. – I Sem.

L	T	P	C
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(23EC0449) ANALOG AND DIGITAL CIRCUITS LAB

(Professional Core)

COURSE OBJECTIVES:

The objectives of this course

1. *To study the characteristics and applications of semiconductor diodes and transistors.*
3. *To design and analyze rectifiers, amplifiers, and oscillator circuits.*
4. *To implement basic Op-Amp applications. and implement combinational and sequential logic circuits.*
5. *To utilize universal gates for logic circuit realization and clock generation.*
6. *To design and implement essential digital components like adders, multiplexers, flip-flops, encoders, and decoders.*

COURSE OUTCOMES:

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

1. *Interpret the characteristics of diodes and transistors for circuit design.*
2. *Demonstrate the input-output characteristics of various transistor configurations (CB, CE, CC) and analyze the performance of BJT-based amplifiers*
3. *Construct and evaluate rectifiers, amplifiers, and oscillator circuits.*
4. *Implement basic Op-Amp applications, combinational and sequential circuits using logic gates.*
5. *Design digital systems using universal gates, multiplexers, and comparators.*
6. *Develop and realize fundamental digital components such as adders, converters, flip-flops, encoders, and decoders*

ANALOG CIRCUITS List of Experiments: (Any 06 Experiments are to be conducted)

1. CB Characteristics
2. CE Characteristics
3. CE Amplifier
4. CC Amplifier
5. Clippers
6. Clampers
7. Hartley & Colpitt‘s Oscillators.
8. RC Phase shift oscillator
9. Astable multivibrator

10. Monostable multivibrator
11. A to D Convertor
12. D to A Convertor
13. Op-Amp Applications-Adder, subtractor, comparator

DIGITAL CIRCUITS List of Experiments: (Any 6 Experiments are to be conducted)

1. Realization of Boolean Expressions using Gates
2. Design and realization of logic gates using universal gates
3. Generation of clock using NAND / NOR gates
4. Design a 4 – bit Adder / Subtractor
5. Design and realization of a 4 – bit Gray to Binary and Binary to Gray Converter
6. Design and realization of 8x1 MUX using 2x1 MUX
7. Design and realization of 4 bit comparator
8. Design and realization of Flip-Flops.
9. Design and realization of Encoders
10. Design and realization of Decoders
11. Design and realization of Comparator.

R23

B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR

(AUTONOMOUS)

III B. Tech. – I Sem.

L	T	P	C
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(23HS0818) SOFT SKILLS

PRE-REQUISITE

COURSE OBJECTIVES:

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:

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

UNIT – I Soft Skills & Communication Skills Lecture Hrs

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 Lecture Hrs

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** **Lecture Hrs**

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** **Lecture Hrs**

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** **Lecture Hrs**

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.

PRESCRIBED BOOKS:

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*

REFERENCE BOOKS

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. 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_j2PUy0pwjVUgj7 KlJ**
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)

III B. Tech. – I Sem.

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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 the course are to

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

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.

Course Outcomes: The students will be able 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) Demonstrate a traffic light circuit using breadboard.
3) Build and demonstrate automatic Street Light using LDR.
4) Simulate the Arduino LED blinking activity in Tinkercad.
5) Build and demonstrate an Arduino LED blinking activity using Arduino IDE.
6) Interfacing IR Sensor and Servo Motor with Arduino.
7) Blink LED using ESP32.
8) LDR Interfacing with ESP32.
9) Control an LED using Mobile App.
10) Design and 3D print a Walking Robot
11) Design and 3D Print a Rocket.
12) Build a live soil moisture monitoring project, and monitor soil moisture levels of a remote plan in your computer dashboard.
13) Demonstrate all the steps in design thinking to redesign a motor bike.

Students need to refer to the following links:

ONLINE LEARNING RESOURCES:

1) https://aim.gov.in/pdf/equipment-manual-pdf.pdf
2) https://atl.aim.gov.in/ATL-Equipment-Manual/
3) https://aim.gov.in/pdf/Level-1.pdf
4) https://aim.gov.in/pdf/Level-2.pdf
5) https://aim.gov.in/pdf/Level-3.pdf

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

III B. Tech. – I Sem.

L	T	P	C
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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):

Upon 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 Building: 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 Modeling, 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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

III B. Tech. – I Sem.

L	T	P	C
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(23CE0151) CONSTRUCTION TECHNOLOGY AND MANAGEMENT
(OPEN ELECTIVE-I)

COURSE OBJECTIVES

The objectives of this course is to

1. *Understand project management fundamentals, organizational structures, and leadership principles in construction.*
2. *Analyze 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)

Upon 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 forLabour, 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.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

III B. Tech. – I Sem.

L	T	P	C
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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 PVmodules*
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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

III B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(23EC0406) ELECTRONIC CIRCUITS
(Open Elective –I)

COURSE OBJECTIVES:
The objectives of this course

1. *To understand semiconductor diodes, their characteristics and applications.*
2. *To explore the operation, configurations, and biasing of BJTs.*
3. *To study the operation, analysis, and coupling techniques of BJT amplifiers.*
4. *To learn the operation, applications and uses of feedback amplifiers and oscillators.*
5. *To analyze the characteristics, configurations, and applications of operational amplifiers.*

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

1. *Explain the operation and characteristics of PN junction diodes and special-purpose diodes such as Zener, Tunnel, LED, Varactor, and Photodiode.*
2. *Analyze the behavior of rectifier circuits (half-wave, full-wave, and bridge) with and without filters, and describe clipping and clamping circuits.*
3. *Demonstrate the operation of Bipolar Junction Transistors in different configurations and evaluate suitable biasing techniques for amplifier stability.*
4. *Compare the performance of single and multistage amplifiers using different coupling methods and analyze the simplified hybrid model in CE, CB, and CC configurations.*
5. *Classify feedback amplifiers and oscillators, and construct basic RC and LC oscillator circuits to meet required oscillation conditions.*
6. *Apply operational amplifier concepts to design and implement analog signal processing applications such as summing amplifiers, integrators, differentiators, and comparators.*

UNIT-I

Semiconductor Diode and Applications: Introduction, PN junction diode – structure, operation and VI characteristics, Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Positive and Negative Clipping and Clamping circuits (Qualitative treatment only).

Special Diodes: Zener and Avalanche Breakdowns, VI Characteristics of Zener diode, Zener diode as voltage regulator, Construction, operation and VI characteristics of Tunnel Diode, LED, Varactor Diode, Photo Diode .

UNIT-II

Bipolar Junction Transistor (BJT): Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch and Amplifier, Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self Bias, Bias Stability, Bias Compensation using Diodes.

UNIT-III

Single stage amplifiers: Classification of Amplifiers - Distortion in amplifiers, Analysis of CE, CC and CB configurations with simplified hybrid model.

Multistage amplifiers: Different Coupling Schemes used in Amplifiers - RC coupled amplifiers, Transformer Coupled Amplifier, Direct Coupled Amplifier; Multistage RC coupled BJT amplifier (Qualitative treatment only).

UNIT-IV

Feedback amplifiers: Concepts of feedback, Classification of feedback amplifiers, Effect of feedback on amplifier characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations (Qualitative treatment only).

Oscillators: Classification of oscillators, Condition for oscillations, RC Phase shift Oscillators, Generalized analysis of LC Oscillators-Hartley and Colpitts Oscillators, Wien Bridge Oscillator.

UNIT-V

Op-amp: Classification of IC‘S, basic information of Op-amp, ideal and practical Op-amp, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.

Applications of op-amp : Summing, scaling and averaging amplifiers, Integrator, Differentiator, phase shift oscillator and comparator.

TEXT BOOKS:

1. Electronics Devices and Circuits, J.Millman and Christos. C. Halkias, 3rd edition, Tata McGraw Hill, 2006.
2. Electronics Devices and Circuits Theory, David A. Bell, 5th Edition, Oxford University press. 2008.

REFERENCES:

1. Electronics Devices and Circuits Theory, R.L.Boylestad, LousisNashelsky and K.Lal Kishore, 12th edition, 2006, Pearson, 2006.
2. Electronic Devices and Circuits, N.Salivahanan, and N.Suresh Kumar, 3rd Edition, TMH, 2012
3. Microelectronic Circuits, S.Sedra and K.C.Smith, 5th Edition, Oxford University Press.

R23	B.Tech-EEE

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(AUTONOMOUS)

III B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(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 Class-Object 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 Auto-unboxing, 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.

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

TEXTBOOKS

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

REFERENCES

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_012880464547618816347_shared/overview*

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

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

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

COURSE OBJECTIVES:
The objectives of this course

1. *To learn the distinction between optimal reasoning Vs. human like reasoning.*
2. *To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.*
3. *To learn different knowledge representation techniques.*
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 BOOK:

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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III B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(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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(AUTONOMOUS)

III B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(23HS0855) MATHEMATICS FOR MACHINE LEARNING AND AI
(OPEN ELECTIVE I)

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)

After 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).

TEXTBOOKS:

1. *Mathematics for Machine Learning by Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Cambridge University Press, 2020.*
2. *Pattern Recognition and Machine Learningby Christopher Bishop, Springer.*

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*
2. *https://ocw.mit.edu*
3. *Stanford CS229 – Machine Learning Course*
4. *https://cs229.stanford.edu/*
5. *DeepAI – Mathematical Foundations for AI*
6. *https://deepai.org*

R23 | B.Tech-EEE

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

(23HS0842) MATERIALS CHARACTERIZATION TECHNIQUES
(OPEN ELECTIVE-I)

COURSE OBJECTIVES

1. *To provide exposure to different characterization techniques.*
2. *To explain the basic principles and analysis of different spectroscopic techniques.*
3. *To elucidate the working of Scanning electron microscope - Principle, limitations and applications.*
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)

After the completion of the course student should 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, 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.

TEXTBOOKS:

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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III B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(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 liquification 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.*
2. *Apply fuel technology in various energy and engineering contexts.*
3. *Analyze the design and working mechanisms and applications of photoelectrochemical cells.*
4. *Analyze the advantages of photoelectric catalytic process such as high efficiency, low environmental impact and renewable energy applications.*
5. *Apply the electrochemical principles to photo voltaic cell, solar power and solar cells.*
6. *Analyze various methods for storage of hydrogen fuel.*

UNIT-I

Electrochemical Systems: Galvanic cell, Electrolyte-types,Reference electrode, standard electrode potential, application of EMF, electrical double layer, polarization, Batteries-Introduction, Lead-Acid, Nickel-Cadmium, Nickel-Metal Hydride 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 fuel value and applications, 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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(AUTONOMOUS)

III B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(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*

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

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

(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.*
5. *To enhance the ability of analyzing Customer and Market segmentation, estimate Market size, develop and validate Customer Persona*

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.

Textbooks:

1. *Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha .*
2. *Entrepreneurship, McGrawHill, 11th Edition.(2020)*
3. *Ries, E. The Lean Startup: How Today's Entrepreneurs Use Continuous*
4. *Innovation to Create Radically Successful Businesses. Crown Business,(2011).*
5. *Osterwalder, A., & Pigneur, Y. Business Model Generation: A Handbook for*
6. *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*
3. *Transforms Organizations and Inspires Innovation, Harper Business.(2019)*
4. *Namita Thapar (2022) The Dolphin and the Shark: Stories on Entrepreneurship, PenguinBooks Limited*
5. *Saras D. Sarasvathy, (2008) Effectuation: Elements of Entrepreneurial Expertise, Elgar Publishing Ltd.*

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

III B. Tech. – II Sem.

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(23EE0224) ELECTRICAL MEASUREMENTS AND INSTRUMENTATION
(Professional Core)

COURSE OBJECTIVES

The objectives of this course

1. *To study about the working principle of electrical measuring instruments*
2. *To study the performance of instrumental transformers, power factor,*
3. *frequency and energy meters To study the functioning of DC and AC bridges*
4. *To study the basics of digital volt meters and transducers*
5. *To understand the concept of sensors and data acquisition systems*

COURSE OUTCOMES (COs)

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

1. *Understand principle and working of electrical measuring instruments*
2. *Understand the principle of operation of instrument transformers, energy meters and analog instruments*
3. *Understand the principle and working of various DC and AC bridges for the measurement of Resistance, Inductance and Capacitance.*
4. *Understand the principle and working of different digital voltmeters and transducers.*
5. *Understand the working of various sensors and data acquisition systems.*
6. *Understand the operation of several types of transducers.*

UNIT I

Measuring instruments & Digital Meters:

Fundamentals: True Value, Errors (Gross, Systematic, Random); Static Characteristic of Instruments (Accuracy, Precision, Sensitivity, Resolution & threshold); Error Analysis-Simple problems; Statistical treatment of data-Simple problems.

Indicating Instruments: Three forces in Electromechanical indicating instrument (Deflecting, controlling & damping forces); Moving iron type (attraction and repulsion), PMMC, Electrodynamometer Type instruments: Torque equation (Expression only, no derivation), shape of scale – simple problems on torque equations; Measurement of voltage and current - Extension of Range of ammeter and voltmeter – problems on extension of range of ammeter and voltmeter.

UNIT II

Measurement Of Power, Power Factor And Energy:

Instrument transformers: Types, CT and PT – Ratio and phase angle errors; (Expression only, no derivation)

Measurement of power: Principle and Operation of Single-phase dynamometer wattmeter, expression (Expression only no derivation) for deflecting and control torques, errors and compensations.
Measurement of Energy: Principle and Operation of Single phase induction type energy meter, driving and braking torques (expression only no derivation), errors and compensations, testing by phantom loading.

UNIT III

Measurement of Resistance: Methods of measuring low, medium and high resistances – Sensitivity of Whetstone's bridge– Kelvin's double bridge for Measuring low resistance, Megger for measurement of high resistance.
Measurement of Inductance: - Maxwell's bridge, Anderson's bridge.
Measurement of Capacitance: De Sauty bridge. Wien's bridge–Scheringbridge–Numerical problems.

UNIT IV
Digital Volt Meters And Transducers:
Digital Voltmeters: Ramp type, Dual Slope integrating type, successive approximation, Potentiometric type DVMs.
Classification of transducers: Active/passive, analog/digital- Strain Gauge-gauge factor (Elementary treatment only)-applications of strain gauge, Q-Meter.

UNIT V
Transducers, Sensors and Data Acquistion:
Definition of Transducers, Classification of Transducers, Advantages of Electrical Transducers, Characteristics and Choice of Transducers; Principle Operation of Resistor, Inductor and Capacitive Transducers; LVDT and its Applications, Strain Gauge and Its Principle of Operation, Gauge Factor, Thermistors, Thermocouples, Piezo Electric Transducers, Photo electric Transducers, Hall effect, Photo Diodes. Optocoupler.

Silicon based micro sensors: Pressure sensor, Gyro sensor, Accelerometer, Flow sensor, Proximity sensor, Temperature sensor, Humidity sensor. (Elementary treatment only)

Introduction to PLC and SCADA Systems: Data acquisition systems (DAS) and interfacing techniques.

TEXT BOOKS:

1. Electrical & Electronic Measurement & Instruments by A.K. Sawhney Dhanpat Rai & Co. Publications, 2021.
2. Electrical Measurements and measuring Instruments–by E.W.Golding and F.C. Widdis, 5th Edition, Reem Publications, 2011.
3. Buckingham and Price, ―Electrical Measurements‖, Prentice – Hall

REFERENCE BOOKS:

1. Electronic Instrumentation by H.S.Kalsi,Tata Mcgrawhill, 3rd Edition, 2016.
2. Electrical Measurements: Fundamentals, Concepts, Applications–by Reissl and, M.U, New Age International (P) Limited, 2010.
3. Electrical & Electronic Measurement & Instrumentation by R.K.Rajput, 2nd Edition, S. Chand & Co., 4th Edition, 2016.
4. Sensor Technology: Hand Book by JonS. Wilson, ELSEVIER publications,2005

ONLINE LEARNING RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_ee112/preview

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III B. Tech. – II Sem.

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(23EC0414) MICROPROCESSORS AND MICROCONTROLLERS
(Professional Core)

COURSE OBJECTIVES

The objectives of this course

1. *To comprehend the architecture, operation, and configurations of the 8086 microprocessors.*
2. *To get familiar with 8086 programming concepts, instruction set, and assembly language development tools.*
3. *To study the interfacing of 8086 with memory, peripherals, and controllers for various applications.*
4. *To learn the architecture, instruction set, and programming of the 8051 microcontrollers.*
5. *To understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.*

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

Textbooks:

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rdEdition,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. – II Sem.

L	T	P	C
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(23EE0225) POWER SYSTEM ANALYSIS

(Professional Core)

COURSE OBJECTIVES

The objectives of this course

1. *The use of per unit values and graph theory concepts, solving a problem using computer.*
2. *Formation of Ybus and Zbus of a Power System network, power flow studies by various methods.*
3. *Different types of faults and power system analysis for symmetrical and also unsymmetrical faults.*
4. *Analysis of power system for steady state and transient stability and also methods to improve stability*

COURSE OUTCOMES (COs)

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

1. *Remember and understand the concepts of per unit values, Y Bus and Z bus formation, load flow studies, symmetrical and unsymmetrical fault calculations.*
2. *Apply the concepts of good algorithm for the given power system network and obtain the converged load flow solution and experiment some of these methods using modern tools and examine the results.*
3. *Analyze the symmetrical faults and unsymmetrical faults and done the fault calculation,*
4. *Analyze the stability of the system and improve the stability.*
5. *Demonstrate the use of these techniques through good communication skills*
6. *Understand equal area criterion and its applications*

UNIT I

PER-UNIT System and Ybus Formation:

Per-Unit representation of Power system elements - Per-Unit equivalent reactance network of a three phase Power System - Graph Theory: Definitions, Bus Incidence Matrix, YBus formation by Direct and Singular Transformation Methods, Numerical Problems.

UNIT II

Formation of Zbus:

Formation of ZBus: Partial network, Algorithm for the Modification of ZBus Matrix for addition element for the following cases: Addition of element from a new bus to reference, Addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old busses - Modification of ZBusfor the changes in network.

UNIT III

Power Flow Analysis:

Static load flow equations – Load flow solutions using Gauss Seidel Method: Algorithm and Flowchart. Acceleration Factor, Load flow Solution for Simple Power Systems (Max. 3-Buses): Newton Raphson Method in Polar Co-Ordinates Form: Load Flow Solution- Jacobian Elements, Algorithm and Flowchart. Decoupled and Fast Decoupled Methods.- Comparison of Different Methods

UNIT IV

Short Circuit Studies:

Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors. Symmetrical Component Theory: Positive, Negative and Zero sequence components, Positive, Negative and Zero sequence Networks. Symmetrical Fault Analysis: LLLG faults with and without fault impedance, Unsymmetrical Fault Analysis: LG, LL and LLG faults with and without fault impedance, Numerical Problems.

