GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)
(A CENTRAL UNIVERSITY)
SCHOOL OF STUDIES OF ENGINEERING AND TECHNOLOGY
Scheme of Teaching and Evaluation (As Per NEP-2020)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
B. TECH. SECOND YEAR (Electrical Engineering)
(Effective from the Academic Year 2025-26)

III-SEMESTER SCHEME OF TEACHING & EVALUATION 2025-26

S.N.	Course Type	Course Code	Course Title	Teaching Hours/week			Examination				Credits
				Theory	Tutorial	Practical/ Drawing	Examination in Hrs	CIA Marks	SEA Marks	Total Marks	
				L	T	P					
1	Ancient Science/Management/ Psychology	EEUCTE1	Engineering Economics	3	-	-	03	40	60	100	3
2	Department Core	EEUCTT2	Electrical Circuits and Network	3	1	-	03	40	60	100	4
3	Department Core	EEUCTT3	Electrical Measurements & Instrumentation	3	-	-	03	40	60	100	3
4	Department Core	EEUCTT4	Electronic Devices & Circuits	3	-	-	03	40	60	100	3
5	Department Elective	EEUCTK1	Probability Theory & Random Process	3	-	-	03	40	60	100	3
		EEUCTK2	Electrical Engineering Materials								
6	Institute Core/OE	ECEUCTE	Data Communication	3	-	-	03	40	60	100	3
		CSUCTO1	Data Structure with C++								
		ITUCTO1	Computer Organisation & Architecture								
		CEUCTO1	Green Buildings								
		CHUCTO1	Engineering Materials								
		MEUCTO1	Introduction to Thermodynamics								
		IPUCTO1	I.C. Engine								
7	Practical	EEUCLT1	Electronic Devices & Circuits Lab	-	-	2	03	25	25	50	1
8	Practical	EEUCLT2	Electrical Measurement & Instrumentation Lab	-	-	2	03	25	25	50	1
9	Practical	EEUCLT3	Simulation Lab	-	-	2	03	25	25	50	1
Total				18	**1**	**06**	**27**	**315**	**435**	**750**	**22**

IV-SEMESTER SCHEME OF TEACHING & EVALUATION 2025-26

	Course Type			Teaching Hours/ week	Examination	

S.N.		Course Code	Course Title	Theory lectures	Tutorial	Practical/ Drawing	Examination in Hours	CIA Marks	SEA Marks	Total Marks	Credits
				L	T	P					
1	Department Core	EEUDTT1	Digital Logic Design	3	-	-	03	40	60	100	3
2	Department Core	EEUDTT2	Electrical Power System I	3	0	-	03	40	60	100	3
3	Department Core	EEUDTT3	Electrical Machine I	3	-	-	03	40	60	100	3
4	Department Core	EEUDTT4	Signals & Systems	3	1	-	03	40	60	100	4
5	Department Elective	EEUDTK1	Electromagnetic Field Theory	3	-	-	03	40	60	100	3
		EEUDTK2	Electrical Power Generation								
		EEUDTK3	Analog and Digital Communication								
6	Institute Core/OE	ECUDTO1	Introduction to Electronics Devices and Circuits	3	-	-	03	40	60	100	3
		ITUDTO1	Computer Network								
		ITUDTO2	Fundamentals of Python								
		CSUDTO1	Introduction to Information								
		CEUDTO1	Remote Sensing & GIS								
		CHUDTO1	Fluidization Engineering								
		MEUDTO1	Introduction to Fluid Mechanics								
		IPUDTO1	Automobile Engineering								
7	Practical	EEUDLT1	Electrical Machine I Lab	-	-	2	03	25	25	50	1
8	Practical	EEUDLT2	Power System I Lab	-	-	2	03	25	25	50	1
9	Mini Project	EEUDPV1	Mini Project	-	-	4	03	50	50	100	2
Total				**18**	**1**	**08**	**27**	**340**	**460**	**800**	**23**

Credit Definition:

➢1-Hour lecture **(L)** per week per semester = **1Credit**

➢1-Hour tutorial **(T)** per week per semester = **1Credit**

➢2-Hour Practical/Drawing**(P)** per week per semester = **1 Credit**

- **Four credit** courses are to be designed for **50** Hours of Teaching-Learning process.
- **Three credit** courses are to be designed for **40** Hours of Teaching-Learning process.
- **Two credit** courses are to be designed for **30** Hours of Teaching-Learning process.
- **One credit** courses are to be designed for **15** Hours of Teaching-Learning process

Note: The above is applicable only to THEORY courses

B. TECH. ELECTRICAL ENGINEERING

II YEAR III SEMESTER SYLLABUS

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EEUCTE1	3	-	-	3 Hours	40	60	100	3

ENGINEERING ECONOMICS

Course Objectives:

- To analyze cost/revenue data and carry out make economic analyses in the decision-making process.
- To justify or reject alternatives/projects on an economic basis.

UNIT-I

Basic concepts and definitions, Methodology of economics, Demand and supply-elasticity, Theory of the firm and market structure, Price and output determinations in different types of market.

UNIT-II

Public sector economics, Welfare economics, Central and commercial marks and their functions, Industrial policies, Theory of localization, Weber & surgent Florence theory, Investment analysis-NPV, ROI, IRR, Payback period, SWOT analysis.

UNIT-III

Monetary and fiscal Policy, Tools, Impact on the economy, Inflation, Business cycle, Cash flow- 2, 3, 4 model.

UNIT-IV

Business forecasting, Elementary techniques, Cost and revenue analysis, Capital budget, Break even analysis.

UNIT-V

Indian economy, Urbanization, Unemployment–poverty, regional disparities, Unorganized sectors- roll of plans, Reforms-post independent period.

Text/Reference Books:

1. N. M. Gregory, "Principles of Economics", Thompson Asia, 2002.
2. V. Mote, S. Paul, and G. Gupta, "Managerial Economics", Tata McGraw Hill, 2004.
3. S. K. Misra and V. K. Puri, "Indian Economy", Himalaya, 2009.
4. P. Saroj, "Textbook of Business Economics", Sunrise Publishers, 2003.
5. U. Kapila, "Indian Economy Since Independence", Academic Foundation, New Delhi.
6. R. Dutt and K. P. M. Sundharam, "Indian Economy", S. Chand & Company Ltd., New Delhi.

Course Outcomes:

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

CO1 Aware of the basic theoretical framework underlying the field of microeconomics, macroeconomics, Indian economy, public finance etc.

CO2 Understand the operations of money and banking and their interaction with the rest of the economy.

CO3 Realize how monetary forces operate through a multitude of channels-market, non- market, institutions and among others.

CO4 Understand the various issues/components of the Indian economy so that they can comprehend and critically appraise current Indian economic problems.

CO5 Understand the major developments in the Indian economy before independence, at the time of Independence and during the post-Independence period.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1		1			2		2	2	1	1	1
CO2	1	1	1	1		1			2		2	2	1	1	1
CO3	1	1	1	1		1			2		2	2	1	1	1
CO4	1	1	1	1		1			2		2	2	1	1	1
CO5	1	1	1	1		1			2		2	2	1	1	1

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EEUCTT2	3	1	-	4 Hours	40	60	100	4

ELECTRICAL CIRCUIT & NETWORK ANALYSIS

Course Objectives:

- Understanding basic electrical circuit concepts to solve circuit problems.
- Learn sinusoidal steady state analysis.
- Understand transient and steady state response.
- Understand Electrical Circuit Analysis Using Laplace Transforms.
- Learn 2-port behaviour with different parameters.

UNIT-I

Network Theorems: Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Millman's theorem (all theorems - analysis with dependent current and voltage sources), Super node and super mesh Analysis, Concept of duality and dual networks. Series and parallel resonance conditions.

UNIT-II

Sinusoidal Steady State Analysis: Representation of sine function as rotating phasor, Phasor diagrams, Impedances and admittances, AC circuit analysis, Effective or RMS values, Average power and complex power, Three-phase circuits (balanced circuit), Mutual coupled circuits, Dot convention in coupled circuits.

UNIT-III

Solution of First Order Networks: Solution of first order differential equations for series and parallel R-L, R-C, R-L-C circuits, Initial and final conditions in network elements, Forced and free response, time constants, steady state and transient state response, Analysis of electrical circuits using Laplace transform for standard inputs (step, ramp and impulse functions), Convolution integral, Inverse Laplace transform, transformed network with initial conditions.

UNIT-IV

Magnetic Coupled Circuits and Resonance: Electrostatic and electromagnetic coupling, Self-inductance, Mutual inductance, Coupling coefficient, Complete network solution with conductive and inductive coupling, Series and parallel resonance, Quality factor, Bandwidth, Selectivity, Half power frequencies, Locus diagram of simple series and parallel circuits.

UNIT-V

Two Port Network and Network Functions: Transfer function representation: Poles and

Zeros, Frequency response (magnitude and phase plots), Two port networks, Terminal pairs, Relationship of two port variables, Impedance parameters, Admittance parameters, Transmission parameters and hybrid parameters, Interconnections of two port networks, Reciprocity & symmetry, Cascade, Series, parallel and series-parallel connections of two port Networks, Barlett's bisection theorem.

Text/ Reference Books:

1. M. E. Van Valkenburg, "Network Analysis", 3rd ed. New Delhi: Prentice Hall.
2. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", 6th ed. New Delhi: McGraw-Hill Education.
3. D. Roy Choudhury, "Networks and Systems", 2nd ed. New Delhi: New Age International Publications.
4. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", 5th ed. New York: McGraw-Hill International.
5. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", 1st ed. Mumbai: Jaico Publishing.

Course Outcomes:

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

CO1 Evaluate the responses by applying network theorems to electrical circuits.

CO2 Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).

CO3 Obtain and analyze the transient and steady-state response of electrical circuits.

CO4 Obtain and analyze the response of electrical circuits using Laplace Transform for standard inputs.

CO5 Analyze two port circuit behaviour with different parameters.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1		1					1	2	3	1	2
CO2	3	3	3	1		1					1	2	3	1	2
CO3	3	3	3	1		1					2	2	3	2	2
CO4	3	3	3	1		1					2	2	3	2	2
CO5	3	3	3	1		1					2	2	3	2	2

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EEUCTT3	3	-	-	3 Hours	40	60	100	3

ELECTRICAL MEASUREMENTS & INSTRUMENTATION

Course Objectives:

- Learn methods for measurement of resistance.
- Understand how to balance equations of AC bridges.
- Learn use of oscilloscope and Lissajous figures for phase and frequency measurements.
- Learn designing of sensors and analyze the operation of electronic measuring instruments.
- Learn how to test and calibrate ammeter, voltmeter, and wattmeter and energy meter.

UNIT- I

Measurement of Resistance: Classification of resistances (low, medium and high), Measurement of resistance by volt drop method, Loss of charge method, Wheatstone's bridge, Kelvin's double bridge, Megger and ohmmeter, AC potentiometers and their use for calibration of meters (ammeter, voltmeter and wattmeter).

UNIT-II

AC Bridges: Measurement of inductance (self and mutual) and capacitance by AC bridges: Hay's, Maxwell's, Anderson, Desauty's bridge, Schering bridge, Oven's bridge and Heaviside bridge and its modification, Wein's bridge for measurement of frequency, Wagner earthing device.

UNIT- III

Detectors And Magnetic Measurement: Construction, theory and operation of D'Arsonval and vibration galvanometer, Oscilloscope-basic principle, CRT feature, Block diagram of oscilloscope, Triggered sources, Measurement of frequency and phase by Lissajous figures.

UNIT-IV

Measuring Instruments: Classification, operation and working principle of PMMC, MI and dynamometer type instruments, Controlling, damping and balancing devices, Single-phase and three-phase electrodynamometer power factor meter, Frequency meters: electrical resonance type, electrodynamometer, ratio-meter type, Phase sequence meter, Maximum demand indicator.

UNIT-V

Power and Energy Measurement: Construction and principle of dynamometer and induction type wattmeter, Measurement of power in a three-phase circuit by using single-phase wattmeters, Wattmeter errors, Low power factor wattmeter, testing of wattmeter,

Single and poly-phase energy meters, Testing of energy meters.