UNIT V

Stability Analysis:

Elementary concepts of Steady State, Dynamic and Transient Stabilities. Derivation of Swing Equation, Power Angle Curve and Determination of Steady State Stability. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation. Numerical methods for solution of swing equation - Methods to improve Stability - Application of Auto Reclosing and Fast Operating Circuit Breakers.

Textbooks:

1. Computer Methods in Power System Analysis by G.W.Stagg and A.H.El-Abiad, Mc Graw-Hill, 2022.
2. Modern Power system Analysis by I.J.Nagrath&D.P.Kothari, Tata McGraw-Hill Publishing Company, 4th Edition, 2011.

Reference Books:

1. Power System Analysis by Grainger and Stevenson, McGraw Hill, 1994.
2. Power System Analysis by Hadi Saadat, McGraw Hill, 1998.
3. Power System Analysis and Design by B.R.Gupta, S. Chand & Company, 2011.

Online Learning Resource:

https://onlinecourses.nptel.ac.in/noc22_ee120/preview

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III B.Tech.– II Sem.

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(23EE0226) AI & ML for ELECTRICAL ENGINEERING
(Professional Elective-II)

COURSE OBJECTIVES
The objectives of this course

1. *The course introduces AI/ML applications in electrical and electronics engineering, focusing on predictive maintenance.*
2. *Students will learn about machine learning models, neural networks, and fuzzy logic techniques to improve system efficiency.*

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

1. *Understanding the Basics and Architecture of Artificial Intelligence*
2. *Analyzing and Applying Artificial Neural Networks (ANN) Concepts*
3. *Implementing ANN Applications in Real-World Problems*
4. *Understanding and Applying Fuzzy Logic Concepts*
5. *Designing and Implementing Fuzzy Logic Applications*
6. *Applications of AI& ML in power systems analysis.*

UNIT I
Introduction to Artificial Intelligence:
Introduction and motivation - Approaches to AI - Architectures of AI - Symbolic Reasoning System - Rule based Systems - Knowledge Representation - Expert Systems.

UNIT II
Overview of Machine Learning:
The Motivation & Applications of Machine Learning: Learning Associations, Classification, Regression; Supervised Learning; Unsupervised Learning; Reinforcement Learning; Gradient Descent: Batch Gradient Descent, Stochastic Gradient Descent; Data pre processing; Under fitting and Overfitting issues

UNIT III
Artificial Neural Networks:
Basics of ANN - Comparison between Artificial and Biological Neural Networks - Basic Building Blocks of ANN - Artificial Neural Network Terminologies - McCulloch Pitts Neuron

Model - Learning Rules - ADALINE and MADALINE Models - Perceptron Networks (Continuous and Discrete) – Perceptron Convergence Theorem - Back Propagation Neural Networks - Associative Memories – BAM and Hopfield networks.

UNIT IV

Fuzzy Logic:

Classical Sets - Fuzzy Sets - Fuzzy Properties, Operations and relations - Fuzzy Logic System - Fuzzification - Defuzzification - Membership Functions - Fuzzy Rule base - Fuzzy Logic Controller Design.

UNIT V

Applications of AI Techniques:

Load forecasting, Load flow studies, Economic load dispatch, Speed control of DC Motor, Speed Control of Induction Motors.

Text Books:

1. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Neural Networks using MATLAB", McGraw Hill Edition, 2006.
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", Third Edition, WILEY India Edition, 2012.
3. Ethem Alpaydin, ―Introduction to Machine Learning‖, MIT Press, 3rd edition, 2014
4. Russell. S and Norvig. P, ―Artificial Intelligence - A Modern Approach‖, 4 th edition, Pearson, 2022

References:

1. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Fuzzy Logic using MATLAB", Springer International Edition, 2013.
2. Yung C. Shin and Chengying Xu, "Intelligent System - Modeling, Optimization & Control, CRC Press, 2009.
3. Kevin P. Murphy, ―Machine Learning: A Probabilistic Perspective‖, MIT Press, 2012

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III B.Tech. – II Sem.

L	T	P	C
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(23EE0227) PROGRAMMABLE LOGIC CONTROLLERS
(Professional Elective-II)

COURSE OBJECTIVES

The objectives of this course

1. *Understand the basic functions and types of PLCs, Easy Veep software, its applications*
2. *Understand Classification of PLCs and applications*
3. *Design PLC Programming for various applications*
4. *Analyze PLC Troubleshooting aspects.*

COURSE OUTCOMES (COs)

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

1. *Understand different types of PLCs, Its classification and the usage of Easy Veep software*
2. *Analyze the hardware details of Allen Bradley PLC*
3. *Design PLC Programming for various applications*
4. *Apply PLC programming concepts in different fields of Science and Technology*
5. *Develop Instruction using ADD and SUB functions, UP and Down counters*
6. *Analyze the analog operation of PLC and demonstrate the various applications with PLC.*

UNIT I

Basic functions of PLCs, Mechanical relays versus PLC, Different types of PLC's – Allen-Bradley – Micrologix: ML1000, ML1100, SLC500, Compact Logix, Mitsubishi FX series, HMI's, Processor and I/O cards

UNIT II

PLC Computational Tool:

Introduction to Easy Veep software, Link between mechanical, electrical and programming documentation, Logic diagrams, Flip-Flop Logic, M8000, M8001 internal bits interpretation, Binary code, data table, manipulation and search engine in Mitsubishi environment Communication between PC and PLC, Communication between PC and HMI, PLC and HMI Serial Local network, Introduction to SLC500

UNIT III

PLC Development:

PLC software and applications, Boolean algebra – understanding binary code, ADD and SUB functions, UP and Down Counters, Introduction to k1Y0, MOV function, CPR and ZCP functions, SHWT and SHRD instructions, Introduction to Absolutely Drum Instruction.Allen Bradley PLC: Introduction to Rockwell Software, Hardware focus, Hardware considerations (Field wiring, Master Control Relay, VFD), Basic programming and applications, Cascade control – subroutine, Different programs.

UNIT IV

PLC Programming:

Programming instructions: Instructions and binary interpretation, Bit Instruction, Timers and counters, Comparison instructions, Programming Instructions - Math instructions, Move and Logical Instructions, Discussions of programming, communications for PLC-Robotic arm, Exercise of setup and monitoring.

UNIT V

Applications:

Analog and Digital parameters by using SLC5/03-VFD-Panel Mate series 1700, Practical Troubleshooting, troubleshooting technique, Control system stability and tuning basics. Applications: Process to rewind, test, and integrate with extrusion process for wiring and fibre optic industries, Food industry – yeast, flour distribution and control. Process Medical equipment Industry – Gas analyzer, Leak tester (using CO_2), plastic wrapping machines etc.

Textbooks:

1. Automating manufacturing systems with PLCs by Hugh Jack, 2010.
2. PLC Hand Book (Automationdirect Siemens)

Reference Books:

1. Programmable Logic Controllers by R. Bliesener, F Ebel, Festo. Didactic publishers, 2002.
2. Programmable Logic Controllers by W. Bolton, 4th Edition, Newnes, 2006.
3. Introduction to PLCs by Jay F. Hooper, 2nd Edition, Carolina Academic Press, 2006.

Online Learning Resources:

https://nptel.ac.in/courses/108105088

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

III Year B.Tech. II Semester

L	T	P	C
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(23EE0228) SWITCHGEAR AND PROTECTION
(Professional Elective - II)

COURSE OBJECTIVES

The objectives of this course

1. *The study of different Circuit Breakers and Relays.*
2. *The protection of Generators and Transformers.*
3. *To discuss the causes of abnormal operating conditions (faults, lightning and switching surges) of the apparatus and system.*
4. *The protection of various feeder bus bars from abnormal conditions and over voltages & importance on neutral grounding for overall protection.*

COURSE OUTCOMES (COs)

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

1. *Understand the operation of different circuit breakers and their specifications.*
2. *Analyze the concepts of different relays which are used in real time power system operation.*
3. *Apply various protective schemes for Transformers, Rotating machines.*
4. *Explain different protective schemes u s e d for Bus bars and Feeders.*
5. *Understand the methods of protection against over voltages and importance of neutral grounding.*
6. *Ability to understand over voltage protection.*

UNIT I

Circuit Breakers:

Circuit Breakers: Elementary principles of arc interruption, Recovery, Restriking Voltage and Recovery voltages - Restriking Phenomenon, Average, Max. RRRV, Current Chopping and Resistance Switching - CB ratings and Specifications, Selection of CB: Types and Numerical Problems. – Auto reclosures. Description and Operation of- Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers.

UNIT II

Electromagnetic, Static and Numerical Relays:

Basic Requirements of Relays – Primary and Backup protection - Construction details of – Attracted armature, balanced beam, inductor type and differential relays – Universal Torque equation – Characteristics of over current, Direction and distance relays. Static Relays – Advantages and Disadvantages – Definite time, Inverse and IDMT static relays – Comparators – Amplitude and Phase comparators. Microprocessor based relays – Advantages and Disadvantages – Block diagram for over current (Definite, Inverse and IDMT), Distance Relays, Impedance Relays and Reactance Relays with their Flow Charts.

UNIT III

Protection of Generators and Transformers:

Protection of generators: Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on percentage winding unprotected. Protection of transformers: Percentage Differential Protection, Numerical Problem on Design of CTs Ratio, Buchholtz relay Protection.

UNIT IV

Protection of Feeders, Transmission Lines and Busbars:

Protection of Feeders (Radial & Ring main) using over current Relays. Protection of Transmission lines – 3 Zone protection using Distance Relays. Carrier current protection. Protection of Bus bars - Differential protection, Differential Pilot wire protection.

UNIT V

Protection Against Over Voltages:

Generation of Over Voltages in Power Systems. -Protection against Lightning Over Voltages - Valve type and Zinc-Oxide Lighting Arresters - Insulation Coordination –BIL. Neutral Grounding, Grounded and Ungrounded Neutral Systems. - Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance – Arcing Grounds and Grounding Practices.

Textbooks:

1. Switchgear and Protection – by Sunil S Rao, Khanna Publishers.
2. Power System Protection and Switchgear by Badari Ram, D.N Viswakarma, TMH Publications,2022.

Reference Books:

1. Protective Relaying Principles and Applications – J Lewis Blackburn, CRC Press.
2. Numerical Protective Relays, Final Report 2004 – 1009704 EPRI, USA.
3. Protective Relaying Theory and Applications - Walter A Elmore, Marcel Dekker.
4. Transmission network Protection by Y.G. Paithankar, Taylor and Francis, 2009.
5. Power System Protection- P. M. Anderson, Wiley Publishers.

Online Learning Resource:

https://onlinecourses.nptel.ac.in/noc22_ee101/preview

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

III Year B.Tech. II Semester

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(23EC0450) COMMUNICATION SYSTEMS
(Professional Elective - III)

COURSE OBJECTIVES
The objectives of this course

1. *To understand the fundamentals of communication systems and amplitude modulation techniques.*
2. *To learn about the angle modulation techniques and bandwidth considerations in communication systems.*
3. *To gain knowledge on pulse analog modulation and multiple access techniques used in digital communication systems.*
4. *To examine pulse modulation and digital modulation techniques used in modern communication systems.*
5. *To study wireless communication systems, cellular networks, and GSM technology.*

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

1. *Describe the basic elements of communication systems and the need for modulation.*
2. *Understand the fundamentals of communication systems and amplitude modulation techniques, DSB-SC, SSB, VSB techniques and their generation/demodulation methods.*
3. *Learn about the angle modulation techniques and bandwidth considerations in communication systems.*
4. *Gain knowledge on pulse analog modulation and multiple access techniques used in digital communication systems.*
5. *Get familiar with pulse modulation and digital modulation techniques used in modern communication systems.*
6. *Know about wireless communication systems, cellular networks, and GSM technology.*

UNIT I
Analog communication-I: Elements of communication systems, need for Modulation, Modulation Methods, Baseband and carrier communication Amplitude Modulation (AM), Generation of AM signals, Rectifier detector, Envelope detector, sideband and carrier power of AM, Double side band suppressed carrier (DSB- SC) modulation & its demodulation, Switching modulators, Ring modulator, Balanced modulator, Single sideband (SSB) transmission, VSB Modulation

UNIT II

Analog communication-II : Angle Modulation & Demodulation: Concept of instantaneous frequency Generalized concept of angle modulation, Bandwidth of angle modulated waves- Narrow band frequency modulation (NBFM); and Wide band FM (WBFM), Phase modulation, Pre-emphasis & De-emphasis, Illustrative Problems.

UNIT III

Digital communications-I (Qualitative Approach only): Pulse analog modulation techniques, Generation and detection of Pulse amplitude modulation, Pulse width modulation, Pulse position modulation

Multiple Access Techniques: Introduction to multiple access techniques, FDMA, TDMA, CDMA, SDMA: Advantages and applications

UNIT IV

Digital communications-II (Qualitative Approach only): Pulse Code Modulation, DPCM, Delta modulation, Adaptive delta modulation, Overview of ASK, PSK, QPSK, BPSK and M-PSK techniques.

UNIT V

Wireless communications (Qualitative Approach only): Introduction to wireless communication systems, Examples of wireless communication systems, comparison of 2G and 3G cellular networks, Introduction to wireless networks, Differences between wireless and fixed telephone networks, Introduction to Global system for mobile (GSM), GSM services and features.

TEXT BOOKS

1. H Taub, D. Schilling and Gautam Sahe, ―Principles of Communication Systems‖, TMH, 2007, 3rd Edition.
2. George Kennedy and Bernard Davis, ―Electronics & Communication System‖, 4th Edition, TMH 2009.
3. Wayne Tomasi, ―Electronic Communication System: Fundamentals Through Advanced‖, 2nd edition, PHI,2001.

REFERENCE BOOKS

1. Simon Haykin, ―Principles of Communication Systems‖, John Wiley, 2nd Edition.
2. Sham Shanmugam, ―Digital and Analog communication Systems‖, Wiley-India edition,2006.
3. Theodore. S.Rapport, ―Wireless Communications‖, Pearson Education, 2nd Edition,2002.

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

III B.Tech. – II Sem.

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(23EE0229) ELECTRICAL DRIVES
(Professional Elective-III)

COURSE OBJECTIVES

The objectives of this course

1. To understand the application of Power Electronics

2. To learn the operation of the chopper fed DC Drives and characteristics

3. To Understand the basic concept and advanced speed control techniques using Power electronics converters that are used in industry

4. Distinguishing features of Induction Motor drives and Synchronous Motor Drives

COURSE OUTCOMES (COs)

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

1. *Evaluate the characteristics and operational aspects of drives operating in different modes.*
2. *Analyze the operational aspects of various controlled rectifiers fed DC drives operating indifferent sustainable modes of operation*
3. *Analyze the operational aspects of various controlled chopper fed DC drives operating in different sustainable modes of operation*
4. *Analyze the operational aspects of various asynchronous motor drives operating in different sustainable modes of operation*
5. *Analyze the operational aspects of synchronous motor and stepper motor drives operating in different sustainable modes of operation*
6. *Apply the concept of closed loop control motor drives.*

UNIT I

Introduction To Electric Drives:

Electrical drives — block diagram, advantages of electric drive, parts of electric drives, choice of electrical drives, the status of DC and AC drives. Dynamics of electrical drives-fundamental torque equations, speed- torque conventions, and multi-quadrant operation; Equivalent values of drive parameters - loads with rotational and translational motion; Load torques — components, nature and classification. Concept of steady-state stability. Electric braking methods — regenerative, dynamic and plugging. Modes of operation of electrical drives — steady state, acceleration including starting and deceleration including stopping. Speed control and drive classifications, closed-loop control of drives — current limit control, torque control, speed control and position control (Block diagram only).

UNIT II

Single-Phase and Three Phase Converter Fed DC Drives:
Control of DC separately excited motor by single-phase and three-phase half and full bridged converters — voltage and current waveforms for continuous and discontinuous conduction, speed-torque expressions and characteristics. Single phase half-controlled rectifier fed DC series motor — voltage and current waveforms for continuous and discontinuous conduction, speed-torque expressions and characteristics. Multi-quadrant operation of DC separately excited DC motor fed from fully controlled rectifier - mechanical reversible switch in armature, dual converter and field current reversal.

UNIT III
DC Chopper Fed Drives:
Control of DC separately excited motor by one ,two and four quadrant choppers - voltage and current waveforms for continuous conduction (motoring, regenerative and dynamic braking), speed-torque expressions and characteristics. Chopper control of DC series motor—operation, speed-torque expressions and characteristics. Closed loop chopper control of separately excited dc motor (block diagram only).

UNIT IV

Induction Motor Drives:
Three phase induction motors — Introduction, Stator variable voltage control — speed-torque characteristics, AC voltage controllers and efficiency of induction motor under voltage control. Stator variable voltage and variable frequency control — slip speed control, torque-power limitations and modes of operation. Voltage Source Inverters (VSIs) and Current Source Inverters (CSIs) fed induction motor and closed loop operation of induction motor drives (Block diagram only).Comparison of VSI and CSI fed drives. Static rotor resistance control, slip power recovery schemes – static scherbius and kramer drive, speed-torque characteristics.

UNIT V
Synchronous and Stepper Motor Drives:
Synchronous Motor Drives: Separate control and self-control of synchronous motors — operations of self- controlled synchronous motors by VSI and CSI. Load commutated CSI fed Synchronous motor—operation and speed torque characteristics. Closed loop control operation of synchronous motor drives (Block diagram only). Stepper Motor Drives: Variable reluctance and permanent magnet operation — features of stepper motor — torques Vs stepping rate characteristics and drive circuits. BLDC motor operation and control.

TEXT BOOKS:

1. Gopal K. Dubey, Fundamentals of Electric Drives, Narosa Publications, Alpha Science International Ltd 2nd Edition 2002.
2. M. H. Rashid (2003), Power Electronic Circuits, Devices and applications, 3rd edition, Prentice Hall of India, New Delhi, India.
3. Krishnan, Ramu. Electric motor drives: modeling, analysis, and control, 1st Edition, Pearson, 2015.