Text/ Reference Books:

1. E. W. Golding, F. C. Widdis, Electrical Measurements and Measuring Instruments, Reem Publications Pvt. Ltd., 3rd ed., 2011.
2. K. Sawhney, A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai and Co., 19th ed., 2020.
3. Albert D. Helfrick, William D. Cooper, Modern Electronic instrumentation and Measurements Techniques, Pearson Education India, 1st ed., 2016.
4. S.C. Bhargava, Electrical Measuring Instruments and Measurements, BS Publications, 1sted., 2013.
5. Ernest O. Doebelin, Dhanesh N. Manik, Measurement systems, McGraw Hill India, 7th ed., 2019.
6. R. K. Rajput, Electrical and Electronic Measurements and Instrumentation, S. Chand & Co. Ltd., 4th ed., 2015.
7. H S Kalsi, Electronic Instrumentation and Measurements, McGraw Hill, 4th ed., 2019.

Course Outcomes:

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

CO1 Make use of suitable methods for the measurement of resistance.

CO2 Derive the balance equations of an AC bridge and evaluate unknown parameters by balancing the bridge.

CO3 Perform amplitude, frequency, and phase measurements using an oscilloscope and to make use of Lissajous figures for phase and frequency measurements.

CO4 Distinguish between the types of measuring instruments and use them for the measurement of Electrical quantities.

CO5 Test and calibrate ammeter, voltmeter, and wattmeter and energy meter.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	1	1	1	1	2	2	3	3	1	1
CO2	3	3	3	3	1	1	1	1	2	1	1	1	3	1	2
CO3	3	3	3	3	2	2	2	1	1	1	1	1	3	2	2
CO4	3	3	3	3	1	1	2	1	2	1	1	1	3	1	2
CO5	3	3	2	2	1	1	1	1	1	2	2	3	3	1	2

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EEUCTT4	3	-	-	3 Hours	40	60	100	3

ELECTRONIC DEVICES & CIRCUITS

Course Objectives:

- To develop basic concept of semiconductor diode and its circuits.
- To introduce bipolar and unipolar devices.
- To develop the concept and analysis of transistor characteristics, biasing and small signal analysis.
- To introduce the concept of operational amplifier.

UNIT-I

Diode and its Application: PN junction diode-structure, energy band diagram, operation and I-V characteristics, Abrupt pn junction, Zener diode, Diode circuits, Half-wave and Full-wave rectifiers, Clipper and Clamping circuits.

UNIT-II

BJT: Structure, operation, configuration & I-V characteristics, Load line analysis, Biasing circuits, BJT as an amplifier: common-emitter, common-base and common collector amplifiers.

UNIT-III

MOSFET: MOSFET structure and I-V characteristics, Biasing circuits, MOSFET as an amplifier: common-source, common-gate and common-drain amplifiers.

UNIT-IV

Multistage Amplifiers: Different type of coupling, Darlington Amplifier, RC Coupled Amplifier.

UNIT-V

Op-Amp: Internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product).

Text/Reference Books:

1. J. Millman and C. C. Halkias, "Integrated Electronics", 2nd edition, TMH 2001.
2. S. Sedra and K. C. Smith, "Microelectronic Circuits Theory and Applications", 6th ed., Oxford,

2015
3. D. Neamen, "Electronic Circuits-Analysis & Design", Cengage Learning, 2/e, 2011.
4. D. A. Bell, "Electronic Device & Circuits", 5th ed., Oxford Publication, PHI, 2008.
5. R. Boylestad and L. Nashelsky, "Electronic Device & Circuit Theory", 11th ed., Pearson, 2013.

Course Outcomes:

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

CO1 Illustrate the knowledge of semiconductor diode and its application.

CO2 Elucidate and analyze the characteristics and performance of transistors.

CO3 Analyze the concept of load line, biasing circuits of transistor and its small signal analysis.

CO4 Analyze different types of coupling and cascaded stages of transistor.

CO5 Comprehend the internal structure and characteristics of opamp.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	2			2			2	3	2	3
CO2	3	3	2	2	1	2			2			2	3	2	3
CO3	3	3	2	2	1	2			2			2	3	3	3
CO4	3	3	2	2	1	2			2			2	3	3	3
CO5	3	3	2	2	1	2			2			2	3	3	3

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EEUCTK1	3	-	-	3 Hours	40	60	100	3

PROBABILITY THEORY & RANDOM PROCESS

Course Objectives:

- To provide mathematical background and sufficient experience so that student can read, write and understand sentences in the language of probability theory.
- To introduce students to the basic methodology of "probabilistic thinking" and apply it to problems.
- To understand basic concepts of Probability theory and Random Variables, how to deal with multiple Random Variables.

UNIT-I

Introduction to Probability: Set theory, Experiments and sample spaces, Discrete and continuous sample spaces, Events, Probability definitions and axioms, Mathematical model of experiments, Joint probability, Conditional probability, Total probability, Bayes' theorem, and independent events, Bernoulli's trials.

UNIT-II

Random Variables: Definition, Conditions for a function to be a random variable, Discrete, Continuous and mixed random variable, Distribution and density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Methods of defining conditioning event, Conditional distribution, Conditional density and their properties, Operation on one random variable: Expected value of a random variable, Function of a random variable,Moments about the origin, Central moments, Variance and skew, Characteristic function, Moment generating function, Transformations of a random variable, Monotonic transformations for a continuous random variable, Non monotonic transformations of continuous random variable, Transformations of discrete random variable.

UNIT-III

Multiple Random Variables: Vector random variables, Joint distribution function and its properties, Marginal distribution functions, Conditional distribution and density-point conditioning, Conditional distribution and density-Interval conditioning, Statistical independence, Sum of two random variables, Sum of several random variables, Central limit theorem, (Proof not expected), Unequal distribution, Equal distributions, Expected value of a function of random variables: Joint moments about the origin, Joint central moments, Joint characteristic functions, Jointly Gaussian random variables: Two random variables case, N random variable case, properties, Transformations of multiple random variables, Linear transformations of Gaussian random variables.

UNIT-IV

Stochastic Processes-Temporal Characteristics: The stochastic process concept, Classification of processes, Deterministic and nondeterministic processes, Distribution and

density functions, Statistical independence and concept of stationary: First-order stationary processes, Second order and wide-sense stationarity, Nth order and strict-sense stationary, Time averages and ergodicity, Mean-ergodic processes, Correlation-ergodic processes, Autocorrelation function and its properties, Cross-correlation function and its properties, Covariance functions and its properties, Gaussian random processes, Linear system response: Mean and mean-squared value, Autocorrelation, Cross-correlation functions.

UNIT-V

Stochastic Processes-Spectral Characteristics: The Power spectrum and its properties, Relationship between power spectrum and autocorrelation function, The cross-power density spectrum and properties, Relationship between cross-power spectrum and cross-correlation function. Spectral characteristics of system response: Power density spectrum of response, Cross power spectral density of input and output of a linear system.

Text/Reference Books:

1. H. P. Hsu, "Schaum's outline of theory and problems of probability, random variables, and random processes", New York, 1997.
2. A. Papoulis, "Probability, Random variables and Stochastic Processes", 4th ed., McGraw Hill, 2017.
3. P. Z. Peebles Jr, "Probability, random variables, and random signal principles", McGraw-Hill, 2001.
4. W. B. Davenport, "Probability and Random Processes for Scientist and Engineers", McGraw-Hill, 1970.
5. H. Stark and J. W. Woods, "Probability, random processes, and estimation theory for engineers", Prentice-Hall, Inc., 1986.

Course Outcomes:

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

CO1 Understand and communicate the axiomatic formulation of modern Probability Theory and think ofrandom variables as an intrinsic need for the analysis of random phenomena.

CO2 Characterize probability models and function of random variables based on single & multiples randomvariables.

CO3 Evaluate and apply moments & characteristic functions and understand the concept of inequalities andprobabilistic limits.

CO4 Understand the concept of random processes and determine covariance and spectral density ofstationary random processes.

CO5 Demonstrate the specific applications to Poisson and Gaussian processes and representation of low passand band pass noise models.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	1							3	2	1
CO2	3	3	3	1	2	2							3	3	2
CO3	3	3	2	2	2	2							3	3	2
CO4	3	3	3	2	2	2							3	3	2
CO5	3	3	2	3	2	2							3	3	3

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EEUCTK2	3	-	-	3 Hours	40	60	100	3

ELECTRICAL ENGINEERING MATERIALS

Course Objectives:

- To learn in depth about electrical and magnetic properties of materials.
- To study properties of conductor, semiconductor and dielectric materials. dielectric and semiconductor materials.
- To introduce the optical properties of solids.

UNIT-I

Conducting materials: Review of energy bands, Description of materials, Drift velocity, Collision time, Mean free path, Mobility, Conductivity, Relaxation time, Factors affecting conductivity of materials, Types of thermal conductivity, Wiedmann- Franz law, Super conductivity, Effect of magnetic field, Properties and application of high conducting materials, Properties and applications high resistive material.

UNIT-II

Semiconductors: Review of silicon and germanium as semiconducting materials, Continuity equation, P-N junction, Hall effect, mobility, Drift & Diffusion, Diffusion & Transition capacitances of P-N junction.

Unit-III

Dielectric materials: Behaviour of dielectric materials in static electric field, Dipole moments, Polarization, Dielectric constant, Polarizability, Susceptibility, mechanisms of polarization, behaviour in alternating field, dielectric loss, loss tangent, types of dielectric & insulating materials, electrostriction, Piezo - electricity, Properties and Applications of gaseous(H_2, N_2 ,SF_6 etc), liquid (transformer oil, capacitor oil, paints etc) and solid (fibrous, paper board, wood, plastic, mica, ceramic material, rubber etc.) insulators.

Unit-IV

Magnetic materials: Permeability, Magnetic susceptibility, magnetic moment, Magnetization, Dipole moment, types of magnetic materials, Magnetostriction, eddy current & hysteresis losses, applications of silicon steel, soft and hard magnetic material.

Unit-V

Optical properties of solids: Photo emission, photo emission materials, electro luminescence junction diode, photo emitters, photo transistor, photo resistors, injunction lasers, solar cell, optical properties of semiconductor, application of photo sensitive

materials (CRT, Tube light, photo panels).

Text/ Reference Books

1. A. J. Dekker, "Electrical Engineering Materials", PHI.
2. Millman & Halkias, "Millman's Electronic Devices & Circuits", McGraw Hill Education; 4th ed., 2015.
3. S. P. Seth, "A Course In Electrical Engineering Materials", Dhanpat Rai, 3rd ed., 2011.
4. Ben G Streetman & Sanjay K Banerjee, "Solid State Electronic Devices", Pearson, 7th ed., 2015.
5. Boylestad & Nashelsky, "Electronic Devices & Circuit Theory", Pearson, 11th ed., 2015.
6. Jaspreet Singh, "Semiconductor devices: Basic Principles", John Wiley, 1st ed., 2000.

Course Outcomes:

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

CO1 Gain a deep understanding of the electrical, thermal, and magnetic properties of materials.

CO2 Learn to evaluate the electrical and dynamic behavior of semiconductors.

CO3 Understand different dielectric materials and their behavior in static and alternating electric fields.

CO4 Understand and analyze the properties and applications of magnetic materials.

CO5 Gain In-depth understanding of photoemission and photosensitive materials

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	2			2			2	3	3	3
CO2	3	2	2	1	1	2			2			2	3	3	3
CO3	3	2	2	1	1	2			2			2	3	3	3
CO4	3	2	2	1	1	2			2			2	3	3	3
CO5	3	2	3	2	1	2			2			2	3	3	3

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

INSTITUTE CORE (III SEMESTER)

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ECEUCTE1	3	-	-	3 Hours	40	60	100	3

DATA COMMUNICATION

Course Objectives:

- To learn the basic concepts of data communications.
- To learn the layered architecture of communication protocols.
- To learn digital signal transmission and encoding techniques.
- To learn multiplexing techniques.
- To learn the concepts and techniques in error detection and correction.

UNIT-I

Data and Signal: Analog and digital signals, Time and frequency domain, Composite signals, Bandwidth, Bit rate, Bit length, Baseband and broadband transmission, Attenuation, Distortion, Noise, Nyquist bit rate, Shannon capacity.

UNIT-II

Data Communication Concepts: Data transmission, Parallel and serial transmission, Synchronous and asynchronous transmission, Simplex, Half-duplex and full-duplex, Unipolar and polar line codes, Non return to zero codes, Return to zero codes, Bipolar line codes.

UNIT-III

Telephone network, Network topology, Multiplexing, Frequency division multiplexing, Time division multiplexing and wavelength division multiplexing, Pulse code modulation.

UNIT IV

Switching Techniques: Circuit, packet and hybrid switching, Types of error, Vertical redundancy check, Longitudinal redundancy check, Cyclic redundancy check, Error correction, Integrated services digital network.

UNIT-V

Transmission Media: Guided and unguided media, Twisted pair, Unshielded twisted pair and shielded twisted pair, Coaxial cable and fiber optic cable, Radio waves, Microwaves and infrared transmission RJ- 45, Network interface card, Rack, Cable standard-category 5, 6 and 7, Cross connection, Straight connection, Cable coding standards.

Text/Reference Books:

1. Forouzan, "Data communication and networking", TMH.
2. Prakash C Gupta, “Data communication and Computer Networks”, PHI Learning.
3. "Computer Networks", Tanenbaum, PHI Learning.
4. Leon-Garcia,Widjaja, "Communication Networks-Fundamental concepts and key Architectures”, TMH.
5. Michael A. Gallo & William M. Hancock, "Computer Communications & Networking Technologies", Cengage Pearson publications.
6. You Zheng & Shakil Akhtar, "Network for computer scientists & engineers", Oxford publication.

Course Outcomes:

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

CO1 Understand the basics of data communication, networking, internet and their importance.

CO2 Interpret the components, tools and techniques of communication systems.

CO3 Explain how information can be sent via communication interfaces and links.

CO4 Determine various modulation, error detection & correction techniques & their applications.

CO5 Identify the basic security threats of a network.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1							3	2	1	1
CO2	3	2	3	1	1							3	2	1	1
CO3	3	2	2	2	2							3	2	2	1
CO4	3	3	3	2	2							3	2	2	1
CO5	3	3	3	2	2							3	2	2	1

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
CSUCTO1	3	-	-	3 Hours	40	60	100	3

DATA STRUCTURE USING C++

Course Objectives:

- Introduce the concept of data structures through array, stack and queues.
- To design and implement various data structure algorithms.
- To introduce various techniques for representation of the data in the real world.
- To develop application using data structure algorithms.

UNIT-I

Introduction: Functions and parameter, Dynamic memory allocation, Recursion.

Linear Lists: Data objects and structures, Linear list data structures, Array Representation, Vector Representation, Singly Linked lists and chains. L1, L2.

UNIT-II

Arrays And Matrices: Arrays, Matrices, Special matrices, Sparse matrices.

Stacks: The abstract data types, Array Representation, Linked Representation, Applications- Parenthesis Matching & Towers of Hanoi. L1, L2, L3.

UNIT-III

Queues: The abstract data types, Array Representation, Linked Representation, Applications- Railroad car arrangement.

Hashing: Dictionaries, Linear representation, Hash table representation. L1, L2, L3.

UNIT-IV:

Binary And Other Trees: Trees, Binary trees, Properties and representation of binary trees, Common binary tree operations, Binary tree traversal the ADT binary tree, ADT binary tree and the class linked binary tree. L1, L2, L3.

UNIT-V

Priority Queues: Linear lists, Heaps, Applications-Heap Sorting.

Search Trees: Binary search trees operations and implementation, Binary Search trees with duplicates. L1, L2, L3.

Text/Reference Books:

1. S. Sahni, "Data structures, Algorithms, and applications in C++", Universities Press, 2nd ed., 2005.
2. S. Sahni, "Data structures, Algorithms, and applications in C++", Mc. Graw Hill, 2000.

3. E. Balaguruswamy, "Object Oriented Programming with C++", TMH, 6th ed., 2013.
4. E. Balaguruswamy, "Programming in C++", TMH, 4th ed., 2010.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1							3	2	1	1
CO2															
CO3	3	2	3	1	1							3	2	1	1
CO4	3	2	2	2	2							3	2	2	1
CO5	3	3	3	2	2							3	2	2	1

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ITUCTO1	3	-	-	3 Hours	40	60	100	3

COMPUTER ORGANIZATION & ARCHITECTURE

Course Objectives:

- Conceptualize the basics of organizational and architectural issues of a digital computer.
- Analyze processor performance improvement using instruction level parallelism.
- Learn the function of each element of a memory hierarchy.
- Study various data transfer techniques in digital computer.
- Articulate design issues in the development of processor or other components that satisfy design requirements and objectives.

UNIT-I

Basic of Computer Organization & Architecture: Introduction, Computer Organization vs. Computer architecture, Von Neumann Architecture vs. Harvard Architecture. Input & Output Organization: Introduction, Simple Bus Architecture, Types of Buses, I/O Communication Methodologies: Programmed I/O(Polling), Interrupt driven I/O & Direct Memory Access (DMA), I/O channel & I/O Processor, Accessing I/O device: Memory Mapped I/O, Isolated I/O Mapped.

UNIT-II

Computer Arithmetic: Introduction, Addition & Subtraction: Addition & Subtraction with Signed – Magnitude Data, Hardware Implementation & Algorithm, Addition & Subtraction with Signed - 2's Complement Data, Multiplication Algorithm: Hardware Implementation for Signed– Magnitude Data, Hardware Algorithm, Booth Multiplication Algorithm, Array Multiplier, Division Algorithms: Hardware Implementation for Signed-Magnitude Data & Algorithm, Carry Look Ahead Adder.

UNIT-III

Memory Organization: Introduction, Types of Memory, Memory Hierarchy, Main Memory, Cache Memory, Virtual Memory, Associative Memory. Processor Organization: Introduction, Control Unit: Hardwired Control Unit, Micro programmed Control Unit, Instruction Set Computer: Reduced Instruction Set Computer (RISC) vs. Complex Instruction Set Computer (CISC).

UNIT-IV

Pipelining: Introduction, Concept of Instruction Pipeline, Design Problems with Pipeline: Structural Hazard, Data Hazard & Control Hazard, Extension in Pipeline Designed: Super Pipelining, Superscalar Processor, Very Long Instruction Width (VLIW) Architecture.

UNIT-V

Multiprocessor System: Introduction, Shared Memory Multiprocessor, Distributed Memory Multiprocessor, Flynn's Classification: Single Instruction Single Data (SISD), Single Instruction Multiple Data (SIMD), Multiple Instruction Single Data (MISD), Multiple Instruction Multiple Data (MIMD), Cache Coherence, Message Passing Model, Cluster Computing, Distributed Computing.

Text/Reference Books:

1. M. Morris Mano, "Computer System Architecture", Pearson Education, New Delhi, India
2. W. Stallings, "Computer Organization & Architecture", Pearson Education, New Delhi, India.
3. J. P. Hayes, "Computer Architecture & Organization", McGraw-Hill, New Delhi, India.
4. N. Jotwani, "Computer System Organization", McGraw-Hill, New Delhi, India.
5. P. V. S. Rao, "Computer System Architecture", PHI, New Delhi, India.
6. R. Chopra, "Advanced Computer Architecture", S. Chand India, New Delhi, India.
7. L. K. Arora, A. Arora, and S. K. Kataria, "Computer Organization & Architecture", S. K. Kataria & Sons, New Delhi, India.
8. B. Ram and S. Kumar, "Computer Fundamentals: Architecture & Organization", New Age International, New Delhi, India.

Course Outcomes:

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

CO1 Understand the computer architecture concepts.

CO2 Understand and apply different number systems and codes.

CO3 Understand memory hierarchy and its impact on computer cost/performance.

CO4 Design a pipeline for consistent execution of instructions with minimum hazards.

CO5 Understand the concepts of multiprocessor.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1							3	2	1	1
CO2	3	2	3	1	1							3	2	1	1
CO3	3	2	2	2	2							3	2	2	1
CO4	3	3	3	2	2							3	2	2	1
CO5	3	3	3	2	2							3	2	2	1

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
CEUCTO1	3	-	-	3 Hours	40	60	100	3

GREEN BUILDINGS

Course Objectives:

- To understand the basics of Green Buildings.
- To learn the concept of site selection and water conservation.
- To study the use of efficient energies.
- To learn about maintenance of Indoor environmental quality.
- To study various green building rating systems including their mandatory requirements and credit points.

UNIT-I

Green Buildings: Introduction, history and evolution, objectives, benefits, typical features of green buildings, Sustainability and green buildings, Global trends in green buildings, Examples of green buildings in India and the world (case studies to be presented by students).

UNIT-II

Site selection and building planning: Criteria for site selection, Preservation of landscape, soil erosion control, understanding and minimizing urban heat island effect. Water conservation and efficiency: Rainwater harvesting methods for roof & non-roof, water demand, water efficient plumbing systems, water metering, waste water disposal, recycle and reuse systems.

UNIT-III

Energy Efficiency: Concepts of embodied energy, operational energy, demolition energy and life cycle energy, Methods to reduce operational energy: Energy efficient building envelopes, efficient lighting technologies, energy efficient appliances for heating and air conditioning systems in buildings, Wind and solar energy harvesting, Energy metering and monitoring, Concept of net zero buildings.

UNIT-IV

Indoor Environmental Quality for Occupant Comfort: Daylighting, air ventilation, exhaust systems, materials, adhesives, building acoustics. **Environment Quality and Occupational Health:** Air conditioning, air quality, Sick building syndrome, minimum fresh air requirement, improved fresh air ventilation, Measure of Indoor air quality (IAQ), Reasons for poor IAQ, Measures to achieve Acceptable IAQ levels.

UNIT-V

Green Building Rating Systems: Introduction to various rating systems (LEED, GRIHA, IGBC etc.), mandatory requirements and credit points of various rating systems, study of green building rating criteria of IGBC, Understanding the green building measures in the areas of site preservation, energy efficiency, materials, water conservation and indoor air quality.

Text/Reference Books:

1. IGBC Green Homes Rating System, Version 2.0., Abridged reference guide, 2013, Indian Green Building Council Publishers.
2. GRIHA version 2015, GRIHA rating system, Green Rating for Integrated Habitat Assessment.
3. K.S. Jagadish, B.V. Venkatarama Reddy and K.S. Nanjunda Rao, "Alternative building materials and technologies".
4. G. D. Rai, "Non-Conventional Energy Resources", Khanna Publishers.
5. "Sustainable Building Design Manual", Vol.1 and 2, TERI, New Delhi 2004.
6. Mike Montoya, "Green Building Fundamentals", Pearson, USA, 2010.
7. Charles J. Kibert, "Sustainable Construction Green Building Design and Delivery", John Wiley & amp; Sons, New York, 2008.
8. Regina Leffers, "Sustainable Construction and Design", Pearson / Prentice Hall, USA, 2009.

Course Outcomes:

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

CO1 Apply the concept and knowledge of Green Building in handling any physical projects.

CO2 Conduct a site selection process and apply water conservation techniques for green buildings.

CO3 Make use of technologies with efficient energies.

CO4 Apply the knowledge in maintaining the indoor environmental quality. CO5: Revise essential parameters of green building rating system.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	1		3	3					2	2	1	2
CO2	3	2	1	2		3	3					1	2	2	3
CO3	3	2	1	2		3	3					2	2	2	3
CO4	3	2	2	2		3	3					2	2	2	2
CO5	3	2	1	1		2	2					1	2	1	2

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
CHUCTO1	3	-	-	3 Hours	40	60	100	3

ENGINEERING MATERIALS

Course Objectives:

- To provide the understanding of material selections for construction to execute a task for a particular application, its properties and behaviour at different circumstances.
- Properties, behaviour and maintenance of various engineering materials.

UNIT-I

Crystalline and Non-Crystalline Materials: Crystalline state, Atomic bonding, Bravais lattices, Miller indices, Structure of some common inorganic compounds, Structural imperfections. Economic, environmental and social issues of material usage.