REFERENCE BOOKS:

1. M. D. Singh, K. B. Khanchandani (2008), Power Electronics, 2nd Edition, Tata McGraw Hill Publications, New Delhi.
2. Vedam Subramanyam (2008), Thyristor Control of Electric drives, 1st Edition, Tata McGraw Hill Publications, New Delhi, India.
3. S. K. Pillai (2007), A First course on Electrical Drives, 2nd Edition, New Age International (P) Ltd.,NewDelhi
4. P.C. Sen, Principles of Electrical Machines and Power Electronics, Wiley, 3rdEdition, 2013.

ONLINE LEARNING RESOURCES:

1. https://web.iitd.ac.in/~amitjain/Drives_VTR.pdf
2. https://sde.uoc.ac.in/sites/default/files/sde_videos/Electrical%20Drives%20and%20Controls_0.pdf
3. https://nptel.ac.in/courses/108/104/108104140/
4. https://nptel.ac.in/courses/108/102/108102046/
5. https://swayam.gov.in/nd1_noc19_ee65/preview

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(AUTONOMOUS)

III B.Tech. – II Sem.

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(23EE0230)RENEWABLE AND DISTRIBUTED ENERGY TECHNOLOGIES
(Professional Elective-III)

COURSE OBJECTIVES

The objectives of this course

1. *To This course explores each of the principal renewable energy sources in turn. Each technology is examined in terms of the relevant physical principles; the main technologies involved; environmental impact; the size of the potential renewable resource; and the future prospects of green energy.*
2. *This Distributed Generation course is intended to provide knowledge of the benefits of renewable energy generation, availability of distributed generation technology, electricity generation technologies, issues related to grid interconnection, and methods of analyzing the technical and economic feasibility.*

COURSE OUTCOMES (COs)

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

1. *Comprehend the renewable energy scenario, anticipate future energy demand and to understand the abstraction concept of electrical energy from Solar Energy.*
2. *Understand the abstraction concept of electrical energy from wind, bio-mass and Tidal energy sources.*
3. *Understand electrical energy storage along with working of Green Energy.*
4. *Compare the performance of different Battery Technologies*
5. *Exemplify rudimentary idea of Distributed Generation*
6. *Comprehend the technical impact, control, and economic aspects of Distributed Generation*

UNIT I

Introduction: Fundamentals of renewable energy sources, Types of energy, Renewable and Non- renewable energy, SWOT analysis, Global warming and climate change, World energy transformation by 2050, Prospects of renewable energy in the world, Renewable energy availability in India.

Solar Energy Fundamentals: Solar Spectrum, propagation of solar radiation from the sun to earth; solar radiation geometry: sun-earth geometry, extra-terrestrial and terrestrial radiation.

Solar Thermal: Solar Collectors, Solar parabolic trough, Solar tower, Solar cooker, Solar water heater, Solar dryer, Solar Pond.

Solar Electric Power Generation: A Generic PV Cell, PV Materials, Equivalent Circuits for PV Cells, Modules and Arrays; I-V Curve under Standard Testing Conditions; Impact of Temperature and Insolation on I-V curves; Shading Impacts on I-V curves; Maximum Power Point Trackers (MPPT).

UNIT II

Wind and Other Energy Systems:

Wind Energy: Air, Wind, Global and Local Wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, Classification of wind energy conversion system (WECS)- Horizontal axis- single, double and multiblade system. Vertical axis- Savonius and darrieus types.

Biomass Energy: Introduction; Photosynthesis Process; Biofuels; Biomass Resources; Biomass conversion technologies-fixed dome; Urban waste to energy conversion; Biomass gasification (Downdraft).

Tidal Power: fundamental characteristics of tidal power, harnessing tidal energy, advantages, and limitations.

UNIT III

Energy Storage and Green Energy:

Energy Storage: Stationary Battery Storage – Basics of Lead-Acid batteries, Battery Storage Capacity, Coulomb efficiency instead of energy efficiency, Battery Sizing. Different Battery storage technologies and comparison of their performance. Introduction to Super capacitors.

Green Energy: Historical Development, Basic Operation of a Fuel Cell, Fuel Cell Thermodynamics, Entropy and the theoretical efficiency of Fuel Cells, Gibbs Free Energy and Fuel Cell efficiency, Electrical output of an Ideal Cell, Electrical Characteristics of Real Fuel Cells, Types of Fuel Cells, H2: Operating principles, Zero energy Concepts. Benefits of hydrogen energy, hydrogen production technologies (electrolysis method only), hydrogen energy storage, applications of hydrogen energy, problem associated with hydrogen energy.

UNIT IV

Introduction to DG and its Grid Integration:

Introduction: Need for Distributed generation, renewable sources in distributed generation, current scenario in Distributed Generation, Planning of DGs – Siting and sizing of DGs – optimal placement of DG sources in distribution systems.

Grid integration of DGs: Different types of interfaces - Inverter based DGs and rotating machine-based interfaces - Aggregation of multiple DG units. Energy storage elements: Batteries, ultracapacitors, flywheels.

UNIT V

Technical Impact, Economic and Control aspects of DG:

Technical impacts of DGs: Transmission systems, Distribution systems, De-regulation – Impact of DGs upon protective relaying – Impact of DGs upon transient and dynamic stability of existing distribution systems.

Economic and control aspects of DGs: Market facts, issues, and challenges - Limitations of DGs. Voltage control techniques, Reactive power control, Harmonics, Power quality issues. Reliability of DG based systems – Steady-state and Dynamic analysis.

Text Book:

1. Muhammad Kamran, Muhammad Rayyan Fazal, "*Renewable Energy Conversion Systems*", First Edition, Elsevier Academic Press, 2021.
2. G. D. Rai, *Non-Conventional Sources of Energy*, Khanna Publisher, 2004

Reference Books:

1. G N Tiwari, *Solar Energy: Fundamentals, Design, Modeling and Applications*, Narosa, 2002.
2. Mukund R Patel, *Wind and Solar Power Systems: Design, Analysis, and Operation*, 2nd Edition, Taylor & Francis, 2006.
3. H. Lee Willis, Walter G. Scott, ―*Distributed Power Generation – Planning and Evaluation*‖, Marcel Decker Press, 2000.
4. Gilbert M. Masters, ―*Renewable and Efficient Electric Power Systems*‖, 2nd Edn., IEEE Press, Wiley, 2013.
5. N. Jenkins, J.B. Ekanayake and G. Strbac, ―*Distributed Generation*‖, 1st Edn, The Institution of Engineering and Technology, London, 2010.

Online Learning Resources:

1. https://archive.nptel.ac.in/courses/121/106/121106014/#
2. https://onlinecourses.nptel.ac.in/noc22_ch27/preview
3. https://www.nptelvideos.com/lecture.php?id=8517

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

III B.Tech. – II Sem.

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(23EE0231) ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB
(Professional Core)

COURSE OBJECTIVES

The objectives of this course

1. *Calibration of various electrical measuring instruments*
2. *Accurate determination of inductance and capacitance using AC Bridges*
3. *Measurement of resistance for different range of resistors using bridges*
4. *Performance of transducers and sensors*

COURSE OUTCOMES (Cos)

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

1. *Determine the unknown Resistance, Inductance and Capacitance using AC and DCbridges*
2. *Understand the calibration of single phase energy meter*
3. *Understand the measurement of power, power factor in a single phase circuit and three phase circuit*
4. *Understand the measurement of 3-Φ active power and reactive power.*
5. *Extend the range of Ammeter and Voltmeter.*
6. *Understand the working of Transducers, Measure distance, temperature, current, voltage and humidity using sensors.*

CHOOSE ANY TEN FROM THE FOLLOWING LIST:

1. Measurement of resistance using Wheatstone bridge and Kelvin‘s Double Bridge.
2. Measurement of inductance using Maxwell‘s bridge, Anderson bridge.
3. Measurement of capacitance using De-Sauty's bridge, Schering bridge.
4. Calibration of single phase energy meter using direct loading method.
5. Calibration of energy meter using Phantom load kit.
6. Measurement of Power using 3-Voltmeter and 3-Ammeter methods in a single phase Circuit.
7. Measurement to Real and Reactive Power in a three phase circuit.
8. Extension of range of given Ammeter and Voltmeter.
9. Measurement of displacement using LVDT.
10. Study of CRO: Measurement of voltage, current, frequency using lissajous patterns.
11. Measurement of different ranges of temperatures using i)RTD ii)Thermocouple
12. Measurement of strain with the help of strain gauge transducers

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

III B.Tech. – II Sem.

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(23EC0416) MICROPROCESSORS AND MICROCONTROLLERS LAB
(Professional Core)

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

1. *Formulate a program and implement algorithms using Assembly language.*
2. *Describe an Assembly language program for the 8086 Microprocessor.*
3. *Develop programs for different applications in the 8086 Microprocessor.*
4. *Interface peripheral devices with 8086 and 8051.*
5. *Demonstrate serial communication and LCD interfacing with 8051 microcontroller using UART and I/O port*
6. *Use an Assembly/Embedded C programming approach for solving real-world problems.*

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 no_s.
   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/Step signal.

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.

Reference Books:

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.

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

III B.Tech. – II Sem.

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(23EE0232)APPLICATIONS OF SOFT COMPUTING TOOLS IN ELECTRICAL ENGINEERING

COURSE OBJECTIVES
The objectives of this course

1. *Calib Understand the basic concepts of Electrical Engineering.*
2. *Apply the concepts to design MATLAB models.*
3. *Analyse various Electrical engineering applications through MATLAB.*
4. *Develop real time models using MATLAB.*

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

1. *Understand the basic concepts of Electrical Engineering.*
2. *Apply the concepts to design MATLAB models.*
3. *Analyze various Electrical engineering applications through MATLAB.*
4. *Develop real time models using MATLAB.*
5. *Design virtual PMU*
6. *Develop real time models using MATLAB.*

Theory:
MATLAB-Introduction, different tool boxes, creation of program files, creation of simulink files, GUI, commonly used blocks, Simpower system toolbox, control system toolbox, Sim Drive lines, Creation of functions, Project implementation through MATLAB.

CHOOSE ANY TEN FROM THE FOLLOWING LIST:

1. Transient analysis of given electrical network
2. Simulation of 1-phase and 3-phase transformers
3. Study of the dynamics of second order system
4. Implementation of buck and boost dc-dc converters
5. Study on the design of PI controllers and stability analysis for a DC-DC buck Converter
6. Sine-PWM techniques for single-phase half-bridge, full-bridge and three-phase inverters
7. Economic Load Dispatch of (i) Thermal Units and (ii) Thermal Plants using Conventional method
8. Transient Stability Analysis of Power Systems using Equal Area Criterion (EAC)
9. Reactive Power Control in a transmission system (Ferranti effect, Effect of shunt Inductor)

10. Fault studies using Z_{bus} matrix
11. Design of virtual PMU
12. Wide area control of Two area Kundur system

Online Learning Resources/Virtual Labs

1. http://vem-iitg.vlabs.ac.in/
2. https://vp-dei.vlabs.ac.in/Dreamweaver/

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III B.Tech. – II Sem.

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(23HS0816) TECHNICAL PAPER WRITING AND INTELLECTUAL PROPER RIGHTS

(Audit Course)

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. *Analyse 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 andlogical 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-Problemsand 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 Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, 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, intellectual property audits.

Text Book:

1. Deborah. E. Bouchoux, Intellectual Property Rights, Cengage Learning India, 2013
2. Meenakshi Raman, Sangeeta Sharma. Technical Communication: Principles and practices .Oxford.

Reference Books:

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 Learning Resources:

1. https://theconceptwriters.com.pk/principles-of-technical-writing/
2.https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html
3.https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html
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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

III B. Tech. – II Sem.

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(23CE0152) DISASTER MANAGEMENT
(Open Elective-II)

COURSE OBJECTIVES:

The objectives of this course is to

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)

Upon 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: 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: Climate Change and Its Impact On Tropical Cyclones, Nature of Cyclonic Wind, Velocities and Pressure, Cyclone Effects, Storm Surges, Floods, and Landslides. Behavior of Structuresin 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 Ilan 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

https://nptel.ac.in/courses/124107010

https://onlinecourses.swayam2.ac.in/cec19_hs20/preview

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

III B. Tech. – II Sem.

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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)

Upon 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 Neighboring 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 Modeling - 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.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR (AUTONOMOUS)

III B. Tech. – II Sem.

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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. M.P. Groover, *Automation , Production systems and CIM*, Pearson Edu. 2008
2. M.P. Groover *Industrial Robotics* , TMH, 1986

REFERENCES:

1. Fu K S, *Robotics* McGraw Hill, 4th edition, 2010.
2. P. Coiffet and M. Chaironze, Kogam *An Introduction to Robot Technology*, Page Ltd. London. 1983
3. Ashitave Ghosal *Robotics, Fundamental Concepts and analysis*, Oxford Press, 1/e, 2006
4. Mittal R K &Nagrath I J Robotics and Control, TMH, 1999

ONLINE LEARNING RESOURCES:

1. *https://www.youtube.com/watch?v=yxZm9WQJUA0&list=PLRLB5WCqU54UJG45UnazSYmnmhgt76o*
2. *https://www.youtube.com/watch?v=6f3bvIhSWyM&list=PLRLB5WCqU54X5Vy4DwjfSODT3ZJgwEjyE*

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

III B. Tech. – II Sem.

L	T	P	C
3	-	-	3

(23EC0441) DIGITAL ELECTRONICS
(Open Elective –II)

COURSE OBJECTIVES:
The objectives of this course

1. *To Learn Boolean algebra, logic simplification techniques, and combinational circuit design.*
2. *To analyze combinational circuits like adders, subtractors, and code converters.*
3. *To explore combinational logic circuits and their applications in digital design.*
4. *To understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.*
5. *To gain knowledge about programmable logic devices and digital IC's.*

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

1. *Apply Boolean algebra and Karnaugh Maps to simplify and analyze logic expressions.*
2. *Design basic logic gates like AND, OR, NAND, NOR, XOR.*
3. *Analyze and design combinational circuits like adders, subtractors, and perform code conversions.*
4. *Design and implement logic functions using multiplexers, decoders, encoders, and comparators.*
5. *Understand sequentiall logic circuits, including latches, flipflops, counters, and shift registers.*
6. *Implement logic circuits using ROM, PLA, PAL, and standard digital ICs like 74-series.*

UNIT-I

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

UNIT-II

Introduction to Combinational Design 1: Binary Adders, Subtractors and BCD adder, Code converters - Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.

UNIT-III

Combinational Logic Design 2: Decoders, Encoders, Priority Encoder, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

UNIT-IV

Sequential Logic Design: Latches, Flip-flops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, set up and hold times, Ripple counters, Shift registers.

UNIT-V

Programmable Logic Devices: ROM, Programmable Logic Devices (PLA and PAL).

Digital IC's: Decoder (74x138), Priority Encoder (74x148), multiplexer (74x151) and de-multiplexer (74x155), comparator (74x85).

TEXT BOOKS:

1. Digital Design, M.Morris Mano & Michel D. Ciletti, 5th Edition, Pearson Education, 1999.
2. Switching theory and Finite Automata Theory, ZviKohavi and NirahK.Jha, 2nd Edition, Tata McGraw Hill, 2005.

REFERENCES:

1. Fundamentals of Logic Design, Charles H Roth,Jr., 5th Edition, Brooks/cole Cengage Learning, 2004.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

III B. Tech. – II Sem.

L	T	P	C
3	-	-	3

(23CS0511) OPERATING SYSTEMS
(Open Elective-II)

COURSE OBJECTIVES:

COURSE OBJECTIVES

The objectives of this course

1. *Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection*
2. *Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.*
3. *Illustrate different conditions for deadlock and their possible solutions.*

COURSE OUTCOMES (COs)

At the end of the course, Student 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.

TEXTBOOKS

1. Operating System Concepts, Silberschatz A, Galvin P B, Gagne G, 10th Edition, Wiley, 2018.
2. Modern Operating Systems, Tanenbaum A S, 4th Edition, Pearson , 2016

REFERENCES

1. *Operating Systems -Internals and Design Principles, Stallings W, 9th edition, Pearson, 2018*
2. *Operating Systems: A Concept Based Approach, D.M Dhamdhere, 3rd Edition, McGraw- Hill, 2013*

ONLINE LEARNING RESOURCES:

1. *https://nptel.ac.in/courses/106/106/106106144/*
2. *http://peterindia.net/OperatingSystems.html*

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

III B. Tech. – II Sem.

L	T	P	C
3	-	-	3

(23CS0556) INTRODUCTION TO MACHINE LEARNING
(Open Elective-II)

COURSE OBJECTIVES:

The course is introduced for students to

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 (CO):

After completion of the 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: Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets

UNIT-II

Nearest Neighbor-Based Models: Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures ,K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.

UNIT- III

Models Based on Decision Trees: Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression.

The Bayes Classifier: Introduction to the Bayes Classifier, Bayes‘ Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification | Class Conditional Independence and Naive Bayes Classifier (NBC)

UNIT-IV

Linear Discriminants for Machine Learning: Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector

Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP.

UNIT-V

Clustering : Introduction to Clustering, Partitioning of Data, Matrix Factorization | Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K-Means Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough K-Means Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering.

TEXTBOOKS:

1. Machine Learning Theory and Practice‖, M N Murthy, V S Ananthanarayana, Universities Press (India), 2024

REFERENCE BOOKS:

1. Machine Learning‖, Tom M. Mitchell, McGraw-Hill Publication, 2017
2. Machine Learning in Action‖,Peter Harrington, DreamTech
3. Introduction to Data Mining‖, Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

III B. Tech. – II Sem.

L	T	P	C
3	-	-	3

(23HS0853) OPTIMIZATION TECHNIQUES FOR ENGINEERS
(Open Elective-II)

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
After 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 Delhi.*
2. *Peressimi A.L., Sullivan F.E., Vhl, J. J. Mathematics of Non-linear Programming, Springer – Verlag.*

WEB REFERENCE:

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*

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

III B. Tech. – II Sem.

L	T	P	C
3	-	-	3

(23HS0858) MATHEMATICAL FOUNDATION OF QUANTUM TECHNOLOGIES
(Open Elective-II)

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

After 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 ($\int\psi^*\varphi\, dx$), 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).

TEXTBOOKS:

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).

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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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

III B. Tech. – II Sem.

L	T	P	C
3	-	-	3

(23HS0843) PHYSICS OF ELECTRONIC MATERIALS AND DEVICES
(Open Elective-II)

COURSE OBJECTIVES

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)

After the completion of the course student should 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).

TEXTBOOKS:

1. *Principles of Electronic Materials and Devices-S.O. Kasap, McGraw-Hill Education (India) Pvt. Ltd.,4th edition, 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:

1. *https://nptel.ac.in/courses/113/106/113106062/*
2. *https://onlinecourses.nptel.ac.in/noc20_ph24/preview*

R23

B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

III B. Tech. – II Sem.