UNIT-II

Mechanical properties of materials and their variation with temperature, Importance and limitations of these properties on material selection for a particular application, Failure of materials under service conditions.

UNIT-III

Corrosion: Mechanism of corrosion, Types of corrosion, Factors influencing corrosion, Methods of corrosion control, Inhibition and other precautionary measures.

UNIT-IV

Non-Ferrous Metals: Copper, Brasses, Bronze, Aluminium, their mechanical properties, Workability and applications, Corrosion resistance. Non-metallic materials of construction.

UNIT-V

Phase diagram: Phase rules, Equilibrium phase diagram, cooling curves and their relations to properties of metals and alloys, Iron-carbon equilibrium diagram. Response of materials to chemical environment.

Text/Reference Books:

1. James F. Shackelford, "Introduction to Materials Science for Engineers", Pearson.
2. L.H.Van Vlack, "Elements of Materials Science and Engineering", Pearson.
3. V. Raghavan, "Materials Science and Engineering", PHI Learning Private Limited.
4. L. H. VanVlack, "Materials Science for Engineers", Addison-Wesley Publishing Co.
5. A. M. Sikkander and T. N. Balu, "Chemistry of Engineering Materials", Raj Publications.
6. K.S. Rajagopalan Corrosion, "Prevention and Control", Scientific Surveys Limited.
7. M. G. Fontana, "Corrosion Engineering", McGraw Hill Education.

8. D. W. Green and R. H. Perry, "Perry's Chemical Engineers' Handbook", McGraw Hill Publication.

Course Outcomes:

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

CO1 Explain different types of materials and their mechanical properties and limitations.

CO2 Explain types of corrosion and various methods to control them.

CO3 Describe phase diagram and its significance.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1		2			1		2			2	1	1	1
CO2	2	1		2			1		2			2	1	1	1
CO3	2	1		2			1		2			2	1	1	1
CO4	2	2		1			1		2			2	2	2	2
CO5	2	2		2			1		2			2	2	2	1

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
MEUCTO1	3	-	-	3 Hours	40	60	100	3

INTRODUCTION TO THERMODYNAMICS

Course Objectives:

- To understand the basic laws of thermodynamics and heat transfer
- To understand the principle of operation of thermal systems like I C Engine, boilers, turbines, condensers etc.

UNIT-I

Fundamental Concepts System, surrounding and universe, Concept of continuum, Property, State, Path, process, Cyclic process, Energy and its form, Work and heat, Enthalpy.

UNIT-II

Laws of thermodynamics: Concepts of Temperature, Zeroth law. First law of thermodynamics. Concept of processes, Flow processes and control volume, Flow work, Steady flow energy equation, Mechanical work in a steady flow of process.

Second law: Essence of second law, Thermal reservoir, Heat engines, COP of heat pump and refrigerator. Statements of second law, Carnot cycle, Concept of Entropy.

UNIT-III

Thermal Power Plant Layout; Rankine Cycle, Major components of thermal power plant, Condensers, Cooling Towers.

UNIT-IV

Power producing machines: Internal combustion engines, basic cycles; Turbines: Basic cycle of turbines, Impulse and Reaction Turbines.

UNIT-V

Power consuming machines: Pumps, compressors; Basic of refrigeration cycles, Environmental- friendly refrigerants, and Air conditioners.

Text/Reference Books:

1. P.K. Nag, "Engineering Thermodynamics", McGraw Hill.
2. P.K. Nag, "Basic and Applied Thermodynamics", McGraw Hill.
3. Sonntag, Borgnakke, Van Wylen and Wiley, "Fundamentals of Thermodynamics".
4. Cengel and Boles, "Thermodynamics-An engineering approach", McGraw Hill.

Course Outcomes:

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

CO1 Explain the basic concepts of thermodynamics such as heat and work.

CO2 State and describe the basic laws of thermodynamics.

CO3 Describe working principle of thermal power plants.

CO4 Understand various energy interactions between heat and work.

CO5 Understand and describe various thermal machines based on thermodynamics.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1										2	1	1
CO2	3	2	2										3	1	1
CO3	3	2	2										3	1	1
CO4	3	2	1										2	1	1
CO5	3	2	1										2	1	1

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
IPUCTO1	3	-	-	3 Hours	40	60	100	3

I.C. ENGINE

Course Objectives:

- To study classifications of internal combustion engine.
- To understand how and why actual cycles deviate from air standard cycle and fuel-air cycle.
- To understand combustion in spark ignition engine and diesel engines.
- To impart knowledge about carburetion, gasoline injection and diesel injection.
- To impart knowledge about ignition, cooling, lubrication and governing systems.
- To impart knowledge about various engine performance characteristics and its testing.

UNIT-I

Introduction of internal combustion engines, classification of I.C. engines, engines components, basic engine nomenclature, four stroke S.I. and C.I. engine, two stroke engines, comparison of two stroke and four stroke engines, comparison of S.I. and C.I. engines.

UNIT-II

Air Standard Cycle: Otto cycle, Diesel cycle, Dual cycle, comparison between Otto, diesel and dual cycles, fuel-air cycles and actual-cycles.

SI Engines: Combustion phenomenon in S.I. Engines, Flame development and its propagation, ignition lag, knocking in S.I. engines, Carburettor, Theory of carburetion.

UNIT-III

CI Engine: Combustion phenomenon in CI engines, p-v diagram and their study for various stage of combustion, delay period, detonation in C.I. engines, Fuel injection in CI engines.

UNIT-IV

Engine Friction and Lubrication: Total engine friction, blow by losses, pumping losses, factors effecting engine friction, mechanism of lubrication, lubrication system.

UNIT-V

Cooling system: Piston and cylinder temperature distribution, principles and various methods of cooling. Measurement of performance parameters.

Text/Reference Books:

1. M.L. Mathur and R.P. Sharma, "A Course in IC Engines", Laxmi Publication.
2. V. Ganesan, "Internal Combustion Engines", TMGH Publication.
3. G.F. Taylor, "Internal Combustion Engines: Theory and Practice".

4. Stone, Richard, "Introduction to IC Engine".
5. Gupta, "Fundamentals of I.C. Engine", PHI publications.

Course Outcomes:

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

CO1 Demonstrate the components & combustion phenomenon of SI and CI engines.

CO2 Perform a thermodynamic analysis of Otto, Diesel, and Dual cycle models.

CO3 Demonstrate the combustion phenomenon of SI engine and CI engine.

CO4 Understand cooling, friction & lubrication systems in engines.

CO5 Evaluate the performance parameters of IC engines.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2			1				2			1	3	1	1
CO2	3	2			1				2			1	2	2	1
CO3	3	2			1				2			2	3	1	1
CO4	3	1			1				2			1	3	1	1
CO5	3	1			1				2			2	3	2	1

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EEUCLT1	-	-	2	3 Hours	25	25	100	1

ELECTRONIC DEVICES & CIRCUITS LAB

List of experiments: (Minimum 10 experiments are to be performed)

1. Design half wave and full wave rectifiers and determine ripple factor, rectifier efficiency and regulation.
2. Design and set up diode clipping and clamping circuits.
3. Determine Zener diode characteristic and determine line and load regulation characteristics using it as a voltage regulator.
4. Design and set up the BJT common emitter amplifier with and without feedback and determine the gain- bandwidth product from its frequency response.
5. Design and measure the frequency response of an RC coupled amplifier using BJT.
6. Design a two stage RC coupled amplifier and determine the effect of cascading on gain and bandwidth.
7. Design, setup and plot the frequency response of MOSFET amplifier and obtain the bandwidth.
8. Plot the transfer and drain characteristics of n-channel MOSFET and calculate its parameters - drain resistance, mutual conductance and amplification factor.
9. Evaluate characteristics of the non-ideal operational amplifiers - Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product.
10. Design and realize inverting and non-inverting amplifier using 741 op-amps and obtain their frequency responses.
11. Design and verify the operation of adder and subtractor circuit using op amp 741.
12. Design and verify the operation of a differentiator and integrator circuits using op amp IC 741 and show that they act as a high pass filter and low pass filter respectively.
13. Design and realize a voltage comparator using op amp 741.
14. Design and realize a Wein-bridge oscillator using op amp 741.
15. Design and realize a phase shift oscillator using op amp 741.
16. Design and realize a square wave generator using op amp 741.

Text/ Reference Books:

1. Millman, "Integrated Electronics", McGraw Hill Education, 2nd ed., 2017.
2. Bhargava N. N., D.C. Kulshreshtha and S.C. Gupta, "Basic Electronics & Linear Circuits", Tata

McGraw Hill, 2013, 2nd ed.

3. D. Roy Choudhury and Shail B. Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd. 11 June 2017, 4th ed.

Course Outcomes:

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

CO1 Design and test rectifiers, clipping circuits, clamping circuits and voltage regulators.

CO2 Design, test and evaluate BJT amplifiers in CE configuration.

CO3 Compute the parameters from the characteristics of BJT and MOSFET devices.

CO4 Evaluate characteristics of the operational amplifiers.

CO5 Design various applications of operational amplifiers.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	1	-	-	-	1	1	1	1	1	1	1
CO2	3	3	3	3	1	-	-	-	3	1	1	1	2	2	2
CO3	3	3	3	1	1	-	-	-	1	1	1	1	1	1	1
CO4	3	3	3	3	1	-	-	-	3	2	1	2	2	2	2
CO5	3	3	3	1	1	-	-	-	1	1	1	1	1	2	2

Weightage: 1 - **Slightly;** 2-**Moderately;** 3-**Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EEUCLT2	-	-	2	3 Hours	25	25	100	1

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB

List of Experiments:

1. Study and observe the oscilloscope as a test and measuring instrument. (Test the resistors, capacitors, diodes, transistors, measure AC/DC voltages, frequency, phase and study the Lissajous patterns).
2. Plot the B-H curve of a magnetic specimen to obtain its hysteresis loss and calculate its Steinmetz's constant & co-efficient.
3. Calibration of 1-Φ induction-type energy meter by phantom loading.
4. Low resistance measurement using Kelvin double bridge.
5. Measurement of inductance using Maxwell's bridges and Anderson bridge.
6. Measurement of capacitance using Schering bridge and De-Sauty bridge.
7. Frequency measurement using Wein bridge.
8. Determination of ratio & phase error in a potential transformer.
9. Determination of ratio & phase error in a current transformer.
10. Temperature measurement using RTD, thermistor and thermocouple.
11. Measurement of pressure and weight using piezoelectric transducer.
12. Measurement of power factor using two-watt meter method.
13. Active power measurement in a balanced 3-Φ system using two wattmeter method.
14. Reactive power measurement in a balanced 3-Φ system using single wattmeter method.

Text/ Reference Books

1. E. W. Golding, F. C. Widdis, "Electrical Measurements and Measuring Instruments", Reem Publications Pvt. Ltd., 2011, 3rd ed.
2. K. Sawhney, "A Course in Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai and Co., 2020, 19th ed.
3. Albert D. Helfrick, William D. Cooper, "Modern Electronic instrumentation and Measurements Techniques", Pearson Education India, 2016, 1st ed.
4. S.C. Bhargava, "Electrical Measuring Instruments and Measurements", BS Publications, 2013, 1st ed.
5. Ernest O. Doebelin, Dhanesh N. Manik, "Measurement systems", McGraw Hill India, 2019, 7th

ed.
6. R. K. Rajput, "Electrical and Electronic Measurements and Instrumentation", S. Chand & Co. Ltd., 2015, 4th ed.
7. H S Kalsi, "Electronic Instrumentation and Measurements", McGraw Hill, 2019, 4th ed.
8. Arun K. Ghosh, "Introduction to Measurements and Instrumentation", Eastern Economy Edition, PHI Learning, 2012, 4th ed.

Other Suggested Readings:

1. https://nptel.ac.in/courses/108/105/108105153/
2. https://www.cdac.in/index.aspx?id=pe_pe_PEG_SMARTENERGY

Course Outcomes:

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

CO1 Demonstrate the measurement of current, voltage, power and frequency using Analog instruments.

CO2 Measure the resistance, inductance, and capacitance using electrical bridges.

CO3 Determine the errors in instrument transformers.

CO4 Measure temperature, displacement, pressure using suitable transducer.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	1	1	1	1	2	2	3	3	3	3
CO2	3	3	3	3	1	1	1	1	2	1	1	1	3	3	3
CO3	3	3	3	3	2	2	2	1	1	1	1	1	3	3	3
CO4	3	3	3	3	1	1	2	1	2	1	1	1	3	3	3
CO5	3	3	3	2	2	2	2	2	2	2	2	2	3	3	3

Weightage**: 1 - Slightly;2 - Moderately;3 - Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EEUCLT3	**-**	**-**	**2**	**3 Hours**	**25**	**25**	**50**	**1**

SIMULATION LAB

List of experiments: (Minimum 10 experiments are to be performed)

1. To study the different functions of Analog / Digital multimeters.
2. To verify Thevenin's theorem for DC/AC Circuits.
3. To verify Norton's theorem for DC/AC Circuits.
4. Determination of transient response of current in series RL circuit with step voltage input and understand the time constant concept with DC Power Supply.
5. Determination of transient response of current and voltage in series RC circuit with step voltage input and understand the time constant concept with DC Power Supply.
6. Determination of transient response of current in RLC circuit with step voltage input for under damped, critically damped and over damped cases.
7. Determination of line and phase voltages in wye and delta connected three phase balanced circuits.
8. Determination of Z parameters for a dc network and computation of Y, Transmission and h parameters.
9. Determination of Y parameters for a dc network and computation of Z, Transmission and h parameters.
10. Determination of transmission parameters for a dc network and computation of Z, Y and h parameters.
11. Determination of h parameters for a dc network and computation of Z, Y and transmission parameters.
12. Determination of driving point and transfer impedances of a two-port ladder network and verification with theoretical values.
13. Verification of parameter properties in inter-connected two port series networks.
14. Verification of parameter properties in inter-connected two port parallel networks.

Course Outcomes:

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

CO1 Understand the usage of common electrical measuring instruments.

CO2 Evaluate the responses by applying network theorems to electrical circuits.

CO3 Analyze the transient and steady-state response of electrical circuits.

CO4 Analyze two port networks behaviour by determining different parameters.

CO5 Verify the properties of interconnected two port networks.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	1			2	1	1	1	3	3	3
CO2	3	3	3	3	2	1			2	1	1	1	3	3	3
CO3	3	3	3	3	2	1			2	1	1	1	3	3	3
CO4	3	3	3	3	2	1			2	1	1	1	3	3	3
CO5	3	3	3	3	2	1			2	1	1	1	3	3	3

Weightage**: 1-Slightly; 2-Moderately; 3-Strongly**

B. TECH. ELECTRICAL ENGINEERING
II YEAR IV SEMESTER SYLLABUS

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EEUDTT1	3	-	-	3 Hours	40	60	100	3

DIGITAL LOGIC DESIGN

Course Objectives:

- To understand number representation and conversion between different representation in digital electronic circuits.
- To analyze logic processes and implement logical operations using combinational logic circuits.
- To understand characteristics of memory and their classification.
- To understand concepts of sequential circuits & analyze sequential systems in terms of state machines.
- To understand concept of Programmable Devices, PLA, PAL, CPLD and FPGA and implement digital system using VHDL.

UNIT – I

Codes: Binary codes: Introduction & usefulness, Weighted & non-weighted codes, Sequential codes, Self complementing codes, Cyclic codes, 8-4-2-1 BCD code, Excess-3 code, Grey code: Binary to Grey and Grey to Binary code conversion, Error detecting code, Error correcting code, 7-bit Hamming code, ASCII code, EBCDIC code.

Realization of Boolean Expressions: Reduction of Boolean Expressions using Laws, Theorems and Axioms of Boolean Algebra, Boolean expressions and logic diagram, Converting AND/OR/Invert logic to NAND/NOR logic, SOP and POS Forms and their realization.

UNIT – II

Minimization Techniques: Expansion of a Boolean expression to SOP form, Expansion of a Boolean expression to POS form, 2,3 & 4 variable K-map: Mapping and minimization of SOP and POS expressions. Completely and Incompletely Specified Function-Concept of Don´t Care Terms.

UNIT – III

Combinational Circuits: Adder & Subtractor: Half adder, Full adder, Half subtractor, Full subtractor, Parallel binary adder, Code converter, Parity bit generator/checker, Comparator. Decoder: 3-line to 8-line decoder, 8-4-2-1 BCD to Decimal decoder, BCD to 7 segment decoders. Encoder: Octal to Binary and Decimal to BCD encoder. Multiplexer: 2-input multiplexer, 4-input multiplexer, 16-input multiplexer. Demultiplexer: 1-line to 4-line & 1-line to 8-line demultiplexer, Multiplexer as Universal Logic Function Generator, Programmed Array Logic (PAL), PLA.

UNIT – IV

Sequential Circuits: Flip-Flop & Timing Circuits: S-R Latch, Gated S-R Latch, D Latch, J-K

Flip-Flop, Edge-triggered S-R, D, J-K, T Flip-Flops, Master-Slave Flip-Flop, Shift Registers: PIPO, SIPO, PISO, SISO, Bi-directional Shift Registers, Universal Shift Registers, Counter: Asynchronous Counter: Ripple Counter, Design of Asynchronous Counter, Effect of propagation delay in Ripple Counter, Synchronous Counter: 4-bit Synchronous Up Counter, 4-bit Synchronous Down Counter, Design of Synchronous Counter, Ring Counter, Jhonson Counter, D/A and A/D converters, Smith trigger, Design of Sequence generator: Digital clock using counters.

UNIT – V

Digital logic families: Introduction, Simple Diode Gating and Transistor Inverter, Basic concept of TTL, Open collector gates, MOS Logic, CMOS Logic, Dynamic MOS Logic, Interfacing: TTL to CMOS, CMOS to TTL, Comparison among various logic families, Manufacturer´s specification.

Text/Reference Books:

1. A. A. Kumar, "Fundamentals of Digital Circuits", 2nd ed., PHI, 2009.
2. H. Taub and D. Schilling, "Digital Integrated Electronics", 1st ed., TMH, 2008.
3. M. M. Mano," Digital Logic and Computer Design", 1st ed., PHI, 2004.
4. A. P. Malvino and D. Leach, "Digital Principles and Application", 4th ed., TMH, 1986.
5. D. Perry, "VHDL", Tata McGraw Hill, 4th ed., 2002.
6. C. Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd ed., 2011.

Course Outcomes:

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

CO1 Apply the knowledge of number systems and Boolean logic used in the development of digital circuits and analyze digital circuits using Boolean algebra and K-maps.

CO2 Design and implement a variety of logical devices using combinational circuits concepts.

CO3 Design and analyze sequential circuits

CO4 Analyze different circuits using different logic families.

CO5 Comprehend the concept of VHDL and design sequential & combinational circuits using VHDL.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	1			1			3	3	1	1
CO2	3	3	3	2	2	1			1			3	3	1	1
CO3	3	3	3	2	2	1			1			3	3	1	1
CO4	3	3	3	2	2	1			1			3	3	1	1
CO5	3	3	3	2	2	1			1			3	3	1	1

Weightage**: 1 - Slightly;2 - Moderately;3 - Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EEUDTT2	3	-	-	3 Hours	40	60	100	3

ELECTRICAL POWER SYSTEMS I

Course Objectives:

- Learn the concept of national grid and smart grid.
- Understand various line parameters for different configurations of transmission lines.
- Learn to perform the analysis of short, medium, and long transmission lines.
- Learn to solve the problems related to insulation resistance and capacitance calculation in underground cables.
- Learn to calculate energy, power, reflection, and refraction coefficients for different terminations of transmission lines.

UNIT I

Introduction to Power System: Evolution of power system, Structure of Power System, introduction of bulk Power grid and micro grid, Overview of national grid, Introduction of smart grid.

Modeling of Generators and Transformers: Real and reactive capability curve of generators**,** Waveform under balanced 3 phase short circuit at the terminals, Steady state, transient and Sub transient equivalent circuits, Phase shift in star delta transformer, 3 Winding transformers, Tap changing transformer.

UNIT II

Overhead Line Components and Parameters: Types of conductors i.e., solid, stranded, ACSR and bundled conductors, Calculation of inductance and capacitance of single and three phase lines for single and double circuit configuration, Concept of GMR and GMD, Effect of earth on line capacitance, Skin effect and proximity effect, Types of loads, voltage, and Frequency dependence of loads and per unit system.

UNIT III

Transmission Line Performance Analysis: Classification of transmission lines ie short, medium, and long lines, nominal T, nominal π, equivalent T and equivalent π circuits, Calculation of ABCD constants for short, medium and long lines, Calculation of efficiency and regulation of short, Ferranti effect, Surge impedance loading.

UNIT IV

Underground Cables: Classification of underground cables, Components of underground cables, Insulation resistance and capacitance of underground cables and their calculations, Capacitance grading and inter sheath grading, Capacitance of three core belted cable, dielectric loss in cable and concept of tan δ.

UNIT V:

Voltage control and Power factor Correction:

Generator voltage control, Line drop compensation by static capacitors and reactors, Control of voltage profile, Control of active and reactive power, Calculation of synchronous phase modifier capacity, On-load tap changing transformer. Power factor Correction: Causes of low power factor, Methods of Improving power factor, Phase advancing and generation of reactive KVAR using static Capacitors, Most economical power factor for constant KW load and constant KVA type loads, Numerical Problems.

Text Reference Books:

1. W. D. Stevenson, "Elements of Power System Analysis", McGraw Hill, 2002, 4th ed.
2. C.L. Wadhwa, "Generation, Distribution and Utilization of Electrical Energy", New Age International, 2015, 3rd. ed.
3. M.V. Deshpande, "Elements of Electrical Power Station Design", 3rd ed, Wheeler Pub.2001.
4. C.L. Wadhwa, "Electrical Power Systems", New Age International, 2016, 7th ed.
5. H. Cotton & H. Barber, "The Transmission and Distribution of Electrical Energy", ELBS ,B.I.Pub., 3rd. ed., 1985
6. D.P. Kothari and I.J. Nagrath, "Power System Engineering", Tata McGraw-Hill Pub. Co., New Delhi, 3rd ed., 2019

Course Outcomes:

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

CO1 Describe the concept of national grid and smart grid.

CO2 Calculate various line parameters for different configurations of transmission lines.

CO3 Perform the analysis of short, medium, and long transmission lines.

CO4 Solve the problems related to insulation resistance and capacitance calculation in underground cables.

CO4 Calculate energy, power, reflection, and refraction coefficients for different terminations of transmission lines.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	2				1	1	2	2	3	3	3
CO2	3	3	2	2	2				1	1	2	2	3	3	3
CO3	3	3	2	2	2				1	1	2	2	3	3	3
CO4	3	3	2	2	2				1	1	-	1	3	3	3
CO5	3	3	2	2	3				1	1	2	2	3	3	3

Weightage**: 1 - Slightly;2 - Moderately;3 - Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EEUDTT3	3	-	-	3 Hours	40	60	100	3

ELECTRICAL MACHINES - I

Course Objectives:

- Aims to provide students with an understanding of the principles behind energy conversion in electromechanical systems.
- The course provides comprehensive knowledge about the construction, operation, characteristics, and applications of DC machines, along with the analysis of key phenomena like armature reaction and commutation.
- Covers the principles of speed control, loss analysis, testing methods, and efficiency calculations for DC motors.
- The principles, operation, performance analysis, and efficiency calculations for single-phase transformers, including auto-transformers and their applications.
- The course covers the fundamental principles, connections, and calculations related to three-phase transformers, including phase conversion and use of tertiary windings.

UNIT-I

Electromechanical Energy Conversion Principles: Principles of energy conversion, single excited and doubly excited magnetic systems, Singly excited electric field systems. Constructional features of rotating electrical machines, Generating emf, emf polygon, MMF produced by distribution windings, Concepts of torque production.