L	T	P	C
3	-	-	3

(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 enumerate the applications of hydrogel polymers.*
5. *To enumerate applications of conducting and degradable polymers in engineering.*

COURSE OUTCOMES

1. *Understand fundamentals of polymers and moulding of plastics.*
2. *Analyze the chemical and physical properties of natural polymers and their applications.*
3. *Apply the knowledge of thermoplastic and thermoset polymers in practical situations.*
4. *Evaluate the environmental and industrial relevance of synthetic polymers and their applications.*
5. *Understand the fundamental principles of hydrogel in polymer networks.*
6. *Analyze the preparation and mechanism of conducting and degradable polymers.*

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, McGraw-Hill, 2010.*

R23

B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

	L	T	P	C
III B. Tech. – II Sem.	3	-	-	3

(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

TEXTBOOKS:

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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IV B. Tech. – I Sem.

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POWER SYSTEM OPERATION AND CONTROL
(23EE0233)

Course Objectives: *The objectives of the course are to make the students learn about:*

1. *Optimal Operation of Thermal Power Stations.*
2. *Hydrothermal Scheduling.*
3. *Modeling of Turbines and Generators.*
4. *Load frequency control of Single Area and Two Area Systems.*
5. *The Shunt and Series Reactive Power Compensations in Power Systems.*
6. *The Key Aspects of Power System Deregulation.*

Course Outcomes:

1. *To Understand the Thermal Station Characteristics and Economic Dispatch Problem of Thermal Units*
2. *To Understand the Optimal Scheduling of Hydro-Thermal Station with minimization of cost of Thermal station.*
3. *To Develop the First Order Models of Turbine, Governor and Generator Load Model*
4. *To Evaluate the Steady State & Dynamic Analysis of Single Area and Two Area Load Frequency Control.*
5. *To Analyze the Series & Shunt Reactive Power Compensation in Transmission and Load Systems*
6. *To Understand the Aspects of Power System Deregulation*

UNIT I

Optimum Operation Thermal Power Station:

Optimum Operation of Thermal Power Station: Heat Rate Curve – Cost Curve – Incremental Fuel Rate – Incremental Fuel Cost and Production Cost, Input – Output Characteristics of Thermal Power Stations and Hydro Power Stations. Optimum Generation Allocation of Thermal Units without Transmission Line Losses and Optimum Generation Allocation with effect of Transmission Line Losses. Transmission Line Loss Formula, Loss coefficients, Numerical Problems.

UNIT II

Economic Operation of Hydro – Thermal Scheduling:

Optimum Operation of Hydrothermal Power Stations:

Hydrothermal Coordination Methods – Optimal power flow problem formulation for loss and cost minimization, Solution of optimal power flow problem using Newton‘s method and Linear Programming technique – Numerical problems.

UNIT III

Load Frequency Control:

Modelling of Turbine & Governor:

The first order Turbine model, Block Diagram representation of Steam Turbines and approximate Linear models, Mathematical Modelling of Speed Governing Systems – Derivation of small Signal Transfer function – Block Diagram.

Single Area Load Frequency Control:
Necessity of Keeping Frequency constant, Definition of Control Area – Single Area Control – Block Diagram representation of an Isolated Power System – Steady State Analysis – Dynamic Response – Controlled & Uncontrolled case.
Two Area Load Frequency Control:
Load Frequency control of Two Area system – Controlled and Uncontrolled case, Tie – Line Bias Control. Proportional Plus Integral Control of Single Area and Its Block Diagram Representation, Steady State Response – Load Frequency Control and Economic Dispatch Control.

UNIT IV
Reactive Power Control:
Overview of Reactive Power Control – Reactive Power Compensation in Transmission Systems – Advantages and Disadvantages of Different Types of Compensating Equipment for Transmission Systems; Load Compensation – Specifications of Load Compensator, Uncompensated and Compensated Transmission Lines: Shunt and Series Compensation.

UNIT V
Power System Deregulation:
Principle of economics, utility functions, power exchanges, electricity market models, market power indices, ancillary services, transmission and distribution charges, principles of transmission charges, transmission pricing methods, demand-side management, regulatory framework – Numerical problems.

TEXTBOOKS:

1. Modern Power System Analysis, D.P.Kothari and I.J.Nagrath, Tata McGraw Hill Publishing Company Ltd.,
2. Electric Energy Systems Theory: An Introduction, Olle I. Elgerd, TMH Publishing Company Ltd., New Delhi, 2nd edition, 1983.

REFERENCES:

1. Power Generation, Operation and Control, Allen J. Wood and Bruce F. Wollenberg, John Wiley & Sons, Inc., New York, 2nd edition, 1996.
2. Reactive Power Control in Electric Systems, T J E Miller, John Wiley & Sons, New York, 1982.
3. Power System Analysis Operation and Control, Abhijit Chakrabarti and Sunita Halder, PHI Learning Pvt. Ltd.,, 3rd Edition, 2010.

Online Learning Resources:
1. https://archive.nptel.ac.in/courses/108/104/108104052/
2. http://kcl.digimat.in/nptel/courses/video/108104191/L01.html
3. **https://nptel.ac.in/courses/108101040**

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

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BUSINESS ETHICS AND CORPORATE GOVERNANCE-(23HS0861)
Management Course- II

COURSE OBJECTIVES: *The objectives of the course are to make the students learn about:*

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)

After the completion of 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

ETHICAL ASPECTS IN ORGANIZATION II: Ethics in Finance: Insider Trading – Ethical Investment - Combating Frauds. Ethical Issues in Information Technology: Information Security and Threats – Intellectual Property Rights – Cyber Crime.

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

REFERENCE BOOKS:

1. Dr. K. Nirmala, KarunakaraReaddy. *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*

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	C
2	0	0	2

E-BUSINESS-(23HS0862)
Management Course- II

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 the students aware on different e-marketing channels & strategies.

Course Outcomes: After the completion of 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: Online branding, social media marketing, and email marketing - E-business strategies: Digital advertising, content marketing, and analytics – E-Customer Relationship Management (eCRM) E-supply chain management (e-SCM)

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, RaymondLeathamWiley India 2007*
4. *S. Jaiswal. E-Commerce GalgotiaPublication 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

IV B.Tech I Semester

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

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Management Science-(23HS0863)
Management Course- II

Course Objectives: *The objectives of the course are to make the students learn about:*

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: *At the end of the 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- IINTRODUCTION 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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	C
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DIGITAL SIGNAL PROCESSING-(23EC0419)
(Professional Elective - IV)

Course Objectives:
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: At the end of the course, the 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.

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.

TEXTBOOKS:

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.

ONLINE LEARNING RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_ee99/preview,
2. https://nptel.ac.in/courses/108105055

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

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ELECTRIC VEHICLE TECHNOLOGY-23EE0234
(Professional Elective - IV)

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

1. *To learn the structure of Electric Vehicle, Hybrid Electric Vehicle*
2. *To learn about the different types of electric motors, power electronics, and energy storage systems used in EVs.*
3. *To gain knowledge about the design methodologies, component sizing, and overall system integration of EVs.*
4. *To study about the EV conversion components and specifications for Electric Vehicles*

COURSE OUTCOMES (COs)

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

1. *Illustrate electric vehicles.*
2. *Summarize the History and Evolution of EVs, Hybrid and Plug-In Hybrid EVs*
3. *Understand drive-train topologies.*
4. *Classify various electrical drives*
5. *Classify energy storage technologies*
6. *Classify different energy management strategies.*

UNIT-I:

INTRODUCTION TO ELECTRIC VEHICLES:

History of electric vehicles, social and environmental importance of electric vehicles, impact of modern drive-trains on energy supplies.

CASE STUDY

Comparison by efficiency of Conventional, Hybrid, Electric and Fuel cell Vehicles.

UNIT-II:

ELECTRIC DRIVE-TRAINS:

Basic concept of electric traction, Introduction to various electric drive-train topologies, Power flow control in electric drive-train topologies.

UNIT-III

ELECTRIC DRIVES & CONTROL:

Introduction to electric components used in electric vehicles, Control of BLDC Motor, Control of Induction Motor Drive, Permanent Magnet (PM) motor Drive & Switched Reluctance Motor (SRM) Drive.

UNIT-IV:

ENERGY STORAGE:

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its modeling, SOC, Different Types of Batteries, Super Capacitor based energy storage and its analysis, Fuel Cells, Hybridization of different energy storage devices.

UNIT-V:

ENERGY MANAGEMENT STRATEGIES & CHARGING INFRASTRUCTURE:

Introduction to energy management strategies used in electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies, Types of EV charging Infrastructure & Standardized Communication protocols for EV charging.

CASE STUDIES

Current issues in electric Vehicles, Thermal Protection of Battery.

TEXT BOOKS:

1. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, ―Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design‖, CRC Press, 2 nd Edition, 2017. (Unit-I, II)
2. Ali Emadi, ―Advanced Electric Drive Vehicles (Energy, Power Electronics, and Machines)‖, CRC Press, 2015. (Unit-III)
3. John G. Hayes and A. Goodarzi, ―Electric Powertrain - Energy Systems, Power electronics and drives for Hybrid, electric and fuel cell vehicles‖, Wiley, 2018. (Unit-IV & V)

REFERENCES:

1. James Larminie, John Lowry, ―Electric Vehicle Technology Explained‖, Wiley, 2 nd Edition 2012.

WEB RESOURCES:

1. https://nptel.ac.in/courses/108106170
2. https://onlinecourses.nptel.ac.in/noc22_ee53
3. https://onlinecourses.nptel.ac.in/noc21_ee112

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	c
2	0	0	2

HVDC AND FACTS-23EE0235
(Professional Elective -IV)

COURSE OBJECTIVES: ***The objectives of this course***

1. *High voltage DC transmission systems*
2. *Flexible AC transmission systems*
3. *Various configurations of the above, Principle of operation, Characteristics of various FACTS devices*

COURSE OUTCOMES (COs)

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

1. *Remember various conventional control mechanisms, transmission networks.*
2. *Understand the necessity of HVDC systems as emerging transmission networks.*
3. *Understand the necessity of reactive power compensation devices.*
4. *Design equivalent circuits of various HVDC system configurations.*
5. *Design and analysis of various FACTS devices.*
6. *Analyze the power flow in systems incorporating HVDC and FACTS devices.*

UNIT-I
INTRODUCTION:

Electrical Transmission Networks, Conventional Control Mechanisms-Automatic Generation Control, Excitation Control, Transformer Tap-Changer Control, Phase-Shifting Transformers; Advances in Power- Electronic Switching Devices, Principles and Applications of Semiconductor Switches; Limitations of Conventional Transmission Systems, Emerging Transmission Networks, HVDC and FACTS. Concepts of virtual inertia

UNIT-II
HIGH VOLTAGE DC TRANSMISSION – I:

Types of HVDC links - Monopolar, Homopolar, Bipolar and Back-to-Back, Advantages and disadvantages of HVDC Transmission, Analysis of Graetz circuit, Analysis of bridge circuit without overlap, Analysis of bridge with overlap less than 600, Rectifier and inverter characteristics, complete characteristics of rectifier and inverter, Equivalent circuit of HVDC Link.

UNIT-III
HIGH VOLTAGE DC TRANSMISSION – II:

Desired features and means of control, control of the direct current transmission link, Constant current control, Constant ignition angle control, Constant extinction angle control, Converter firing- angle control- IPC and EPC, frequency control and Tap changer control, Starting, Stopping and Reversal of power flow in HVDC links.

UNIT-IV
FLEXIBLE AC TRANSMISSION SYSTEMS-I:

Types of FACTS Controllers, brief description about various types of FACTS controllers, Operation of

6- pulse converter, Transformer Connections for 12-pulse, 24-pulse and 48-pulse operation, principle of operation of various types of Controllable shunt VAR Generation, Principle of switching converter type shunt compensator, principles of operation of various types of Controllable Series VAR Generation, Principle of Switching Converter type series compensator.

UNIT-V
FLEXIBLE AC TRANSMISSION SYSTEMS-II:
Unified Power Flow Controller (UPFC) – Principle of operation, Transmission Control Capabilities, Independent Real and Reactive Power Flow Control; Interline Power Flow Controller (IPFC) – Principle of operation and Characteristics, UPFC and IPFC control structures (only block diagram description), objectives and approaches of voltage and phase angle regulators

TEXTBOOKS:

1. Narain G. Hingorani and Laszlo Gyugyi, Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems, IEEE Press, Wiley-Interscience, New Jersey, 2000.
2. E.W. Kimbark, Direct current transmission, Vol. I, Wiley Interscience, New York, 1971.

REFERENCE BOOKS:

1. K R Padiyar, FACTS Controllers in Power Transmission and Distribution, NewAge International Publishers, New Delhi, 2007.
2. AnriqueAcha, Claudio R. Fuerte-Esquivel, Hugo Ambriz-Pérez and César Angeles-Camacho, FACTS: Modelling and Simulation in Power Networks, John Wiley & Sons, West Sussex, 2004.
3. R Mohan Mathur and Rajiv K Varma, Thyristor-Based FACTS Controllers forElectrical Transmission Systems, IEEE Press, Wiley-Interscience, New Jersey, 2002.

Online Learning Resources:

1. https://nptel.ac.in/courses/108104013,
2. https://nptel.ac.in/courses/108107114

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

IV B.Tech – I Sem.

L	T	P	C
3	0	0	3

MODERN CONTROL THEORY-23EE0236
(Professional Elective-V)

COURSE OBJECTIVES

The objectives of this course is to

1. *To familiarize the state space representation in controllable, observable, diagonal and Jordan canonical forms.*
2. *Introduce the concept of controllability and observability tests through canonical forms and design of state feedback controller by pole placement technique and State Observer design.*
3. *Analysis of a nonlinear system using describing function approach.*
4. *Illustrate the Lypanov's method of stability analysis for linear and non-linear continuous time autonomous systems.*
5. *Formulation of Euler Laugrange equation for the optimization of typical functional and solutions.*

COURSE OUTCOMES

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

1. *Analyze different canonical forms - solution of State equation.*
2. *Design of control system using the pole placement technique is given after introducing the concept of controllability and observability.*
3. *Analyze nonlinear system using describing function technique and phase plane analysis.*
4. *Examine the stability analysis using Lyapunov method.*
5. *Illustrate the Minimization of functional using calculus of variation*
6. *State and quadratic regulator problems.*

UNIT I
STATE SPACE ANALYSIS:

State Space Representation – Canonical forms – Controllable canonical form – Observable canonical form - Jordan Canonical Form - Solution of state equation – State transition matrix.

UNIT II
CONTROLLABILITY - OBSERVABILITY AND DESIGN OF POLE PLACEMENT:

Tests for controllability and observability for continuous time systems – Time varying case – Minimum energy control – Time invariant case – Principle of duality – Controllability and observability form Jordan canonical form and other canonical forms – Effect of state feedback on controllability and observability – Design of state feedback control through pole placement.

UNIT III
NONLINEAR SYSTEMS:

Introduction to nonlinear systems - Types of nonlinearities. Introduction to phase–plane analysis - Singular points; Describing function - basic concepts - Describing functions of non- linearities.

UNIT IV
STABILITY ANALYSIS BY LYAPUNOV METHOD:

Stability in the sense of Lyapunov – Lyapunov's stability and Lyapunov's instability theorems – Direct method of Lyapunov for the linear and nonlinear continuous time autonomous systems.

UNIT V
CALCULUS OF VARIATIONS:
Minimization of functional of single function – Constrained minimization – Minimum principle – Control variable inequality constraints – Control and state variable inequality constraints –Euler lagrangine equation.

Text Books:

1. Modern Control System Theory – by M. Gopal - New Age International Publishers - 2nd edition - 1996
2. Modern Control Engineering – by K. Ogata - Prentice Hall of India - 3rd edition - 1998.

Reference Books:

1. Automatic Control Systems by B.C. Kuo - Prentice Hall Publication.
2. Control Systems Engineering by I.J. Nagarath and M.Gopal - New Age International (P) Ltd.
3. Digital Control and State Variable Methods – by M. Gopal - Tata Mc Graw–Hill Companies - 1997.
4. Systems and Control by Stainslaw H. Zak - Oxford Press - 2003.
5. Optimal control theory: an Introduction by Donald E.Kirk by Dover publications.

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IV B.Tech – I Sem.

L	T	P	C
3	0	0	3

SWITCHED MODE POWER CONVERSION-23EE0237
(Professional Elective-V)

Course Objectives: To make the students:

1. *Understand basic concepts of DC-DC converters*
2. *Understand the concepts of resonant converters and their classification, various types of multilevel inverters, power conditioners, UPS and filters.*
3. *Apply various modulation and harmonic elimination techniques over the converters.*
4. *Analyze the state space modelling of various types of converters.*
5. *Design inductor and transformer for various power electronic applications.*

COURSE OUTCOMES (COs)

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

1. *Remember basic concepts of various converters.*
2. *Understand the problems and to design of various DC-DC converters, advanced converters of SMPCs.*
3. *Evaluate the performance of resonant converters.*
4. *Analyze the performance characteristics of 1-ϕ and 3-ϕ inverters with single/multi levels, power conditioners, UPS and filters.*
5. *Analyze the performance characteristics of 1-ϕ and 3-ϕ inverters with single/multi levels, power conditioners, UPS and filters.*
6. *Design various applications of the above in Power Systems, EVE, Renewable Energy Systems, etc.*

UNIT I

DC-DC CONVERTERS:

Principles of step-down and step-up converters – Analysis and state space modelling of Buck, Boost, Buck- Boost and Cuk converters – Numerical Examples

UNIT II

SWITCHING MODE POWER CONVERTERS:

Analysis and state space modelling of flyback, Forward, Luo, Half bridge and full bridge converters- control circuits and PWM techniques – Numerical Examples

UNIT III

RESONANT CONVERTERS:

Introduction- classification- basic concepts- Resonant switch- Load Resonant converters- ZVS, Clamped voltage topologies- DC link inverters with Zero Voltage Switching- Series and parallel Resonant inverters- Voltage control – Numerical Examples

UNIT IV

DC-AC CONVERTERS:

Single phase and three phase inverters, control using various (sine PWM, SVPWM and advanced modulation) techniques, various harmonic elimination techniques- Multilevel inverters- Concepts - Types: Diode clamped- Flying capacitor- Cascaded types- Applications.