UNIT-II

DC Machines: Constructional features, parts of DC machines, Simplex and multiplex lap and wave windings; Methods of excitation, characteristics of saturated and un-saturated series, shunt, cumulatively and differentially compound excited machines operating as motors and generators, applications of DC machines; Armature reaction, demagnetizing and cross magnetizing ampere-turns, compensating windings, commutation process and methods of commutation, role of inter poles and compensating winding. Problems on emf equation, torque equation and armature reaction. Principle of operation of cross- field Generators-Amplidyne-Metadyne.

UNIT-III

Speed Control of DC Motors: Speed control of shunt & series motors, losses in DC machines and calculation of efficiency. Need for starters and Starters for DC series shunt and compound motors.

Testing of DC Motors: No-load test, Load tests and regenerative tests such as Swinburne's Test, Direct load test, Hopkinson's test, Field's test and Retardation test. Calculation of efficiency based on all the above tests.

UNIT-IV

Single-Phase Two Winding Transformers: Construction, principle of operation, E.M.F. equation, phasor diagrams; Equivalent circuit, determination of equivalent circuit parameters, Predetermination of performance equivalent circuit parameters and Sumpner's test. Losses, Separation of no-load losses, Calculation of efficiency and regulation by direct and indirect methods, Conditions for maximum efficiency. Concept of all-day efficiency. Parallel operation of transformers and load sharing.

Auto transformer: Principle of operation, Saving of copper compared to two-winding transformer and applications.

UNIT-V

Three-Phase Transformers: Merits of three phase Transformers over three phase transformer bank Type of connections such as Delta-Delta, Delta-Star, Star-Delta, Delta-Star, V-V connection and T-T Connections. Relation between line and phase voltages and currents, Vector Groups, use of tertiary winding. Three phase to Two phase connections and vice-versa. Problems on three phase transformers.

Text/ Reference Books

1. Dr. P. S Bimbhra, "Electrical Machinery, Theory: Performance & Applications", Khanna Publishers, 2021.
2. Stephen D. Umans, Fitzgerald and Kingsley's "Electric machinery", TMH Publishers, 7th ed, 2020.
3. Nagarath & D.P Kothari, "Electrical Machines", TMH Publishers, 2017, 5th ed.
4. J.B. Gupta, "Theory & Performance of Electrical Machines", S.K. Kataria & Sons, 2013, 5th ed.
5. A.E Clayton & NN Hancock, "The Performance and Design of Direct Current Machines", CBS Publishers, 2004.
6. P. S Bimbhra, "Electric Machines", Khanna Publishers, 2017, 2nd ed.

Course Outcomes:

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

CO1 Students will acquire a fundamental understanding of the working principles, design features, and torque generation in electromechanical energy conversion devices.

CO2 Students will develop a strong foundation in the construction, operation, and application of DC machines, as well as the ability to analyze key phenomena such as armature reaction and commutation.

CO3 Students will gain practical knowledge of speed control, efficiency calculation, testing methods, and the application of starters in DC motors.

CO4 Students will gain comprehensive knowledge in the operation, performance analysis, efficiency calculations, and applications of both single-phase transformers and auto-transformers.

CO5 Students will gain a comprehensive understanding of the principles, connections, and calculations for three-phase transformers, including phase conversion and the use of tertiary windings.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	1				1	1	1	2	3	2	2
CO2	3	3	3	1	1				1	1	1	2	3	2	2
CO3	3	3	3	2	1				1	1	1	2	3	2	2
CO4	3	3	3	2	2				1	1	2	2	3	2	2
CO5	3	3	3	2	2				1	1	2	2	3	2	2

Weightage**: 1 - Slightly;2 - Moderately;3 - Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EEUDTT4	3	-	-	3 Hours	40	60	100	3

SIGNALS & SYSTEMS

Course Objectives:

- Learn to analyze and identify different types of continuous and discrete signals and systems.
- Learn to represent various responses of LTI continuous and discrete systems.
- Understand different continuous and discrete time domain transformation techniques.
- Learn to represent any aperiodic signal as a combination of sinusoids.
- Learn sampling and reconstruction of signals.

UNIT-I

Signals and systems: Definition of signal, test signals, operations on signals, Classification of Signals, definition of system and system classification, System properties: additivity and homogeneity, causality, stability, invertibility.

UNIT-II

Linear Time Invariant (LTI) Systems: Impulse response and step response, convolution, Properties of LTI systems, Eigen functions, System representation through differential and difference equations.

UNIT-III

Continuous Time System Analysis: The Laplace Transform, region of convergence, poles and zeros of system, Properties of Laplace transform, Inverse Laplace transform, Laplace domain analysis, Solution to differential equations and system behavior.

Discrete Time System Analysis: The z-Transform, region of convergence, Properties of z-transform, Inverse Z-transform, Z-domain analysis, solution to difference equations and system behavior.

UNIT-IV

Fourier analysis of Continuous Time System: Fourier series representation, Fourier Transform, Properties of Fourier transform, Magnitude and Phase response.

Continuous to Discrete conversion: Sampling, Sampling theorem and signal reconstruction. **Fourier analysis of Discrete Time System:** The Discrete-Time Fourier Transform (DTFT), properties of DTFT, LTI system representation by DTFT.

UNIT-V

Discrete Fourier Transform (DFT), Properties of DFT, Parseval's Theorem, **Fast Fourier Transform (FFT):** Concept of twiddle factor, DIT and DIF radix-2 algorithm.

Text/ Reference Books:

1 B. P. Lathi, "Principles of Linear Systems and Signals", Oxford University Press, 2009.
1. H. P. Hsu, "Schaum's outline: Theory and problem of Signal & Systems", TMH 1995.
2. Samarjit Ghosh, "Signals & Systems", Pearson Education, 2006
3. S. K. Mitra, "Signals & Systems", Oxford University Press, 2015
4. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.
5. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi, 2001.

Course outcomes:

At the end of this course students will able to:

1. Analyze and identify different types of continuous and discrete signals and systems.
2. Investigate and represent various responses of LTI continuous and discrete systems.
3. Perform different continuous and discrete time domain transformation technique.
4. Represent any aperiodic signal in to a combination of sinusoids.
5. Obtain the conversion using sampling and reconstruction of signals.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	2				1	1	1	2	3	2	2
CO2	3	3	1	2	3				1	1	1	2	3	2	2
CO3	3	3	2	2	3				1	1	1	2	3	2	2
CO4	3	3	2	2	1				1	1	2	2	3	2	2
CO5	3	3	2	1	1				1	1	2	2	3	2	2

Weightage**: 1 - Slightly;2 - Moderately;3 - Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EEUDTK1	3	-	-	3 Hours	40	60	100	3

ELECTROMAGNETIC FIELD THEORY

Course Objectives:

- To introduce the concept of electric field intensity for different charge distributions'
- To understand electrostatics
- To understand magnetostatics
- To understand the concept of magnetic force between different elements
- Understand the concept of time varying field

UNIT-I

Transmission Lines: Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, reflection coefficient and VSWR, Impedance Transformation on Loss-less and Low loss Transmission line, Power transfer on TX line, Smith Chart, Admittance Smith Chart

UNIT-II

Basics of Vector algebra and Electric fields: Scalars and vectors, vector algebra, the Cartesian, circular cylindrical and spherical coordinate systems, transformations between coordinate systems, Coulomb's law, electric field intensity, electric field due to several charges, Gauss law and its application, divergence and divergence theorem, Stokes theorem.

UNIT-III

Maxwell's Equations: Basic laws of Electromagnetics, Maxwell's Equations, Boundary conditions at Media Interface.

UNIT-IV

Uniform Plane Wave: Uniform plane wave, Propagation of wave, Wave polarization, Wave propagation in conducting medium, phase and group velocity, Power flow and Poynting vector, Surface current and power loss in a conductor.

UNIT-V

Plane Waves at a Media Interface: Plane Waves at a Media Interface- Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface.

Text / Reference Books

1. William H. Hayt, Jr. and John A. Buck, "Engineering Electro magnetics", Tata McGraw-Hill Publishing Company Ltd, 7th ed, 2006.
2. G. S. N. Raju, "Electromagnetic Field theory and transmission lines", Pearson Education, 2006.

3. Matthew N. O. Sadiku, "Elements of Electro magnetics", Oxford University Press, 7th ed, 2018.
4. Robert Plonsey and Robert E. Collin, "Principles and Applications of Electromagnetic Fields", McGraw-Hill, 1961.
5. David K. Cheng, "Field and Wave Electro magnetics", Pearson Education Limited, 2nd ed., 2013.

Course Outcomes:

At the end of this course students will able to:

CO1 Estimate electric field intensity and potential for different charge distributions'

CO2 Gain fundamental knowledge on Electrostatics

CO3 Able to apply the concepts of magnetostatics and related mathematical tools equips you with the knowledge and skills to understand and analyze magnetic fields in a steady-state system.

CO4 Gain a thorough understanding of how magnetic forces and materials interact

CO5 To analyze and design systems that involve time-varying electromagnetic phenomena.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	2			2			2	3	3	3
CO2	3	3	2	2	1	2			2			2	3	3	3
CO3	3	3	3	2	1	2			2			2	3	3	3
CO4	3	3	2	2	1	2			2			2	3	3	3
CO5	3	3	3	2	1	2			2			2	3	3	3

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EEUDTK2	3	-	-	3 Hours	40	60	100	3

ELECTRICAL POWER GENERATION

Course Objectives:

- Learn the basic requirements for the design and development of a modern power plant.
- Understand how economically power can be generated and distributed among the load centres.
- Gain Knowledge about the cheapest ways of electric power generation.
- Learn the operation of different accessories associated with conventional and nonconventional power plants.
- Learn about new renewable power devices for socioeconomic applications.

UNIT-I

Part A: Introduction to Generating station & Loads: Choice of Power station and units: Types of power station, choice of type of generation, choice of size of generator units and number of units. Definition of connected load, maximum load, maximum demand, demand factor, load factor, diversity factor, plant capacity factor, plant utilization factor, load duration curve, mass curve.

Part B: Economic operation of power systems: Economic load scheduling, Load sharing between two and multiple generators, neglecting transmission loss.

UNIT-II

Hydro power stations: Hydrology, hydrographs, flow duration curve, mass curve, types of dams, principle of working of a hydroelectric plant, classification, types of turbines, characteristics, tidal power generation.

UNIT-III

Coal Fired Based Thermal Power Plant: Schematic diagram, operation, super thermal power plant, steam turbines, characteristics.

UNIT-IV

Nuclear Power Plant: Schematic diagram, operation, classification, nuclear reactors, concept of MHD generation.

UNIT-V

Part A: Solar Power Generation: Description and principle of working, performance characteristics of solar cell, types of solar cell.

Part B: Wind power generation, classification of wind turbine, components of wind turbine, operating characteristics of wind turbine.

Text Books/Reference Books:

1. B. R. Gupta, "Generation of Electrical Energy", S Chand and Company Ltd., 7th ed, 2017.
2. T. H. Car, "Electric Power Stations", Vol. I and II, Chapman and Hall, 1944.
3. C. S. Solanki, "Solar Photovoltaics – Fundamentals, Technologies and Applications", PHI Learning Pvt Ltd, 3rd ed, 2015.
4. S. P. Sukhatme and J. K. Nayak, "Solar Energy: Principles of Thermal Collection and Storage", Tata McGraw-Hill Publishing Company Ltd, 3rd ed, 2008.
5. J. B. Gupta, "A Course in Electrical Power", S. K. Kataria & Sons, 2009.

Course Outcomes:

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

CO1 Explain the basic requirements for the design and development of a modern power plant.

CO2 Explain how economically power can be generated and distributed among the load centres.

CO3 Demonstrate the cheapest ways of electric power generation.

CO4 Explain the operation of different accessories associated with the conventional and non-conventional power plants.

CO5 Develop new renewable power devices for socioeconomic applications.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	1	1	1		1			2	3	2	2
CO2	3	3	3	1	1	1	1		1			2	3	2	2
CO3	3	3	3	1	1	1	1		1			2	3	2	2
CO4	3	3	3	1	1	1	1		1			2	3	2	2
CO5	3	3	3	1	1	1	1		1			2	3	2	2

Weightage**: 1 - Slightly;2 - Moderately;3 - Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EEUDTK3	3	-	-	3 Hours	40	60	100	3

ANALOG AND DIGITAL COMMUNICATION

Course Objectives:

- Learn different types of Amplitude modulation.
- Learn to analyze angle modulation and different types
- Learn Pulse modulation and multiplexing of signals
- Understand PCM and digital modulation
- Learn to evaluate the channel capacity and coding efficiency.