UNIT V

POWER CONDITIONERS, UPS & FILTERS:

Introduction- Power line disturbances- Power conditioners –UPS: offline UPS, Online UPS, Applications – Filters: Voltage filters, Series-parallel resonant filters, filter without series capacitors, filter for PWM VSI, current filter, DC filters – Design of inductor and transformer for PE applications – Selection of capacitors.

TEXTBOOKS:

1. Power Electronics: Essentials and Applications by L. Umanand, Wiley, 2009
2. M.H. Rashid – Power Electronics handbook, Elsevier Publication, 2001.
3. Course material on Switched Mode Power Conversion by V Ramanarayanan, Dept. of Electrical Engg. IISc. Bangalore.

Reference Books:

1. Philip T. Krein, ―Elements of Power Electronics‖, Oxford University Press, 2012
2. Ned Mohan, Tore.M.Undeland, William.P.Robbins, Power Electronics converters, Applications and design, 3rd Edition, John Wiley and Sons, 2006
3. M.H. Rashid, Power Electronics circuits, devices and applications, 3rd Edition Prentice Hall of India New Delhi, 2007.

Online Learning Resources:

1. https://nptel.ac.in/courses/108108036
2. https://nptel.ac.in/courses/108105180

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

IV B.Tech – I Sem.

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ELECTRICAL DISTRIBUTION SYSTEM-23EE0238
(Professional Elective-V)

Course Objectives: To make the students:

1. *To know about fundamental aspects of distribution system, principle of distribution substations.*
2. *To know about classification of various loads.*
3. *To understand difference between conventional load flow studies of power system and distribution system load flow.*
4. *To know about evaluation of voltage droop and power loss calculations, distribution automation and management system, SCADA.*

COURSE OUTCOMES (COs)

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

1. *Understand fundamental aspects of distribution system and various factors affecting the distribution systems.*
2. *Analysis of substations and modeling of loads.*
3. *Understand difference between conventional load flow studies of power system and distribution system load flow.*
4. *Evaluation of voltage drop and power loss calculations and capacitor location and cost analysis.*-
5. *Analyze the concepts of SCADA.*
6. *Analyze the concepts of Automation distribution system and management.*

UNIT I

DISTRIBUTION SYSTEM FUNDAMENTALS:

Brief description about electrical power transmission and distribution systems, Different types of distribution sub-transmission systems, Substation bus schemes, Factors effecting the substation location, Factors effecting the primary feeder rating, types of primary feeders, Factors affecting the primary feeder voltage level, Factors effecting the primary feeder loading.

UNIT II

DISTRIBUTION SYSTEM SUBSTATIONS AND LOADS:

Substations: Rating of a distribution substation for square and hexagonal shaped distribution substation, Service area with ―n‖ primary feeders, K constant, Radial feeder with uniformly and non-uniformly distributed loading. Benefits derived through optimal location of substations.

Loads: Various types of loads, Definitions of various terms related to system loading, Distribution transformer loading, feeder loading, Relationship between the Load Factor and Loss Factor, Modelling of star and delta connected loads.

UNIT III

DISTRIBUTION SYSTEM LOAD FLOW:

Exact line segment model, Modified line model, approximate line segment model, Step-Voltage Regulators, Line drop compensator, Forward/Backward sweep distribution load flow algorithm – Numerical problems

UNIT IV

VOLTAGE DROP AND POWER LOSS CALCULATION:

Analysis of non-three phase primary lines, concepts of four-wire multi-grounded common-neutral distribution system, Percent power loss calculation, Distribution feeder cost calculation methods, Capacitor installation types, Series and Shunt Capacitors, Types of three-phase capacitor-bank connections, Procedure for best capacitor location, Economic justification for capacitors – Numerical problems.

UNIT V

DISTRIBUTION AUTOMATION:

Distribution automation, distribution management systems, distribution automation system functions, Basic SCADA system, Consumer Information Service (CIS) – Geographical Information System (GIS) – Automatic Meter Reading (AMR), Outage management, decision support applications, substation automation, control feeder automation.

TEXTBOOKS:

1. Distribution System Modelling and Analysis, William H. Kersting, CRC Press, Newyork, 2002.
2. Electric Power Distribution System Engineering, TuranGonen, McGraw-Hill Inc., New Delhi, 1986.

REFERENCE BOOKS:

1. Control and automation of electrical power distribution systems, James Northcote-Green and Robert Wilson, CRC Press (Taylor & Francis), New York, 2007.
2. Biswarup Das, Power distribution Automation, IET publication, 2016.
3. Dr. M. K. Khedkar, Dr. G.M. Dhole, Electric Power Distribution Automation, Laxmi Publications, First edition, 2017.

Online Learning Resource:

https://onlinecourses.nptel.ac.in/noc22_ee126/preview

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IV B.Tech – I Sem.

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SMART GRID TECHNOLOGIES - 23EE0263

(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 Synchrophasor 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.

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

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ELECTRIC VEHICLES
(Open Elective- IV)

COURSE OBJECTIVES:

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)

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

TEXTBOOKS:

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

REFERENCE BOOKS:

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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IV B.Tech – I Sem.

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POWER SYSTEMS AND SIMULATION LAB-23EE0239
(Skill Enhancement Course)

COURSE OBJECTIVES: ***The objectives of this course***

1. *To do the experiments (in machines lab) on various power system concepts like determination of sequence impedance, fault analysis, finding of subtransient reactance's.*
2. *To draw the equivalent circuit of three winding transformer by conducting a suitable experiment.*
3. *To develop the MATLAB program for formation of Y and Z buses. To develop the MATLAB programs for Gauss-Seidel and fast decoupled load flow studies.*
4. *To develop the SIMULINK model for single area load frequency problem.*

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

1. *Analyze and determine the sequence impedances of both cylindrical rotor and salient pole synchr machine to understand their behavior under various fault conditions.*
2. *Conduct fault analysis (LG, LL, LLG, and LLLG) on synchronous machines and interpret the im faults on system stability and performance.*
3. *Develop and simulate load flow analysis using various methods (Gauss-Seidel, Newton-Raphson, Decoupled) and formulate the YBus for power system networks.*
4. *Develop and simulate load flow analysis using various methods (Gauss-Seidel, Newton-Raphson, Decoupled) and formulate the ZBus for power system networks.*
5. *Model load frequency control problems for single and two-area systems, employing both uncontr PI-controlled approaches to evaluate system performance.*
6. *Simulate load frequency control problems for single and two-area systems, employing both unco PI-controlled approaches to evaluate system performance.*

CHOOSE ANY TEN FROM THE FOLLOWING LIST:

1. Determination of Sequence Impedances of Cylindrical Rotor Synchronous Machine
2. Determination of Sequence Impedances of salient pole Synchronous Machine
3. LG Fault Analysis on an un loaded alternator
4. LL Fault Analysis on conventional phases
5. LLG Fault Analysis
6. LLLG Fault Analysis
7. Determination of Sub transient reactance of salient pole synchronous machine
8. Equivalent circuit of three winding transformer.
9. YBus formation using Soft Tools

10. ZBus formation using Soft Tools
11. Gauss-Seidel load flow analysis using Soft Tools
12. Newton-Raphson load flow analysis using Soft Tools
13. Fast decoupled load flow analysis using Soft Tools
14. Solve the Swing equation and Plot the swing curve
15. Develop a model for a uncontrolled single area load frequency control problem and simulate the same using Soft Tools.
16. Develop a model for PI controlled single area load frequency control problem and simulate the same using Soft Tools.
17. Develop a model for a uncontrolled two area load frequency control problem and simulate the same using Soft Tools.
18. Develop a model for PI controlled two area load frequency control problem and simulate the same using Soft Tools.

Online Learning Resource:

1. https://www.ee.iitb.ac.in/~vlabsync/template/vlab/index.html#

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IV B.Tech – I Sem.

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GENDER SENSITIZATION - 23HS0820
(Audit Course)

COURSE OBJECTIVES: To make the students:

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. *Notify 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 labor and its relation to politics and Economics.*
5. *Appraise how gender-role beliefs and sharing behavior 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-**23***

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- House Work: The Invisible Labour- 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. 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 Paper back Edn. March 1990

REFERENCE BOOKS

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, LisaD. Gender and Governance, New Delhi, Rawat Publication, 2007
4. Singh, Direeti, Women and Politics World Wide, NewDelhi, 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. **GENDERANDCULTURE**
   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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B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

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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, aluminum, 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)

Upon 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, Aluminum, Glass, Paints and Plastics: Wood - Structure – Types and Properties – Seasoning – Defects; Alternate Materials for Timber – GI / Fibre – Reinforced Glass Bricks, Steel & Aluminum, 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 andTypes; 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, 1st Edition, 2010.
2. G C Sahu, Joygopal Jena, *Building Materials and Construction,* McGraw-Hill Pvt Ltd, 1st Edition, 2015.

REFERENCES

1. B. C. Punmia, Ashok Kumar Jain and Arun Kumar, *Building Construction*, Jain - Laxmi Publications (P) Ltd., New Delhi
2. P. C. Varghese, *Building Materials*, Prentice Hall of India, 2015.
3. N.Subramanian, *Building Materials Testing and Sustainability*, Oxford Higher Education, 2019.
4. R. Chudley, *Construction Technology*, Longman Publishing Group, 1973.
5. S. K. Duggal, *Building Materials,* Oxford & IBH Publishing Co. Ltd., New Delhi, 2019

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IV B. Tech. – I Sem.

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(23CE0155) ENVIRONMENTAL IMPACT ASSESSMENT
(Open Elective - III)

COURSE OBJECTIVES

The objectives of this course is to

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)

Upon 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 analyze 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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B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.	**L**	**T**	**P**	**C**
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(23ME0357) 3D PRINTING TECHNOLOGIES
(Open Elective - III)

COURSE OBJECTIVES:

The objectives of the course are to

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:

On successful completion of the course, the student 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.

TEXTBOOKS:

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 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*

R23

B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(23EC0414) MICROPROCESSORS AND MICROCONTROLLERS
(Open Elective –III)

COURSE OBJECTIVES:
The objectives of this course

1. *To comprehend the architecture, operation, and configurations of the 8086 microprocessors.*
2. *To get familiar with 8086 programming concepts, instruction set, and assembly language development tools.*
3. *To study the interfacing of 8086 with memory, peripherals, and controllers for various applications.*
4. *To learn the architecture, instruction set, and programming of the 8051 microcontrollers.*
5. *To understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.*

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, 3rdEdition,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.

R23

B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(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)

At the end of the course, Student 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 recovery protocols in databases.*

UNIT-I

Introduction: Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

UNIT-II

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus. BASIC SQL:Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

UNIT III

SQL: Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

UNIT IV

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependencyLossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).

UNIT V

Transaction Concept: Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

Introduction to Indexing Techniques: B+ Trees, operations on B+Trees, Hash Based Indexing.

TEXTBOOKS

1. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, TMH 3rd edition, (For Chapters 2, 3, 4)
2. Database System Concepts,5th edition, Silberschatz, Korth, Sudarsan,TMH (For Chapter 1 and Chapter 5)

REFERENCES

1. Robert Kruse, *Data Structures and program design in C,* Pearson Education Asia
2. Trembley & Sorenson, *An introduction to Data Structures with applications,* McGraw Hill
3. Donald E Knuth, Addison-Wesley, *The Art of Computer Programming*, Vol.1: Fundamental Algorithms, 1997.
4. Langsam, Augenstein & Tanenbaum, *Data Structures using C & C++:* Pearson, 1995
5. N.Wirth, *Algorithms + Data Structures & Programs,* PHI
6. Horowitz Sahni & Mehta, *Fundamentals of Data Structures in C++,* Galgottia Pub.
7. Thomas Standish, *Data structures in Java*, Pearson Education Asia
8. C J Date, *Introduction to Database Systems,* 8th edition, Pearson.
9. RamezElmasri, Shamkant B. Navathe, *Database Management System* 6th edition Pearson

R23

B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(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)

At the end of the course, Student 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, keyloggers, 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, 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

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

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

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

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.

TEXTBOOKS

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

R23

B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(23HS0856) WAVELET TRANSFORMS AND ITS APPLICATIONS
(Open Elective-III)

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
After 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 Multiresolution Formulation of Wavelet Systems: Signal Spaces -The Scaling Function - Multiresolution Analysis - The Wavelet Functions - The Discrete Wavelet Transform- A Parseval's Theorem - Display of the Discrete Wavelet Transform and the Wavelet Expansion

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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: Multiresolution versus Time-Frequency Analysis- Periodic versus Nonperiodic 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. *RaghuveerRao, ―Wavelet Transforms‖, Pearson Education, Asia*
2. *C. S. Burrus, Ramose and A. Gopinath, Introduction to Wavelets and Wavelet Transform, Prentice Hall Inc.*

ONLINE RESOURCES

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*

R23

B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(23HS0844) SMART MATERIALS AND DEVICES
(Open Elective-III)

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: Chemical etching, 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. *MahmoodAliofkhazraei, Handbook of functional nanomaterials, Vol (1&2), Nova Publishers, 2014*
3. *Handbook of Smart Materials, Technologies, and Devices: Applications of Industry,4.0,Chaudhery MustansarHussain, Paolo Di Sia, Springer,2022.*
4. *Fundamentals of Smart Materials,Mohsen Shahinpoor, Royal Society of Chemistry, 2020*

NPTEL COURSE LINK:

1. *https://onlinecourses.nptel.ac.in/noc22_me17/preview*

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR (AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(23HS0846) INTRODUCTION TO QUANTUM MECHANICS
(Open Elective - III)

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: Penetration of a potential barrier (tunneling effect). Periodic potential and Harmonic oscillator, Energy eigen functions and eigen values.

UNIT-III
Operator Formalism

Operators, Operator Algebra, Eigen values and Eigen vectors, Postulates of quantum mechanics, 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.

TEXTBOOKS:

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 COURSE 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

R23

B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(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.*
2. *Analyze the concept of green chemistry in the catalytic industry.*
3. *Understand the importance of green synthesis.*
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.*
6. *Apply alternative green methods for green chemistry.*

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 carbondioxide, super critical water, Polyethylene glycol (PEG), Ionic liquids, Recyling 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-V

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: Green Nanoscience, wiley-VCH, 2013.*

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(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

TEXTBOOKS:

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/*

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR (AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(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)

Upon 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—Neighborhood - Operations: Aggregation, Filtering – Extended Neighborhood-Operations- Zonal Operations - Statistical Analysis – Cost Distance Analysis-Least Cost Path.

UNIT-II

Vector Analysis Non-Topological Analysis- Attribute Database Query, Structured Query Language, CoOrdinate 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/

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(23CE0157) SOLID WASTE MANAGEMENT
(Open Elective - IV)

COURSE OBJECTIVES

The objectives of this course is to

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

Upon 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; Pyrolisis, 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.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(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:

On successful completion of the course, the student 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/

R23

B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(23EC0442) TRANSDUCERS AND SENSORS

(Open Elective –IV)

COURSE OBJECTIVES:

The objectives of this course

1. *To understand characteristics of Instrumentation System and the operating principle of motion transducers.*
2. *To explore working principles, and applications of different temperature transducers and Piezo-electric sensors.*
3. *To provide knowledge on flow transducers and their applications.*
4. *To study the working principles of pressure transducers.*
5. *To introduce working principle and applications of force and sound transducers.*

COURSE OUTCOMES (COs):

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

1. *Understand characteristics of Instrumentation System and the operating principle of motion transducers.*
2. *Explore working principles, and applications of different temperature transducers and Piezo-electric sensors.*
3. *Gain knowledge on flow transducers and their applications.*
4. *Learn the working principles of pressure transducers.*
5. *Understand the working principle and applications of force and sound transducers.*
6. *Analyze and select appropriate transducers based on application requirements, standards, calibration methods, and performance characteristics for industrial and biomedical instrumentation systems.*

UNIT-I

Introduction: General Configuration and Functional Description of measuring instruments, Static and Dynamic Characteristics of Instrumentation System, Errors in Instrumentation System, Active and Passive Transducers and their Classification.

Motion Transducers: Resistive strain gauge, LVDT, RVDT, Capacitive transducers, Piezo-electric transducers, seismic displacement pick-ups, vibrometers and accelerometers.

UNIT-II

Temperature Transducers: Standards and calibration, fluid expansion and metal expansion type transducers - bimetallic strip, Thermometer, Thermistor, RTD, Thermocouple and their characteristics.

Hall effect transducers, Digital transducers, Proximity devices, Bio-sensors, Smart sensors, Piezo-electric sensors.

UNIT-III

Flow Transducers: Bernoulli's principle and continuity, Orifice plate, Nozzle plate, Venture tube, Rotameter, Anemometers, Electromagnetic flow meter, Impeller meter and Turbid flow meter.

UNIT-IV

Pressure Transducers: Standards and calibration, different types of manometers, elastic transducers, diaphragm bellows, bourdon tube, capacitive and resistive pressure transducers, high and low pressure measurement.

UNIT-V

Force and Sound Transducers: Proving ring, hydraulic and pneumatic load cell, dynamometer and gyroscopes. Sound level meter, sound characteristics, Microphone**.**

TEXT BOOKS:

1. *A.K. Sawhney, ―A course in Electrical and Electronics Measurements and Instrumentation‖, Dhanpat Rai& Co. 3rd edition Delhi, 2010.*
2. *Rangan C.S, Sarma G.R and Mani V S V, ―Instrumentation Devices and Systems‖, TATA McGraw Hill publications, 2007.*

REFERENCES:

1. *Doebelin. E.O, ―Measurement Systems Application and Design‖,McGraw Hill International, New York, 2004.*
2. *Nakra B.C andChaudharyK.K , ―Instrumentation Measurement and Analysis‖, Second Edition, Tata McGraw-Hill Publication Ltd.2006.*

R23

B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(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

The Application Layer: 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)

TEXTBOOKS:

1. *AndrewS. Tanenbaum, David j.wetherall, 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*

R23

B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(23CS0545) INTERNET OF THINGS
(Open Elective-IV)

COURSE OBJECTIVES:

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*:**

After completion of the 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 Arshdeep Bahga, *Internet of Things (A Hands-on Approach)*, 1st Edition, VPT, 2014.
2. K. Valavanis and George J. Vachtsevanos, *Handbook of Unmanned Aerial Vehicles*, Springer, Boston, Massachusetts: Credo Reference, 2016.

REFERENCE BOOKS:

1. Jan Holler, Vlasios Tsiatsis, 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. Arshdeep Bahga, Vijay Madisetti, *Internet of Things: A Hands-On Approach*, Universities Press, 2014.
3. Pethuru Raj, Anupama C. Raman, *The Internet of Things: Enabling Technologies and Use Cases*, 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: 978-1-4493-9357-1.
6. *DGCA RPAS Guidance Manual*, Revision 3, 2020.
7. John Baichtal, *Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs*, Que Publishing.