UNIT-I

Amplitude Modulation: Need of modulation, Amplitude modulation, Single tone and multi tone amplitude modulation, Amplitude Modulation Index, power relation. Generation and detection of AM wave, suppressed carrier modulation and detection techniques.

UNIT-II

Angle Modulation: Mathematical equation of frequency modulation (FM), frequency spectrum, phase modulation (PM), relationship between PM and FM, pre-emphasis and de-emphasis, adjacent channel interference, comparison of narrow band and wide band FM, generation of FM.

UNIT-III

Pulse Modulation System: Sampling theorem, Sampling of Low Pass and band pass signals, Aliasing, Aperture effect, Basic principles of PAM, PWM and PPM, their generation and detection, FDM, TDM, Comparison of TDM and FDM.

UNIT-IV

PCM and Digital Modulation Techniques: Quantization, PCM, PCM generator, Quantizer, Transmission band width in PCM, PCM receiver, quantization noise/error in PCM, DPCM.

Introduction To Digital Modulation: Types of digital modulation techniques, Fundamentals of binary ASK, PSK and FSK, Generation of BASK, BPSK and BFSK and their coherent detection techniques.

UNIT-V

Information Theory: Introduction, Sources of information, Contents in DMS, Contents of a symbol, Information rate, Discrete memoryless channel, mutual information, Channel capacity, Source coding, Coding efficiency.

Text/ Reference Books:

1. Taub and Shilling, "Principles of Communication Systems", Tata Mc GrawHill.
2. P. Chakrabarti, "A Text Book of Analog & Digital Communication", Dhanpat Rai & Co,.
1. Kennedy, "Electrical Communication Systems",TMH.
2. Sanjay Sharma, S.K. Kataria & Sons, "Digital Communications", NewDelhi

Course outcomes:

At the end of this course students will able to:

CO1 Explain the modulation process and different types of modulation.

CO2 Analyze the angle modulation and compare different type of angle modulation useful.

CO3 Analyze Pulse modulation and multiplexing of signals.

CO4 Explain PCM and Digital modulation, and its mechanism.

CO5 Evaluate the channel capacity and coding efficiency.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	1	1	1		1			1	3	2	2
CO2	3	3	3	1	1	1	1		1			1	3	2	2
CO3	3	3	3	1	1	1	1		1			1	3	2	2
CO4	3	3	3	1	1	1	1		1			2	3	2	2
CO5	3	3	3	1	1	1	1		1			2	3	2	2

Weightage**: 1 - Slightly;2 - Moderately;3 - Strongly**

INSTITUTE CORE (IV SEMESTER)

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ECUDTO1	3	-	-	3 Hours	40	60	100	3

INTRODUCTION TO ELECTRONIC DEVICES & CIRCUITS

Course Objectives:

- To develop basic concept of semiconductor materials and physics.
- To introduce different methods of DC analysis and AC models of semiconductor devices.
- To develop the concept and analysis of transistor characteristics, biasing and thermal stability stabilization.
- To help students develop various designs of amplifiers and its applications.
- To analyze and perform the theoretical concepts through laboratory and simulation experiments.

UNIT-I

Semiconductor Concept: Review of semiconductor & energy band diagram, The k-space diagrams of Si and GaAs, Density of states function, The fermi–dirac probability function, The distribution function and the fermi energy, Semiconductor in equilibrium, Carrier transport phenomena, Carrier generation and recombination.

UNIT-II

Junction Diode Characteristics: Description of pn junction action, The abrupt junction, The ideal diode model, Temperature dependence of I-V characteristics, Breakdown mechanism, Diode resistance, Diode capacitance, Clipper, Clamper, Rectifier.

UNIT-III

Transistor Characteristics: NPN, PNP, Operations, Early effect, Current equations, Input and output characteristics of CE, CB, CC, Transistor as a switch & amplifier, Transistor biasingand thermal stabilization.

UNIT-IV

Field Effect Transistor (FET): JFET construction, operation & device characteristics, Pinch off voltage and its significance, Classification of MOSFET, The two-terminal MOS structure, C- V characteristics, The Basic structure & operating principal of MOSFET, Threshold voltage, Current-voltage characteristics, Biasing of JFET & MOSFET.

UNIT-V

Low Frequency Analysis: h-parameter models for CB, CE, CC configurations and their inter relationship, Analysis and comparison of the three configurations, Approximate

models and calculation of CE and CC amplifiers, CE with emitter resistance, Analysis of low frequency CS and CD FET amplifier.

Text/Reference Books:

1. D. A. Neaman, "Semiconductor Physics and Devices- Basic Principles", 4th ed., TMH, 2021.
2. J. Millman and C. C. Halkias, "Electronic Devices and Circuits", 6th ed., Tata McGraw Hill PublishingLimited, New Delhi, 2003.
A. Mottershead, "Electronic Devices and Circuits- An Introduction", Prentice Hall of India PrivateLimited, New Delhi, 2003
3. R. Boylestad and L. Nashelsky, "Electronic Device & Circuit Theory", 11th ed., Pearson, 2013.
4. B. G. Streetman and S. Banerjee, "Solid State Electronic Devices", Pearson Education, 2002 / PHI
5. S. M. Sze and K. N. Kwok, "Physics of Semiconductor Devices," 3rd ed., John Wiley & Sons, 2006.

Course Outcomes:

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

CO1 Illustrate the knowledge of semiconductor physics.

CO2 Comprehend the characteristics of the PN junction diode and its application in electronic circuits.

CO3 Elucidate and analyze the characteristics and performance of transistors.

CO4 Analyze the concept of load line and design biasing circuits of transistor.

CO5 Evaluate low frequency analysis of transistor.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	1			3			2	3	1	2
CO2	3	3	2	3	2	1			3			2	3	2	2
CO3	3	3	2	3	2	1			3			2	3	2	2
CO4	3	3	2	3	2	1			3			2	3	2	2
CO5	3	3	2	3	2	1			3			2	3	2	2

Weightage**: 1 - Slightly;2 - Moderately;3 - Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ITUDTO1	3	-	-	3 Hours	40	60	100	3

COMPUTER NETWORK

Course Objectives:

- Discuss the basic taxonomy and terminology of the computer networking.
- Discuss the functionality of different layers of OSI Model.
- Discuss different protocols of TCP/IP protocol suite.
- Discuss the process of IP addressing and working of routing protocols.
- Discuss the different challenges of Internetworking, Congestion control and Quality of services

UNIT-I

Introduction: Data communications: Components, Data representation, Direction of data flow (simplex, half duplex, full duplex).

Networks: Distributed processing, Network criteria, Physical structure (type of connection, topology), categories of network (LAN, MAN, WAN); Internet: brief history, internet today, Protocols and standard.

Reference models: OSI reference model, TCP/IP reference model, their comparative study.

Physical Layer: Transmission technology.

UNIT-II

Data Link Layer: Types of errors, Error detection & correction methods, Framing (character and bit stuffing), Flow control, Protocols: Stop & wait ARQ Go – Back – N ARQ, Selective repeat ARQ.

Medium access sub layer: Point to point protocol, Multiple Access Protocols: Pure ALOHA,Slotted ALOHA, CSMA, CSMA/CD, Token ring, Reservation, Polling, FDMA, TDMA, CDMA.

UNIT-III

Network Layer: Internetworking devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway.

Addressing: IP addressing, classful addressing, subnetting.

Routing: Techniques, Static vs. Dynamic routing, Routing table for classful address, Flooding,Shortest path algorithm, Distance vector routing, Link state routing.

Protocols: ARP, RARP, IP, ICMP, IPV6.

UNIT-IV

Transport Layer: Process to process delivery, UDP: Services and applications, TCP: StreamOriented Service, Segment, Timers, Congestion control techniques: Avoidance and Detection.

UNIT-V

Application Layer: DNS, SMTP, FTP, HTTP & WWW.

Security: Cryptography, User authentication, Security protocols in internet, Firewalls. Recentresearch topic on networking.

Text/Reference Books:

1. B.A.Forouzan, "Data Communications and Networking", TMH Publication.
2. S. Tanenbaum, "Computer Networks", Pearson Education / PHI Publication.
3. Comer, "Internetworking with TCP/IP", Pearson Education/PHI by Publication.
4. W.Stallings, "Data and Computer Communications", PHI Publication.

Course Outcomes:

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

CO1 Upon completion of this course, the students will be able to

CO2 Understand the working of different internetworking devices.

CO3 Understand the working of Internet.

CO4 Understand the difference between OSI and TCP/IP.

CO5 Understand the security mechanism in Networking.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	1			3			2	3	1	2
CO2	3	3	2	3	2	1			3			2	3	2	2
CO3	3	3	2	3	2	1			3			2	3	2	2
CO4	3	3	2	3	2	1			3			2	3	2	2
CO5	3	3	2	3	2	1			3			2	3	2	2

Weightage**: 1 - Slightly;2 - Moderately;3 - Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ITUDTO2	3	-	-	3 Hours	40	60	100	3

FUNDAMENTALS OF PYTHON PROGRAMMING

Course Objectives:

- To read and write simple python programs.
- To develop python programs with conditionals and loops.
- To define python functions and call them.
- To use python data structures –- lists, tuples, dictionaries.
- To do input/output with files in python.

UNIT-I

Introduction to Python: Introduction to python and its historical background, Applications, Installation of python and development environments (IDLE, Jupyter), Writing and running python programs, Understanding python's syntax and code structure, Basic input and output operations.

UNIT-II

Data Types and Variables: Data types: integers, floats, strings and booleans, Variables and their naming conventions, Type conversion, and typecasting, Python Operators: arithmetic, comparison, logical and assignment operators.

UNIT-III

Python Control Flow and Loops: Python decision-making with if, elif, and else statements, Python loops: while and for loops, Break and continue statements, Python control statements (pass, assert), String operations: concatenation, replication, slicing, and indexing.

UNIT-IV

Python Data Structures and Functions: Python sequences, Lists, tuples, and range, Python collections, sets, dictionaries, Functions in python: defining, calling, parameters, return, Work with various data structures and create functions for different tasks.

UNIT-V

Advanced Topics and Modules: File handling in python, Exception handling, Introduction to modules and libraries, Built-in modules in python, Overview of python libraries (e.g., math, random), Explore packages.

Text/Reference Books:

1. Wesley J. Chun, "Core Python Programming", 2nd ed., Pearson.
2. Allen Downey, "Think Python" Green Tea Press.
3. Kenneth A. Lambert, "Introduction to Python", Cengage.

4. Vamsi Kurama, "Python Programming: A Modern Approach", Pearson.
5. Mark Lutz and O'Really, "Learning Python".

Course Outcomes:

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

CO1 Introduce students to Python's history, installation, and basic usage, enabling them to write andexecute simple Python programs.

CO2 Familiarize students with Python syntax, data types, variables, and fundamental operators tobuild a solid programming foundation.

CO3 Teach students how to make decisions and control program flow using conditional statements andloops in Python.

CO4 Enable students to work with various data structures like lists, tuples, sets, dictionaries, and functions to manipulate data effectively.

CO5 Equip students with essential skills for file handling, and exception handling, and introduce them to modules and libraries in Python for more advanced programming tasks.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2							3	3	3	2
CO2	3	3	2	2	2							3	3	3	2
CO3	3	3	2	2	2							3	3	3	2
CO4	3	3	2	2	2							3	3	3	2
CO5	3	3	2	2	3							3	3	3	3

Weightage**: 1 - Slightly;2 - Moderately;3 – Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
CSUDTO1	3	-	-	3 Hours	40	60	100	3

INTRODUCTION TO INFORMATION SCIENCE

Course Objectives:

- To understand basic concepts about Coding Theorem.
- To understand basic concepts about error detection and correction methods.
- To understand basic concepts about compression techniques.
- To understand basic concepts about video image compression techniques.
- To understand basic concepts about cryptography.