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

R23

B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(23CS0557) INTRODUCTION TO QUANTUM COMPUTING
(Open Elective-IV)

COURSE OBJECTIVES*:*

The objectives of this course

1. *To introduce the principles and mathematical foundations of quantum computation.*
2. *To understand quantum gates, circuits, and computation models.*
3. *To explore quantum algorithms and their advantages over classical ones.*
4. *To develop the ability to simulate and write basic quantum programs.*
5. *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.

TEXTBOOKS:

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

R23

B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(23HS0857) FINANCIAL MATHEMATICS
(Open Elective-IV)

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 (COs):
On successful completion of this course, students will 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: 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.

TEXTBOOKS:

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. *IoannisKaratzas& 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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B.Tech-EEE

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	C
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(23HS0845) SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS
(Open Elective-IV)

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), Deposition: Chemical Vapor Deposition, Pattern: photolithography and Etching: Dry and Wet Etching.

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:

1. *https://onlinecourses.nptel.ac.in/noc21_ee32/preview*

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

IV B. Tech. – I Sem.

L	T	P	C
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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.*
2. *Analyze the synthesis of a nanomaterial's using various methods comparing and evaluating their effectiveness.*
3. *Apply various instrumental methods to cauterize nanomaterials and interpret the result.*
4. *Apply the BET method for surface area and porosity analysis of nanomaterials and porous solids.*
5. *Apply knowledge of synthesis, properties and applications of various nanomaterials.*
6. *Evaluate the applications of nanomaterials in various fields and their benefits in day to Day Life.*

UNIT-I

Basics and Characterization of Nanomaterials: Introduction, Scope of nanoscience and nanotecnology, 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, highenergy 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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IV B. Tech. – I Sem.

L	T	P	C
3	-	-	3

(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-J B Priestly
5. My Days: A Memoir

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.*
7. *Narayan, R. K. (1974). My days: A memoir. New Delhi: Indian Thought Publications.*

ONLINE RESOURCES

1. *https://www.litcharts.com/poetry/alfred-lord-tennyson/ulysses*
2. *https://www.litcharts.com/lit/ain-t-i-a-woman/summary-and-analysis*
3. *https://englishliterature.education/articles/poetry-analysis/the-second-coming-by-w-b-yeats-critical-analysis-summary-and-line-by-line-explanation/#google_vignette*
4. *https://sirjitutorials.com/where-the-mind-is-without-fear-poem-notes-explanation/*
5. *https://www.litcharts.com/lit/twelfth-night/themes*
6. *https://smartenglishnotes.com/2021/11/28/the-luncheon-summary-characters-themes-and-irony/*

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

Bachelor of Technology

Department of Electrical and Electronics Engineering

HONOURS in ELECTRIC VEHICLES (EEE Department)

S.No.	Course Code	Course Name	Contact Hours per week		Credits
			L	P	
1	23EE0251	E - Mobility	3	-	3
2	23EE0252	Battery Management Systems	3	-	3
3	23EE0253	Special Machines for Electric Vehicles	3	-	3
4	23EE0254	Grid Interface of Electric Vehicles	3	-	3
5	23EE0255	EV Charging Technologies	3	-	3
6	23EE0256	Project on Electric Vehicles	-	6	3

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

L	T	P	C
3	0	0	3

(23EE0251) E - MOBILITY

Course Objectives:

The objectives of this course

- *Understand the fundamental concepts and principles of Electric vehicles*
- *Apply the concepts to implement battery technology*
- *Apply the concepts to implement charging technology*
- *Understand the future trends in EVs*

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

CO1: Understanding the Fundamentals of Electric Vehicles and Vehicle Dynamics Choose suitable motors and analyze different power electronics in EVs. -L2
CO2: Analyzing Battery Technologies for Electric Vehicles. -L4
CO3: Understanding and Evaluating Charging Technologies for Electric Vehicles. -L2
CO4: Exploring Future Trends and Innovations in Electric Vehicles. -L5
CO5: Understanding E-Mobility, Policy, and Integration with Smart Grids. -L2
CO6: Compare policy, environmental, and economic aspects influencing the adoption of electric mobility – L4

UNIT I

Introduction:
Introduction to electric vehicles: EV verses gasoline vehicles, vehicle dynamics fundamentals, e-drivetrain, Electric motor, Power electronic in electric vehicles, Regenerative braking.

UNIT II

Battery Technology:
Battery Technology for EVs: Storage technologies for EV, Battery working principles, Battery losses, Li-ion batteries, Battery pack and battery management system.

UNIT III

Charging Technology:
Charging Technology of EVs: AC charging - Type 1,2,3, DC charging, Fast charging and its limitations, Smart charging and applications, Vehicle to X(V2X), X2V technology.

UNIT IV

FUTURE TRENDS IN Evs:
Future trends in e-Vehicles: Wireless charging of EV, On-road charging of EV, Battery swap technology, Solar powered EVs, Charging EVs from renewables.

UNIT V

E-Mobility:
E-mobility: electrification challenges, business, connected mobility and autonomous mobility case study in Indian Roadmap Perspective, Policy- EVs in infrastructure system, integration of EVs in smart grid, social dimensions of EVs.

Textbooks:

1. Iqbal Hussain, “Electric & Hybrid Vehicles – Design Fundamentals”, Second Edition, CRC Press, 2011.
2. James Larminie, “Electric Vehicle Technology Explained”, John Wiley & Sons, 2003.

Reference Books:

1. Mehrdad Ehsani, Yimin Gao, Ali Emadi, “Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals”, CRC Press, 2010.
2. Sheldon S. Williamson, Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles, Springer, 2013.
3. Sandeep Dhameja, “Electric Vehicle Battery Systems”, Newnes, 2000
4. Tariq Muneer and Irene Illescas García, “The automobile, In Electric Vehicles: Prospects and Challenges”, Elsevier, 2017.

Online Learning Resources:

1. https://nptel.ac.in/courses/108106170

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

L	T	P	C
3	0	0	3

(23EE0252) BATTERY MANAGEMENT SYSTEMS

Course Objectives:

The objectives of this course

- *Understand the basics of batteries and its parameters*
- *Apply the concepts to create Battery Management System*
- *Create Physical and Simulation models for Battery Management System*
- *Design different Battery Management Systems*

Course Outcomes (COs):

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

CO1: Understand the role of battery management system -L2
CO2: Identify the requirements of Battery Management System. L2
CO3: Interpret the concept associated with battery charging / discharging process. -L3
CO4: Analyze various parameters of battery and battery pack. L4
CO5: Design the model of battery pack. L5
CO6: Assess safety, reliability, and standards compliance in the design of Battery Management Systems. – L5

UNIT I
Introduction:
Introduction to Battery Management System, Cells & Batteries, Nominal voltage and capacity, C rate, Energy and power, Cells connected in series, Cells connected in parallel, Electrochemical and lithium-ion cells, Rechargeable cell, Charging and Discharging Process, Overcharge and Undercharge, Modes of Charging

UNIT II
Battery Management System:
Introduction and BMS functionality, Battery pack topology, BMS Functionality, Voltage Sensing, Temperature Sensing, Current Sensing, BMS Functionality, High-voltage contactor control, Isolation sensing, Thermal control, Protection, Communication Interface, Range estimation, State-of charge estimation, Cell total energy and cell total power

UNIT III
Battery State Of Charge And State Of Health Estimation:

Battery state of charge estimation (SOC), voltage-based methods to estimate SOC, Model-based state estimation, Battery Health Estimation, Lithium-ion aging: Negative electrode, Lithium ion aging: Positive electrode, Cell Balancing, Causes of imbalance, Circuits for balancing

UNIT IV

Modelling and Simulation:
Equivalent-circuit models (ECMs), Physics-based models (PBMs), Empirical modelling approach, Physics-based modelling approach, Simulating an electric vehicle, Vehicle range calculations, Simulating constant power and voltage, Simulating battery packs

UNIT V

Design Of Battery Management Systems:

Design principles of battery BMS, Effect of distance, load, and force on battery life and BMS, energy balancing with multi-battery system

Textbooks:

1. Plett, Gregory L. Battery management systems, Volume I: Battery modelling. Artech House, 2015.
2. Plett, Gregory L. Battery management systems, Volume II: Equivalent-circuit methods. Artech House, 2015.

Reference Books:

1. Bergveld, H.J., Kruijt, W.S., Notten, P.H.L "Battery Management Systems -Design by Modelling" Philips Research Book Series 2002.
2. Davide Andrea," Battery Management Systems for Large Lithium-ion Battery Packs" Artech House, 2010
3. Pop, Valer, et al. Battery management systems: Accurate state-of-charge indication for battery-powered applications. Vol. 9. Springer Science & Business Media, 2008.

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L	T	P	C
3	0	0	3

(23EE0253) SPECIAL MACHINES FOR ELECTRIC VEHICLES

Course Objectives:
The objectives of this course

- *Understand various Motor Drives useful for EV applications*
- *Apply the concepts to implement various designs*
- *Analyze performance of various Motor Drives*
- *Evaluate the usage of specific drive for EV application*

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

CO1: Understanding the Fundamentals of Permanent Magnet Brushless Motor Drives. -L2
CO2: Analyzing Switched Reluctance Motor (SRM) Drives. -L4
CO3: Evaluating Stator-Permanent Magnet (PM) Motor Drives. -L4
CO4: Understanding and Designing Magnetic-Gear Motor Drives. -L2
CO5: Exploring Advanced Magnet less and Multiphase Motor Drives. L5
CO6: Evaluate the integration of special machines with power electronic converters and control systems in EV applications. – L5

UNIT I
Permanent Magnet (PM) Brushless Motor Drives:

Structure of PM Brushless Machines, Principle of PM Brushless Machines Modeling of PM Brushless Machines, Inverters for PM Brushless Motors Motor Control, Design Criteria of PM Brushless Motor Drives for EVs, Design Examples of PM Brushless Motor Drives for EVs, Application, Advantages and Limitations for EVs.

UNIT II
Switched Reluctance Motor Drive:
Structure of SR Machines, Principle of SR Machines, SR Converters Topologies, SR Motor Control, Design Criteria of SR Motor Drives for EVs, Examples of SR Motor Drives for EVs, Application, Advantages and Limitations for EVs.

Unit III
Stator-PM Motor Drives:
Doubly-Salient PM Motor Drives, Flux-Reversal PM Motor Drives, Flux-Switching PM Motor Drives, Hybrid-Excited PM Motor Drives Flux-Mnemonic PM Motor Drives, Design Criteria of Stator-PM Motor Drives for EVs, Application, Advantages and Limitations for EVs.

UNIT IV
Magnetic-Geared Motor Drives:
Principle of MG Machines, Modeling of MG Machines, Inverters for MG Motors, MG Motor Control, Design Criteria of MG Motor Drives for EVs, Application, Advantages and Limitations for EVs

UNIT V

Advanced Magnetless Motor Drives and Multiphase Motor Drives:

Introduction of Advanced Magnetless technology, Synchronous Reluctance Motor Drives, Doubly-Salient DC Motor Drives, Flux-Switching DC Motor Drives, Design Criteria of Advanced Magnetless Motor Drives for EVs, Application, Advantages and Limitations for EVs. Multiphase Induction Motor drives – principle, operation and control, Multiphase PMSM machine – principle, operation and control, Fault tolerant operation of multiphase drives

Textbooks:

1. Mehrdad Ehsani, Yimin Gao, Sebatien Gay and Ali Emadi, "Modern Electric, Hybrid Electric and Fuel cell vehicles: Fundamentals, Theory and Design", CRC Press, 2004.
2. James Larminie and John Loury, "Electric Vehicle Technology – Explained", John Wiley & Sons Ltd, 2003.

Reference Books:

1. Sandeep Dhameja, "Electric Vehicle Battery Systems", Butterworth – Heinemann, 2002.
2. Ronald K Jurgen, "Electric and Hybrid – Electric Vehicles", SAE, 2002.
3. Ron Hodkinson and John Fenton, "Light Weight Electric/Hybrid Vehicle Design", Butterworth – Heinemann, 2001.
4. Iqbal Husain, "Electric and Hybrid Vehicles- Design Fundamentals" CRC Press, 2011.

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

L	T	P	C
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(23EE0254) GRID INTERFACE OF ELECTRIC VEHICLES

Course Objectives:
The objectives of this course

- *Understand the Grid interfacing concept of EVs*
- *Analyze the EV impact on grid*
- *Design new types of charging facilities for EVs*
- *Evaluate the role of EV as ancillary service*

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

CO1: Understanding the Fundamentals of Smart Grid and Electric Vehicle Integration Analyze Impact of EV on smart grid -L2
CO2: Analyzing the Impact of EVs and V2G on the Smart Grid and Renewable Energy Systems -L3
CO3: Applying Power Conversion Technologies for Smart Grids and Electric Vehicles- L4
CO4: Designing Control and Management Strategies for PEV Parking Lots -L5
CO5: Evaluating the Role of PEVs as Ancillary Services in Smart Grids -L4
CO6: Describe communication protocols, smart grid technologies, and control architectures for effective EV-grid integration – L2

UNIT I
Introduction to Smart Grid and PEV:
Introduction to smart grid and microgrid, Impact of PEVs on Distributed Energy Resources in the Smart Grid, V2G Technology and PEVs Charging Infrastructures

UNIT III
Impact of V2G and G2V on the Smart Grid and Renewable Energy Systems:
Types of Electric Vehicles, Motor Vehicle Ownership and EV Migration, Impact of Estimated EVs on Electrical Network, Impact on Drivers and the Smart Grid, Standardization and Plug-and-Play

UNIT III
Power Conversion Technology in the Smart Grid and EV:
Impacts of EV Penetration on Grid Power Profile, Requirements of Its Control and Monitoring, Hybrid EV Powertrain Architectures, Control, Monitoring and Management Strategies of EV, V2G Communication System, System model of EV, Case study of three phase fault and its impact

UNIT IV
Planning, Control and Management Strategies for Parking Lots for PEVs:
Introduction to PEV Charging Facility, Long-Term Planning for PEV Parking Lots, Control and Management of PEV Parking Lots - stages of implementation

UNIT V

PEV as Ancillary Service in Smart Grid:

Introduction to Ancillary Services, PEV Charger Optimization, PEV as ancillary source, Control Strategies for PEVs to Follow the Individual Operation Values, Systems and Control Algorithm for Smart PEV Chargers, Avoiding the Harmonic Propagation Within the Grid, Case study

Textbooks:

1. Lu, J. and Hossain, J., Vehicle-to-grid: linking electric vehicles to the smart grid. Institution of Engineering and Technology, 2015.
2. Rajakaruna, S., Shahnia, F. and Ghosh, A. eds., Plug In Electric Vehicles in Smart Grids: Integration Techniques. Springer, 2014.

Reference Books:

1. Rajakaruna, S., Shahnia, F. and Ghosh, A. eds., Plug in electric vehicles in smart grids: charging strategies. Springer, 2014.
2. Salman, S.K., Introduction to the Smart Grid: Concepts, Technologies and Evolution (Vol. 94). IET., 2017.

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(AUTONOMOUS)

L	T	P	C
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(23EE0255) EV CHARGING TECHNOLOGIES

Course Objectives:
The objectives of this course

- *Provide a comprehensive understanding of the various electric vehicle (EV) charging technologies, standards, and infrastructure requirements.*
- *Introduce the different types of EV chargers (AC, DC, fast chargers) and their operating principles.*
- *Explain the integration of power electronic converters and control strategies in EV charging systems.*
- *Analyse the challenges in grid-connected EV charging, including load management, power quality, and smart charging.*

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

CO1: Understanding Battery Basics and Key Parameters-L2

CO2: Analyzing Battery Modeling Techniques and Capacity Estimation-L3

CO3: Exploring Charging Infrastructure and Regulatory Frameworks-L4

CO4: Evaluating Battery Charging Techniques and Performance-L3

CO5: Understanding Power Electronics in EV Charging Systems-L3

CO6: Evaluate the impact of large-scale EV charging on grid stability, load profiles, and demand-side management – L5

UNIT I
Battery Basics:
Battery parameters- Cell and Battery Voltages, Charge (or Amp hour) Capacity, Energy Stored, Specific Energy, Energy Density, Specific Power, Amp hour (or Charge) Efficiency, Energy Efficiency, Self-discharge Rates, Battery Geometry, Battery Temperature, Heating and Cooling Needs 35 3.2.12 Battery Life and Number of Deep Cycles Types of batteries- lead-acid, nickel based sodium based, lithium batteries, metal-air batteries. Refilled Batteries.
UNIT II
Battery Modeling:
The Purpose of Battery Modelling, Electrochemical model, black box model, equivalent circuit model - Battery Equivalent Circuit, Modelling Battery Capacity, Simulating a Battery at a Set Power, Calculating the Peukert Coefficient, Approximate Battery Sizing, Battery state of charge estimation.

UNIT III
Charging Infrastructure:
EV supply equipment, charging standards, classification of charging infrastructure, connecting EVs

to the electricity grid, regulatory framework for EV charging connections, communication protocols for smart charging, Battery Management System.

UNIT IV
Battery Charging Techniques:
Basic Terms for Evaluating Charging Performances, Charging Algorithms for Li-Ion Batteries, Optimal Charging Current Profiles for Lithium-Ion battery, Lithium Titanate Oxide Battery with Extreme Fast Charging Capability. Super Capacitors for battery charging.

UNIT V
Power Electronics in EV Charging:
Active front end rectifiers - Forward converters, half and full bridge DC-DC converters, power factor correction converters, decreasing impact on the grid and switches, bidirectional battery chargers, wireless charging.

TEXT BOOKS:

1. James Larminie, John Lowry, “Electric Vehicle Technology Explained”, Wiley, 2012.
2. RuiXiong, Weixiang Shen, “Advanced Battery management Technologies for Electric Vehicle”, Wiley, 2018

REFERENCES:

1. Handbook of Electric Vehicle Charging Infrastructure Implementation, NITI Aayog, Government of India.
2. Chris Mi, M. AbulMasrur, Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives, Wiley, 2017
3. Bruno Scrosati, Jurgen Garche, Werner Tillmetz, Advances in Battery Technologies for Electric Vehicles, Wood head Publishing Series in Energy, 2015
4. Sheldon S. Williamson , Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles, Springer, 2013

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR (AUTONOMOUS)

MINORS in ENERGY SYSTEMS (EEE Department)

S.No.	Code	Course Name	Contact Hours per week			Credits
			L	T	P	
1	23EE0271	Energy Audit and Management	3	-	0	3
2	23EE0272	Energy Management in Building	3	-	0	3
3	23EE0273	Energy Storage Technologies	3	-	0	3
4	23EE0274	Energy Scenario and Energy Policy	3	-	0	3
5	23EE0275	Waste Energy Management	3	-	0	3
6	23EE0276	Project in Energy Systems	-	-	6	3

MINORS in MICRO GRID TECHNOLOGY (EEE Department)

S.No.	Code	Course Name	Contact Hours per week			Credits
			L	T	P	
1	23EE0277	Futuristic Power Systems	3	0	0	3
2	23EE0278	Power Electronic Converters for Energy Sources	3	0	0	3
3	23EE0279	Microgrid Power and Control Architecture	3	0	0	3
4	23EE0280	Microgrid System Design	3	0	0	3
5	23EE0281	Analysis of Smart Grid Systems	3	0	0	3
6	23EE0282	Project in Micro Grid Technology	0	0	6	3

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)
B. Tech (EEE)

L	T	P	C
3	0	0	3

(23EE0271) ENERGY AUDIT AND MANAGEMENT

Course Objectives:

- Able to understand the basic concepts of Energy Audit and Management, Principles and objectives of Energy management and Basics of Thermal, Electrical energy management
- Able to apply the fundamental concepts for development of energy management systems
- Able to Design Energy Audit reports
- Able to analyze designed energy management systems

Course Outcomes:

CO1: Understanding the Fundamentals of Energy Auditing and Conservation. -L2
CO2: Analyzing Energy Audit Concepts and Techniques -L3
CO3: Designing comprehensive Energy Management Programs -L5
CO4: Implementing and Monitoring Energy Management Programs – L4
CO4: Managing Thermal Energy and Implementing Energy Conservation Techniques L4
CO5: Implementing Electrical Energy Management and Conservation -L4

UNIT I
Introduction:
Basic elements and measurements - Mass and energy balances – Scope of energy auditing industries - Evaluation of energy conserving opportunities.

UNIT II
Energy Audit Concepts:
Need of Energy audit - Types of energy audit – Energy management (audit) approach - understanding energy costs - Bench marking – Energy performance - Matching energy use to requirement - Maximizing system efficiencies - Optimizing the input energy requirements - Duties and responsibilities of energy auditors- Energy audit instruments - Procedures and Techniques.

UNIT III
Principles and Objectives of Energy Mangement:

Design of Energy Management Programmes - Development of energy management systems – Importance - Indian need of Energy Management - Duties of Energy Manager - Preparation and presentation of energy audit reports - Some case study and potential energy savings.

UNIT IV
Thermal Energy Management:
Energy conservation in boilers - steam turbines and industrial heating systems - Application of FBC - Cogeneration and waste heat recovery - Thermal insulation - Heat exchangers and heat pumps - Building Energy Management.

UNIT V
Electrical Energy Management:
Supply side Methods to minimize supply-demand gap- Renovation and modernization of power plants - Reactive power management – HVDC - FACTS - Demand side - Conservation in motors - Pumps and fan systems – Energy efficient motors. Demand side management.

Textbooks:

1. Hamies, Energy Auditing and Conservation; Methods Measurements, Management and Case study, Hemisphere, Washington, 1980.
2. Energy Management: W.R.Murphy, G.Mckay

Reference Books:

1. Energy Management Principles: C.B.Smith
2. Efficient Use of Energy : I.G.C.Dryden
3. Energy Economics A.V.Desai
4. Guide book for National Certification Examination for Energy Managers and Energy Auditors (Could be downloaded from www.energymanagertraining.com).

Online Learning Resources: . https://nptel.ac.in/courses/108106022

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR (AUTONOMOUS)

B. Tech (EEE)

L	T	P	C
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(23EE0272) ENERGY MANAGEMENT IN BUILDING

Course Objectives:

- Able to understand the significance of energy management in buildings, Ventilation and Air conditioning aspects, Climate influence, energy usage estimation and technological options for energy management
- Able to apply the Energy management concepts for building designs
- Able to analyze different conditions for preparation of efficient energy management system for a building
- Able to design efficient energy management systems for buildings

Course Outcomes:

CO1: Understanding the Fundamentals of Energy Use in Buildings Apply the Energy management concepts for building designs -L2
CO2: Analyzing Indoor Environmental Requirements and Their Impact on Energy Use -L3
CO3: Analyzing the Role of Climate and Environmental Factors in Building Energy Use -L3
CO4: Evaluating Solar and Climatic Impact on Building Design – L4
CO5: Evaluating Energy Utilization and Heat Transfer in Building Envelopes L4
CO6: Implementing Energy Management Strategies for Buildings -L5

UNIT I

Overview of the Significance of Energy use and Energy Processes in Building:

Indoor activities and environmental control - Internal and external factors on energy use and the attributes of the factors - Characteristics of energy use and its management - Macro aspect of energy use in dwellings and its implications – Concepts of energy efficient building.

UNIT II

Indoor Environmental Requirement and Management:

Thermal comfort – Ventilation and air quality - Air-conditioning requirement - Visual perception – Illumination requirement - Auditory requirement – Concept of sick building syndrome – Significance in energy management in buildings.

UNIT III

Climate:

Solar radiation and their influences - The sun-earth relationship and the energy balance on the earth's surface – Climate – Wind - Solar radiation - Temperature – Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings.

UNIT IV

End-Use:

Energy utilization and requirements – Lighting and day lighting – End-use energy requirements – Status of energy use in buildings – Estimation of energy use in a building - Heat gain and thermal performance of building envelope – Steady and non steady heat transfer through the glazed window and the wall – Standards for thermal performance of building envelope – Evaluation of the overall thermal transfer – Concepts of window management.

UNIT V

Energy Management Options:

Energy audit and energy targeting – Technological options for energy management – Modifications for energy efficient buildings for Indian conditions. Energy Management for large tower buildings.

Textbooks:

1. Heating and Cooling of Buildings – Design for Efficiency, J. Krieder and A. rabl, McGraw Hill,
1994.
2. Mechanical and Electrical Equipment for Buildings, S. M. Guinnes and Reynolds, Wiley, 1989.

Reference Books:

1. Energy Design for Architects, Shaw, Aee Energy Books, 1991.
2. Energy Conservation in Buildings – Royal Institute of Architecture, Canada.
3. Publication of CBRI, Roorkee – Energy Management in Buildings.

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B.Tech (EEE)

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(23EE0273) ENERGY STORAGE TECHNOLOGIES

Course Objectives:

- Able to introduce the fundamentals and performance characteristics of various battery technologies, including battery management systems.
- Able to provide in-depth knowledge of primary and advanced battery chemistries, their fabrication techniques, design considerations, and application-specific performance metrics.
- Able to explore the integration of energy storage systems with renewable energy sources and smart grid technologies.
- Able to impart an understanding of electrochemical supercapacitors and fuel cells.

Course Outcomes:

CO1: Understanding the Basics of Batteries and their performance characteristics -L2

CO2: Analyzing Primary Battery Types and Their Applications -L3

CO3: Exploring Advanced Battery Technologies and Their Applications -L4

CO4: Evaluate the role of energy storage in enhancing the performance and reliability of renewable energy systems-L4

CO5: Evaluating charging methodologies and energy conversion efficiency – L4

CO6: Understanding and Applying Supercapacitors in Energy Storage -L4

UNIT I

Batteries:

Types-battery characteristics - voltage, current, capacity, volumetric energy density, specific energy density, charge rate, cycle life, internal resistance, energy efficiency, shelf life, battery management system, SoC, SoH estimation techniques. Testing of batteries, battery charging method, Factors affecting the battery performance.

UNIT II

Primary Batteries:

Fabrication, performance aspects, packing and rating of alkaline manganese, silver oxide cells. Lithium primary batteries-Lithium/Manganese Dioxide, Lithium/Carbon Monofluoride, Lithium/Thionyl chloride, Lithium/Sulfur Dioxide, Lithium/Iodine, Lithium-Aluminum/Iron Disulfide.

UNIT III

Advanced Batteries:

Advanced Lead Acid Battery -design, performance aspects, Pb-Acid batteries for transportation, nickel-metal hydride batteries, zinc- alkaline batteries, ZEBRA Battery ($Na/NiCl_2$) -NaS Battery-Lithium-Ion Battery-Lithium- Polymer Battery, Li-air batteries, Li-S batteries, Sodium -ion batteries.

UNIT IV

Storage for Renewable Energy Systems:

Solar energy, Wind energy, pumped hydro energy, Energy storage in Micro-grid and Smart grid, Energy Management with storage systems, Battery SCADA, Increase of energy conversion efficiencies by introducing energy storage. Superconducting Magnetic Energy Storage (SMES), charging methodologies, Photo galvanic cells, semiconductor solar batteries (SC-SB), thermo-ionic converter s, dye-sensitized solar cells (DSSC).

UNIT V

Supercapacitors and Fuel Cells:

Fundamentals of electrochemical Supercapacitors, electrode and electrolyte interfaces and their capacitances, charge-discharge characteristics, energy/power density, design, fabrication, operation and evaluation, thermal management. Supercapacitors for transportation applications - aqueous and organic based supercapacitors, Pseudo and asymmetric supercapacitors. Advance battery-supercapacitors hybrids for auto, space and marine applications. Fuel Cells working Principle and Construction.

TEXT BOOKS:

1. Dell, Ronald M. Rand and David A. J., “Understanding Batteries”, Royal Society of Chemistry, 2001.
2. Vladimir S. Bagotsky, Alexander M. Skundin, Yurij VM. Volfkovich., “Electrochemical power sources : Batteries, fuel cells, and supercapacitors”, John Wiley & Sons, Inc.,2015.

REFERENCES:

1. Lindon David, “Handbook of Batteries”, McGraw Hill, 2002.
2. Kiehne H. A., “Battery Technology Handbook”, Expert Verlag, Renningen Malsheim, 2003.
3. AuliceScibioh M. and Viswanathan B., “Fuel Cells – Principles and Applications”, University Press, 2006.
4. A.G.Ter-Gazarian, “Energy Storage for Power Systems”, The Institution of Engineering and Technology (IET) Publication, UK, 2011.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR (AUTONOMOUS)

B.Tech (EEE)

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(23EE0274) ENERGY SCENARIO AND ENERGY POLICY

Course Objectives:
The student able to:
- Understand the basic concepts of Energy scenario and Energy policy
- Apply the concepts to strengthen energy system
- Analyze the different scenarios around the globe
- Implementation of suitable Energy policy for existing systems

Course Outcomes:
CO1: Understanding the Global Energy Scenario and Its Impact on Economic Development-L2
CO2: Analyzing International Energy Policies and Treaties -L3
CO3: Analyzing the structure and dynamics of India's energy sector – L2
CO4: Evaluating key national energy policies and regulatory frameworks -L3
CO5: Evaluating Global Energy Issues and Energy Security -L3
CO6: Exploring Energy Conservation and Sustainable Development- L4

UNIT I
Global Energy Scenario:
Role of energy in economic development and social transformation - Energy and GDP - GNP and its dynamics - Energy sources and overall Energy demand and availability - Energy consumption in various sectors and its changing pattern - Depletion of energy sources and impact exponential rise in energy consumption on economies of countries.

UNIT II
Energy Polices:
International Energy Polices of G-8 Countries - G-20 Countries - OPEC Countries - EU Countries - International Energy Treaties (Rio, Montreal, Kyoto) - INDO-US Nuclear Deal.

UNIT III
Indian Energy Scenario:
Energy resources and Sector wise energy Consumption pattern Impact of energy on economy and development - National and State Level Energy polices and Issues - Status of Nuclear and Renewable Energy and Power Sector reforms. Energy policy 2030.

UNIT IV
Energy Policy:
Global Energy Issues - Energy Security - Energy Vision Energy Pricing and Impact of Global Variations Energy Productivity (National and Sector wise productivity).

UNIT V
Energy Conservation:
Act – 2001 and its features - Electricity Act – 2003 and its features - Energy Crisis - Future energy options - Need for use of new and renewable energy sources - Energy for Sustainable development.

Textbooks:
1. Energy for a sustainable World: Jose Golden berg, Thomas Johan son, AKN. Reddy, Robert Williams (Wiley Eastern).
2. Energy Policy, B.V. Desai (Wiley Eastern)

Reference Books:
1. Modeling approach to long term demand and energy implication, J.K.Parikh
2. Energy Policy and Planning, B.Bukhootsow
3. TEDDY Year Book Published by Tata Energy Research Institute(TERI) World Energy Resources, Charles E. Brown, 'International Energy Outlook' - EIA annual Publication
4. BEE Reference book: no. 1/2/3/4

Online Learning Resources: 1. https://nptel.ac.in/courses/109106161

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L	T	P	C
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(23EE0275) WASTE ENERGY MANAGEMENT

Course Objectives:
The student able to:
- Understand the classification, composition, and characterization of various waste types
- Explore thermo-chemical waste conversion technologies
- Study bio-chemical waste conversion methods
- Evaluate environmental and health impacts of waste-to-energy technologies

Course Outcomes:
CO1: Understanding and Characterizing Different Types of Waste -L2
CO2: Analyzing Thermo-Chemical Waste Conversion Methods and Their Environmental Impacts -L3
CO3: Understanding Bio-Chemical Conversion Technologies for Waste to Energy-L2
CO4: Designing appropriate Bio-Chemical Conversion Technologies for Waste to Energy-L4
CO5: Evaluating Energy Production from Waste Plastics and Waste Heat Recovery-L4
CO6: Analyzing Environmental and Health Impacts of Waste-to-Energy Conversion and Case Studies-L3

UNIT I
Characterization of Wastes:

Agricultural residues and wastes including animal wastes; industrial wastes; municipal solid wastes. Waste processing types and composition of various types of wastes; Characterization of Municipal Solid Waste, Industrial waste and Biomedical Waste, waste collection and transportation; waste processing-size reduction, separation; waste management hierarchy, waste minimization and recycling of Municipal solid waste.

UNIT II
Thermo Chemical Conversion:
Incineration, pyrolysis, gasification of waste using gasifiers, environmental and health impacts of incineration; strategies for reducing environmental impacts. Energy production from wastes through incineration, energy production through gasification of wastes, Energy production through pyrolysis and gasification of wastes, syngas utilization.

UNIT III
Bio-Chemical Conversion:
Anaerobic digestion of sewage and municipal wastes, direct combustion of MSW-refuse derived solid fuel, industrial waste, agro residues, anaerobic digestion biogas production, and present status of technologies for conversion of waste into energy, design of waste to energy plants for cities, small townships and villages. Energy production from wastes through fermentation and trans esterification. Cultivation of algal biomass from waste water and energy production from algae, Energy production from organic wastes through anaerobic digestion and fermentation.

UNIT IV
Energy Production From Waste Plastics, Gas Cleanup Waste, Heat Recovery:
Concept of conversion efficiency, energy waste, waste heat recovery classification, advantages and applications, commercially viable waste heat recovery devices.

UNIT V

Environmental and Health Impacts-Case Studies: Environmental and health impacts of waste to energy conversion, Industrial waste management – Hazardous waste management – E-waste management -EV Batteries – Mobile Chargers - case studies of commercial waste to energy plants, waste to energy- potentials and constraints in India, eco- technological alternatives for waste to energy conversions.

Textbooks:

1. Parker, Colin and Roberts, "Energy from Waste – An Evaluation of Conversion Technologies", Elsevier Applied Science, 1985.
2. Khandelwal, K. C. and Mahdi, S. S., "Biogas Technology - A Practical Hand Book", Vol. I & amp; II, Tata McGraw Hill Publishing Co. Ltd., 1983.

REFERENCES:

1. Robert C. Brown, "Thermo-chemical Processing of Biomass: Conversion into Fuels, Chemicals and Power", John Wiley and Sons, USA, 2019
2. Sergio Capareda, "Introduction to Biomass Energy Conversions", CRC Press, USA, 2013.
3. Krzysztof J Ptasinski, "Efficiency of Biomass Energy: An Exergy Approach to Biofuels, Power, and Biorefineries, John Wiley & Sons, USA, 2013.
4. Vesilind, P.A., and Worrell W. A, "Solid Waste Engineering, 2nd Ed", Cengage India, 2016.

MINORS in MICRO GRID TECHNOLOGY (EEE Department)

S.No.	Code	Course Name	Contact Hours per week			Credits
			L	T	P	
1	23EE0277	Futuristic Power Systems	3	-	0	3
2	23EE0278	Power Electronic Converters for Energy Sources	3	-	0	3
3	23EE0279	Microgrid Power and Control Architecture	3	-	0	3
4	23EE0280	Microgrid System Design	3	-	0	3
5	23EE0281	Analysis of Smart Grid Systems	3	-	0	3
6	23EE0282	Project in Micro Grid Technology	-	-	6	3

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B.Tech (EEE)

L	T	P	C
3	0	0	3

(23EE0277) FUTURISTIC POWER SYSTEMS

Course Objectives:

1. To explore the state of the art and future trends in power systems.
2. To understand the technical, economic and social challenges in power system evolution.
3. To realize the role and importance of Microgrids if futuristic power systems.

Course Outcomes

Upon successful completion of this course, the learner will be able:

CO1: To solicit the importance of large scale renewable energy integration with existing grid infrastructure.L1
CO2: To understand the importance and utility of Energy storage systems in futuristic power systems. L2
CO3: To explore large scale micro-grid deployment with RES and ESS integration. L3
CO4: To Evaluate the applications of energy storage systems (ESS) in energy management, power quality enhancement, voltage regulation, and system reliability L4
CO5: To understand the role of communication and IT Infrastructure in power system and related challenges. L2
CO-6 To explore the potential of Microgrids and its importance in Indian context. L3

UNIT-I
Introduction:

Present status of worldwide scenario of electricity generation, transmission and distribution; Energy infrastructure-Resilience and Security; Social, Technical and economic challenges; Major trends driving power system evolution; State of the art technologies in power system.

UNIT-II
Renewable Energy Integration:

Review of renewable energy (RE) resources and systems: Solar- PV, Solar Thermal, Wind, Biomass, Micro-hydro and Fuel Cell, comparison of various RE resources; Renewable Energy Policies and present status of integration with existing grid; Large scale integration of renewable energy-Technical challenges, enabling technologies, International requirements;
Renewable energy forecasting

UNIT-III
Energy Storage Systems (ESS):

Review of energy storage components: Battery, VRB, Ultra-capacitor, Fuel Cells, Pumped Hydro-Storage and flywheels, comparison of ESS technologies; Importance of ESS in futuristic power systems; Aggregated ESS, Distributed ESS; Applications of ESS: Energy Management (Load Leveling and Peak Shifting), Fluctuation Suppression (Intermittency Mitigation), Uninterruptible Power System Low-Voltage Ride Through; Placement of the ESS to Improve
Power Quality, Voltage Regulation Using ESS, ESS as Spinning Reserve.

UNIT-IV
Micro-grid and Smart-grid:

Micro-grid evolution: Micro-grid concept, importance in futuristic power system, basic architectures and control, objectives and state of the art technologies; Microgrid as a building block of Smart-grid; Smart-grid concept, Smart Grid versus conventional electrical networks, Smart-grid infrastructure, Smart Grid communication system and its cyber security,
International standard IEC 61850 and its application to Smart-grid;

Microgrids /smart grid and Electric Vehicles integration. Technical, Economic, Environmental and Social Benefits of Microgrid Operation. Microgrids for Rural Electrification, Review of Microgrid Best Practices through Case Studies: Strategic Planning, Operations: Commercial and Financial Considerations; Technical and Social Context.

UNIT-V

Communication and IT infrastructure:

Requirements of Communication and IT infrastructure in futuristic power systems: various communication protocols, comparison of performance; IEEE standard: IEEE 802.11 Mesh Networking, IEEE 802.15.4-Wireless Sensor Networks; Communications Technologies for Smart metering; Cyber security issues and mitigation techniques.

Text Books:-

1. Microgrids Architectures and Control Edited by Nikos Hatziargyriou, IEEE and Wiley, 2014
2. Energy Storage for Sustainable Microgrid by David Wenzhong Gao, Elsevier, 2015
3. Introduction to the Smart Grid- Concepts, Technologies and Evolution by Salman K. Salman, IET, 2017
4. Energy Storage Systems and Components by Alfred Rufer, CRC Press, 2018

Reference Books:-

1. Energy Efficiency and Renewable Energy Handbook Edited by D. Yogi Goswami and Frank Kreith, 2nd Edition- 2016, CRC
2. Clean Energy Microgrids, Edited by Shin'ya Obara and Jorge Morel IET, 2017
3. Hybrid-Renewable Energy Systems in Microgrids- Integration, Developments and Control edited by Hina Fathimaby *et al.*, Elsevier WoodHead Publishing, 2018
4. Smart Microgrids: Lessons from Campus Microgrid Design and Implementation edited by Hassan Farhangi, CRC Press 2017

Website Reference / Video Courses:

1. NPTEL Web Course on: DC Microgrid And Control System Prof. Avik Bhattacharya, IIT Roorkee
2. NPTEL Web Course on Electronics and Distributed Generation Dr. Vinod John Department of Electrical Engineering IISc Bangalore
3. NPTEL Web Course on Introduction to Smart Grid, PROF. N.P. PADHY Department of Electrical Engineering IIT Roorkee PROF. PREMALATA JENA Department of Electrical Engineering
4. NPTEL Web Course on Electric vehicles and Renewable energy, Prof. Ashok Jhunjhunwala, Prof. Prabhjot Kaur, Prof. Kaushal Kumar Jha and Prof. L Kannan, IIT Madras

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L	T	P	C
3	0	0	3

(23EE0278) POWER ELECTRONIC CONVERTERS for ENERGY SOURCES

Course Objectives

1. To illustrate the design philosophies used in the domain of microgrid power converters.
2. To explore the control implementations in power converters for voltage, current and power regulation for various DC and AC energy sources

Course Outcomes

Upon successful completion of this course, the learner will be able to:

CO1: Select and size various passive and active components for power converters L3
CO2: Design power converters used with DC energy resources with their control implementation L5
CO3: Design power converters used with AC energy resources. L5
CO4: Analyze and implement control strategies for grid conditions. L3
CO5: Understand the design considerations of power conditioning unit for ESS, SPV and Wind applications. L2
CO6: Understand the design and selection aspects of various auxiliary systems and components used in PCUs L2

UNIT-I
Selection of components for Power Electronics Converters (PEC):
Selection and Sizing of capacitors and magnetic components for PECs, design of Magnetic Components; Selection and sizing of Power Devices, Commonly used software tools for selection and sizing; Heatsink- selection and sizing.

UNIT-II
Design and Control of DC-DC Converters:
Design of Buck and Boost converters, Design examples; Design of Bidirectional Converters. Design of gate driver circuits; Review of DC-DC converter modelling; Closed loop PI controller design for buck and boost converters; Current control mode and voltage control mode.

UNIT-III
Design and Control of DC-AC converters:
Design of Inverter for standalone applications; Design of grid connected Inverter with different grid synchronization strategies- ZCD, PLL; Strategies for Control of voltage, current and power output.

UNIT-IV
Design of PCU for SPV and Wind Application:
Various topologies of Power Converter Unit (PCU) for SPV and Wind energy systems. Design considerations of PCU for SPV and Wind energy Systems and Design Examples.

UNIT-V
Design of PCU for ESS Applications and Design of Auxiliary System and Interfaces:
Design consideration for BDC converter based PCU for batteries and Ultra-capacitors. Design of current and voltage sensor interfaces; Design considerations for auxiliary power supplies; Design of protection and snubber components: Introduction to Digital Signal Processors (DSP) and microcontroller interfaces

Text Books:-

1. Power Electronic Converters for Microgrids by Suleiman M. Sharkh, Mohammad A. Abusara, Georgios I. Orfanoudakis Babar Hussain, IEEE and Wiley, 2014
2. Control Circuits In Power Electronics Practical Issues In Design And Implementation Edited by Miguel Castilla, IET, 2016
3. Control and Dynamics in Power Systems and Microgrids by Lingling Fan, CRC Press, 2017
4. Integrated Power Electronic Converters and Digital Control, by Ali Emadi, Alireza Khaligh, Zhong Nie, and Young Joo, Lee 2009, CRC Press.

Reference Books:-

1. Cooperative Synchronization in Distributed Microgrid Control by Ali Bidram, Vahidreza Nasirian Ali Davoudi, and Frank L. Lewis, Springer, 2017
2. Hybrid-Renewable Energy Systems in Microgrids- Integration, Developments and Control edited by Hina Fathimaby et al., Elseiver WoodHead Publishing, 2018
3. Smart Microgrids- Lessons from Campus Microgrid Design and Implementation edited by Hassan Farhangi, CRC Press 2017
4. Energy Storage Systems and Components by Alfred Rufer, CRC Press, 2018
5. Microgrids Design and Implementation edited by Antonio Carlos Zambroni de Souza and Miguel Castilla, Springer, 2019
6. Microgrids Architectures and Control Edited by Nikos Hatziargyriou, IEEE and Wiley, 2014
7. Energy Storage for Sustainable Microgrid by David Wenzhong Gao, Elsevier, 2015

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(23EE0279) MICROGRID POWER and CONTROL ARCHITECTURE

Course Objectives:

1. To study various power and control architectures adopted in DC and AC Microgrids.
2. To explore various control strategies used in power control
3. To take insight into operations stability and protection issues related to Microgrids

Course Outcomes:

Upon successful completion of this course, the learner will be able to:

CO1: Understand various types Microgrids based on applications, power and control architecture. L2

CO2: Analyze the power and control architecture in DC Microgrid and adherence to IEEE 1547 standards L3

CO3: Analyze the power and control architecture in DC Microgrid L3

CO4: Compare and contrast various control architectures used DC, AC and Hybrid Microgrids also various aspects related to stability in Microgrids L4

CO5: Illustrate the various operational challenges in Microgrids L3

CO6: Comprehend the various aspects related to the stability in Microgrids L4

UNIT-I

Microgrid Power Architecture:

Types of Microgrid system, AC and DC and Hybrids Microgrids, Application based Suitability of Microgrid type; Review of power architecture of various Microgrids deployed world-wide. Comparison of various Microgrid power architectures.

UNIT-II

AC Microgrid and Control Architecture:

Black-start operation, Grid Synchronisation- various Grid synchronization methods, Grid forming and grid following operations; Power Control- Real and reactive power control in AC Microgrid, simple droop control and other variants of droop control, Unit Power Flow Control, Feeder power flow control and Mixed mode control, source optimization; Centralized, decentralised, distributed and hierarchical control architecture, Local and system / supervisory level control strategies, Multi Agent System (MAS) Based Control; Control approaches used in AC Microgrids deployed worldwide. Microgrid standards IEEE 1547 series. Communication in AC Microgrids

UNIT-III

DC Microgrid and Control Architecture:

Power sharing in DC Microgrids, source optimization; Control approaches: Centralized, decentralised, distributed and hierarchical control architecture. Control approaches used in hybrid Microgrids. Communication in DC/Hybrid Microgrids

UNIT-IV

Operational Control in Microgrids:

Energy management in Microgrids, coordinated control, load management, grid synchronisation and islanding, Anti-islanding schemes; Various Architectural and Operational Challenges in Microgrid, Optimal operation of Microgrids.

UNIT-V

Microgrid Stability & Protection:

Steady-state and dynamic stability in AC and DC Microgrids, Methods to improve the stability in Microgrids; introduction to small signal and large signal stability analysis in Microgrids. Fault scenarios in DC and AC Microgrids, Protection in DC and AC Microgrids, adaptive protection, Fault current source (FCS) based protection; Protection challenges in islanded and autonomous modes of operation and ways to mitigate.

Text Books:-

1. Microgrids Design and Implementation edited by Antonio Carlos Zambroni de Souza and Miguel Castilla, Springer, 2019
2. Microgrids Architectures and Control Edited by Nikos Hatziargyriou, IEEE and Wiley, 2014
3. Cooperative Synchronization in Distributed Microgrid Control by Ali Bidram, Vahidreza Nasirian Ali Davoudi, and Frank L. Lewis, Springer, 2017
4. Control Circuits In Power Electronics Practical Issues In Design And Implementation Edited by Miguel Castilla, IET, 2016

Reference Books:-

1. Control and Dynamics in Power Systems and Microgrids by Lingling Fan, CRC Press, 2017
2. Hybrid-Renewable Energy Systems in Microgrids- Integration, Developments and Control edited by Hina Fathimaby et al., Elseiver WoodHead Publishing, 2018
3. Urban DC Microgrid Intelligent Control and Power Flow Optimization by Manuela Sechilariu and Fabrice Locment, 2016 Elsevier
4. Integrated Power Electronic Converters and Digital Control, by Ali Emadi, Alireza Khaligh, Zhong Nie, and Young Joo, Lee 2009, CRC Press.
5. Island Power Systems by Lukas Sigrist, Enrique Lobato, Francisco M. Echavarren Ignacio Egido, and Luis Rouco, CRC Press, 2016

Website Reference / Video Courses:

1. NPTEL Web Course on: DC Microgrid and Control System Prof. Avik Bhattacharya, IIT Roorkee
2. NPTEL Web Course on Electronics and Distributed Generation Dr. Vinod John Department of Electrical Engineering IISc Bangalore
3. NPTEL Web Course on Introduction to Smart Grid, PROF. N.P. PADHY Department of Electrical Engineering IIT Roorkee PROF. PREMALATA JENA Department of Electrical Engineering
4. NPTEL Web Course on Electric vehicles and Renewable energy, Prof. Ashok Jhunjhunwala, Prof. Prabhjot Kaur, Prof. Kaushal Kumar Jha and Prof. L Kannan, IIT Madras

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR (AUTONOMOUS)
B.Tech (EEE)

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(23EE0280) MICROGRID SYSTEM DESIGN

Course Objectives:

1. To illustrate the design philosophies used in the domain of Microgrid.
2. To explore the selection of power and control architecture of Microgrids
3. To study the design aspects of AC Microgrid, DC Microgrid and their auxiliary systems

Course Outcomes:

Upon successful completion of this course, the learner will be able to:

CO1: Select and size various Microgrid energy resources L3
CO2: Select the power and control architecture of the Microgrid L3
CO3: Select appropriate communication network architectures and interfaces for microgrid applications based on design requirements and operational constraints L3
CO4: Design the Microgrid's communication architecture. L5
CO5: Illustrate the design aspects DC and AC Microgrids with their control strategies. L4
CO6: Illustrate the implementation of the Microgrid islanding detection and anti-islanding scheme/ blackstart operation L4

UNIT-I
Selection/ Sizing of Microgrid Energy Resources
Factors affecting the selection and sizing of energy resources for Microgrid applications, dependency on type of loads connected, Selection/ Sizing: Renewable energy resources, Energy Storage components. Hybrid combination of RES and ESS.

UNIT-II
Selection of Power and Control Architecture:
Factors affecting the selection of Microgrid power and control architecture; Design Consideration for control implementation; Sensors: Selection of sensors and design of sensor Interfaces, design of control Interfaces. Design considerations for DSP/ Microcontroller interfaces

UNIT_III
Selection and Design of Communication Architecture:
Design considerations for selection of communication network for Microgrid applications; Design and implementation of communication links/ interfaces. Microg4controller programming for Data transfer on communication network. Practical design considerations for Communication networks.

UNIT-IV
Design of DC and AC Microgrid:
Design DC Power Conditioning Units for RES and ESS, Unidirectional and Bidirectional Converter design, implementation of Control loop with DSP; Programming for Power sharing and Energy Management algorithms; Design of Protection system for DC Microgrid Design AC Power Conditioning Units for RES and ESS, Unidirectional and Bidirectional Converter design, implementation of Control loop with DSP; Grid Synchronization. Programming for Power sharing and Energy Management algorithms; Design of Protection system for AC Microgrid.

UNIT-V

Islanding in Microgrids:

Selection and implementation of Islanding detection and anti-islanding scheme; Black- start and Autonomous operations in Microgrids;

Text Books:-

1. Microgrids Design and Implementation edited by Antonio Carlos Zambroni de Souza and Miguel Castilla, Springer, 2019
2. Microgrids Architectures and Control Edited by Nikos Hatziargyriou, IEEE and Wiley, 2014
3. Power Electronic Converters For Microgrids by Suleiman M. Sharkh, Mohammad A. Abusara, Georgios I. Orfanoudakis Babar Hussain, IEEE and Wiley, 2014

Reference Books:-

1. Energy Storage for Sustainable Microgrid by David Wenzhong Gao, Elsevier, 2015
2. Cooperative Synchronization in Distributed Microgrid Control by Ali Bidram, Vahidreza Nasirian Ali Davoudi, and Frank L. Lewis, Springer, 2017
3. Energy Efficiency and Renewable Energy Handbook Edited by D. Yogi Goswami and Frank Kreith, 2nd Edition- 2016, CRC
4. Control Circuits In Power Electronics Practical Issues In Design And Implementation Edited by Miguel Castilla, IET, 2016
5. Hybrid-Renewable Energy Systems in Microgrids- Integration, Developments and Control edited by Hina Fathimaby et al., Elseiver WoodHead Publishing, 2018
6. Urban DC Microgrid Intelligent Control and Power Flow Optimization by Manuela Sechilariu and Fabrice Locment, 2016 Elsevier
7. Integrated Power Electronic Converters and Digital Control, by Ali Emadi, Alireza Khaligh, Zhong Nie, and Young Joo, Lee 2009, CRC Press.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR (AUTONOMOUS)
B.Tech (EEE)

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(23EE0281) ANALYSIS of SMART GRID SYSTEMS

Course Objectives:
1. To introduce the concept of smart grids by comparing them with conventional power systems.
2. To apply numerical techniques for solving nonlinear equations in power systems
3. To develop an understanding of power system security analysis
4. To provide knowledge on the operational and planning aspects of smart grids

Course Outcomes:
CO1: Understand the analysis and planning of smart grids L2
CO2: Evaluate the tools for modeling and analysis of smart grid L3
CO3: Understand and evaluate the concepts of power system security, stability and reliability. L2
CO4: Apply security analysis techniques and advanced contingency analysis methods. L2
CO5: Analyze and synthesize the smart grid operation L4
CO6: Assess the influence of distributed generation in smart grid on power systems L4

UNIT-I
Introduction:
Conventional power systems and Smart grid, definition of smart grid, need for smart grid, Smart grid architecture, smart grid domains, enablers of smart grid, Communication architecture and protocols for smart grid, smart grid priority standards and regulation, smart-grid activities in India.

UNIT-II
Systems of non linear equations:
Fixed point iteration, Newton Raphson Iteration, Continuation methods, Power system application: power flow, regulating transformer, Fast decoupled load flow, PV curves and continuation power flow, three phase power flow

UNIT-III
Smart Grid Security analysis:
Concept of security, Security analysis and monitoring, factors affecting power system security, detection of network problems, an overview of security analysis. Contingency analysis for generator and line outages by Interactive Linear Power Flow (ILPF) method, Fast decoupled inverse Lemma based approach, network sensitivity factors, Contingency selection, concentric relaxation and bounding.

UNIT-IV
Smart Grid Operation and Planning: Economic Dispatch, Optimal Power Flow, Load forecasting, Operation of smart grid system, Load Dispatch Centre functions, preventive, Emergency and Restorative, control objectives of a smart distribution system, Operational bottlenecks in smart grid. Planning Aspects of smart grid, Planning and operation Standards.

UNIT-V
Distributed Generation in Smart Grid:
Renewable-based Distributed generations, Energy Storage Technologies, Modeling, Control of energy storage system, Short- mid -long term application of energy storage system in smart grids.

Text Books:
1. Muhammad Kamran, Fundamentals of Smart Grid Systems, Academic Press, 2022
2. Mariesa L Crow, Computetional methods for Electric Power Systems, CRC Press, NW, 2016, 3rd Edition.

3. Francisco D´ıaz-Gonz´alez, Andreas Sumper and Oriol Gomis-Bellmunt, Energy Storage in Power Systems, John Wiley & Sons Ltd, 2016

Reference Books:

1. Prabha Kundur, Power System Stability and Control, McGraw Hill Education, 2006, 1st Edition.
2. Math H. J. Bollen, Fainan Hassan, Integration of Distributed Generation in the Power System, Wiley, 2011
3. A. Mahaboob Subahani, G. R. Kanagachidambaresan, M. Kathiresh, Integration of Renewable Energy Sources with Smart Grid, Willey, 2021
4. J. Ekanayake, N. Jenkins, K. Liyanage, J. Wu, A. Yokoyama, Smart Grid: Technology and Applications, John Wiley & Sons, 2015, 1st Edition.
5. Ali Keyhani, Design of smart power grid renewable energy systems, Wiley, 2019, 3rd Edition. Other

Online Learning Resource:

1. https://nptel.ac.in/courses/108/104/108104052/