UNIT-I

Uncertainty, Information and Entropy Information Measures: Characteristics on information measure, Shannon's concept of information, Shannon's measure of information, Model for source coding theorem, Communication system, Source coding and line/channel coding,channel models, channel mutual information capacity (Bandwidth).

UNIT-II

Channel coding, Theorem for discrete memory less channel, Information capacity theorem, Error detecting and error correcting codes, Types of codes, Block codes, Tree codes, Hamming codes, Description of linear block codes by matrices, Description of linear tree code by matrices, Parity check codes, Parity check polynomials.

UNIT-III

Compression: Lossless and lossy, Huffman codes, Binary Image compression schemes, Run length Encoding, CCITT group-3 1D compression, CCITT group-3 2D compression, CCITT group-42D compression.

UNIT-IV

Video Image Compression: Requirement of full motion video compression, CCITT H 261video coding algorithm, MPEG compression methodology: MPEG-2 compression, Audio (Speech) compression.

UNIT-V

Cryptography: Encryption, Decryption, Cryptogram (cipher text), Concept of cipher, Cryptanalysis, Keys: Single key (Secret key), Cryptography, two-key (Public key) cryptography, Single key cryptography, Ciphers, Block Cipher code, Stream ciphers, Requirements for secrecy, The data Encryption Standard, Public Key Cryptography, Diffie-Hellmann public key distribution, The Rivest-Shamin Adelman (R-S-A) system for public key cryptography, Digital Signature.

Text/Reference Books:

1. Das, Mullick & Chatterjee, "Digital Communication", New Age Pub.
2. Proakis, "Digital Communication", TMH.
3. Gonzales & Woods, "Digital Image Processing", Pearson.
4. G. Keiser, "Local Area Network", TMH.

Course Outcomes:

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

CO1 Student will be able to know about Coding Theorems.

CO2 Student will be able to know about error detection and correction methods.

CO3 Student will be able to know about compression techniques.

CO4 Student will be able to know about video image compression techniques.

CO5 Student will be able to know about cryptography.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2							3	3	3	2
CO2	3	3	2	2	2							3	3	3	2
CO3	3	3	2	2	2							3	3	3	2
CO4	3	3	2	2	2							3	3	3	2
CO5	3	3	2	2	3							3	3	3	3

Weightage**: 1 - Slightly;2 - Moderately;3 - Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
CEUDTO1	3	-	-	3 Hours	40	60	100	3

REMOTE SENSING & GIS

Course Objectives:

- Apply the concepts of Photogrammetry and its applications such as determination of heights ofobjects on terrain.
- Understand the basic concept of Remote Sensing and know about different types of satellite andsensors.
- Illustrate Energy interactions with atmosphere and with earth surface features, Interpretation ofsatellite and top sheet maps.
- Understand different components of GIS and Learning about map projection and coordinate system.

UNIT-I

Introduction to Photogrammetry: Principles and types of aerial photographs, geometry of vertical and aerial photograph, Scale and Height measurement on single and vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of Stereoscopy, fiducial points, parallax measurement using fiducial line.

UNIT-II

Remote Sensing: Basic concepts and foundation of Remote Sensing elements, Data information, Remote sensing data collection, Remote sensing advantages and Limitations, Remote sensing process. Electromagnetic spectrum, Energy interaction with atmosphere and with earth surface features (soil, water, and vegetation) Indian Satellites and Sensors characteristics, Map and Image false color composite, Introduction to digital data, Elements of visual interpretations techniques.

UNIT-III

Geographic Information Systems: Introduction to GIS, Components of GIS, Geospatial data, Joining spatial and attribute Data, GIS Operations, Spatial data input- Attribute Data Management, Data display, Data exploration, Data analysis. **Coordinate systems:** Geographic Coordinate system; Approximation of Earth, Datum: Map Projections; Types of map projections- map projection parameters- commonly used map projections – projected coordinate systems.

UNIT-IV

Vector Data Model: Representation of simple features- Topology and its importance: Coverage and its data structure, Shape file, Data models for composite features Object based vector data model, Classes and their Relationships, The geo-based data model, Geometric representation of spatial feature and data structure, Topology rules.

UNIT-V

Raster Data Model: Elements of Raster data model: Types of Raster data: Raster data

structure: Data conversion, Integration of Raster and Vector data. Data Input: Metadata: Conversion of Existing data, Creating new data, Remote sensing data, Field data, Digitizing, Scanning, on screen digitizing, importance of source map, Data Editing.

Text/Reference Books:

1. Bhatta B, "Remote sensing and GIS", 2008, Oxford University Press.
2. Lillesand, T.M, R.W. Kiefer and J.W. Chipman "Remote Sensing and Image Interpretation", 2013, Wiley India Pvt. Ltd., New Delhi.
3. Schowenger, R. A., "Remote Sensing", 2006, Elsevier publishers.
4. Parkinson,B. W., Spilker, J. J. jr., "Global Positioning System: Theory & Applications (Volume-I)", 1996, AIAA, USA.
5. M.Anji Reddy, "Remote Sensing and Geographical Information systems" , JNTU Hyderabad 2001, B.S. Publications.
6. Peter A Burragh and Rachael A. Mc Donnell, "Principals of Geo physical Information System", Oxford Publishers, 2004.
7. George Joseph, "Fundamentals of Remote Sensing", Universities Press, 2013.

Course Outcomes:

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

CO1 Understand the principles of aerial and satellite remote sensing, Able to comprehend the energyinteractions with earth surface features, spectral properties of water bodies.

CO2 Understand the basic concept of GIS and its applications, know different types of data representation in GIS.

CO3 Understand and Develop models for GIS spatial Analysis and will be able to know what thequestions that GIS can answer are.

CO4 Apply knowledge of GIS software and able to work with GIS software in various application fields.

CO5 Illustrate spatial and non-spatial data features in GIS and understand the map projections andcoordinates systems.

CO6 Apply knowledge of GIS and understand the integration of Remote Sensing and GIS.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	2			1		1				3	1	2
CO2	3	2	2	2			1		1				3	2	1
CO3	2	2	2	3			2		2				3	2	1
CO4	2	2	2	1			1		2				2	3	1
CO5	2	2	3	2			1		2				2	3	2

Weightage**: 1 - Slightly;2 - Moderately;3 - Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
CHUDTO1	3	-	-	3 Hours	40	60	100	3

FLUIDIZATION ENGINEERING

Course Objectives:

- To impart the fundamental knowledge of Fluidization and understand the different aspects of fluidized bed systems applied in various industries.

UNIT-I

Phenomenon of Fluidization, Advantages and disadvantages of fluidization compared to conventional processes, Classification of various industrial beds, Industrial applications of fluidized beds in mineral processing, coal and biomass gasification & combustion FCC petroleum refining, pharmaceuticals, cement and other solid handling systems, Fluidized Bed Drying.

UNIT-II

Gross behavior of fluidized beds-Minimum fluidizing velocity and pressure drops; Voidage, Design of distributors, Effect of temperature and pressure on fluidized bed, Elutriation and entrainment Transport disengaging height.

UNIT-III

Bubbles in dense beds-Davidson Model, stream of bubbles, Bubbling bed models, Geldart classification, Different regimes of Fluidization, Davidson's model, Variation of Bubbling bed and Circulating Fluidized beds.

UNIT-IV

Emulsion phase, Turn-over rate of solids, Residence Time Distribution of Solids, Diffusion model of solids movement, Interchange coefficient of solid into and out of wake.

UNIT-V

Flow Pattern of Gas through fluidized beds, diffusion model for gas flow; two region models,evaluation of interchange coefficients, Heat and Mass transfer in Fluidized Beds.

Text/Reference Books:

1. D. Kunii and O. Levenpiel, Butterworth-Heinemann, "Fluidization Engineering", Elsevier.
2. J. F. Davidson and D. Harrison, "Fluidization", Academic Press.
3. F.A. Zenz and D. F. Othmer," Fluidization and Fluid Particles Systems", Reinhold Publishing.
4. W. C. Yang, "Fluidization and Fluid-Particle Systems", CRC Press.

Course Outcomes:

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

CO1 Describe fluidization and its recommendation in various industries exploiting its various

advantages in evaluating the heat and mass transfer aspects.

CO2 Apply model equations for fluidized beds for application in various industries.

CO3 Able to understand various fluidization characteristics like minimum fluidization velocity, complete fluidization velocity and transport disengage height.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3								3	1	2
CO2	3	3	3	3	3								3	1	2
CO3	3	3	3	3	3								3	2	2
CO4	3	2	3	2	3								2	2	2
CO5	3	2	3	2	3								2	2	2

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
MEUDTO1	3	-	-	3 Hours	40	60	100	3

INTRODUCTION TO FLUID MECHANICS

Course Objectives:

- To familiarize with the properties of fluids and the applications of fluid mechanics.
- To formulate and analyze problems related to calculation of forces in fluid structure interaction.
- To understand the concept of fluid measurement, types of flows and dimensional analysis.
- To understand boundary layer concepts.

UNIT-I

Fundamentals of Fluid Mechanics: Introduction; Applications; Concept of fluid; Difference between solids, liquids and gases; Concept of continuum; Ideal and real fluids; Fluid properties

UNIT-II

Fluid Statics: Concept of static fluid pressure; Pascal's law and its engineering applications; Hydrostatic paradox; Pressure distribution in a liquids

UNIT-III

Fluid Kinematics: Classification of fluid flows; Lagrangian and Euler flow descriptions;

Velocity and acceleration of fluid particle; Local and convective acceleration; Normal and tangential acceleration; Flow rate and discharge mean velocity; One dimensional continuity equation; Continuity equation

UNIT-IV

Fluid Dynamics: Euler's equation of motion; Bernoulli's equation using principle of conservation of energy; equation of motion and its applications to steady state ideal and real fluid flows

UNIT-V

Fluid devices; Conversion of mechanical to fluid energy - applications

Text/Reference Books:

1. S.K. Som, G. Biswas and S. Chakraborty, "Introduction to Fluid Mechanics and FluidMachines", Tata McGraw Hill Publications, 3rd ed, 2011.
2. D.S. Kumar, "Fluid Mechanics and Fluid Power Engineering", S.K. Kataria and SonsPublishers, 1st ed, 2009.
3. Y.A. Cengel and J.M. Cimbala, "Fluid Mechanics - Fundamentals and Applications",Tata McGraw Hill Publications, 3rd ed, 2013.
4. V.L. Streeter, E.B. Wylie and K.W. Bedford, "Fluid Mechanics", McGraw HillBookCompany, New York, 9th ed, 1998.
5. Frank M. White, "Fluid Mechanics", Tata Mc Graw Hill Publications, 5th ed, 2012.

Course Outcomes:

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

CO1 Understand the concept of fluids and their properties.

CO2 Distinguish various types of flows and learn flow measurement methods.

CO3 Apply the concept to solve the problems related to fluid statics.

CO4 Apply concepts to solve problems on fluid kinematics.

C05 Demonstrate working principle of various fluid-based devices.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1										2	1	3
CO2	3	2	2										3	1	3
CO3	3	2	2										3	1	3
CO4	3	2	1										2	1	3
CO5	3	2	1										2	1	3

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
IPUDTO1	3	-	-	3 Hours	40	60	100	3

AUTOMOBILE ENGINEERING

Course Objectives:

- To provide the knowledge of basic structure of an automobile.
- To provide the knowledge of transmission system and its various elements.
- To provide the knowledge of clutches and suspension system
- To provide the knowledge of braking system.
- To provide the knowledge of steering system and engine emissions.

UNIT-I

Introduction of an automobile: Component and basis structure of automobile, classification, difference between automobile and automotive, the chassis construction & classification, defect in frames, frameless construction & specifications. Wheel and tyres: Types of wheels, wheel dimension, desirable tyres properties, types of tyres, tyre material, tyre dimension, factors affecting tyre life.

UNIT-II

Transmission system: Function of transmission types, sliding mesh gear box, constant mesh gear box, synchro mesh gear box, torque converter, propeller shaft, universal joint, hook joint, final drive, differential, performance of gear box.

UNIT-III

Clutches: Requirement, function & type of clutch, dry friction clutch, wet friction clutch, clutch plate, single plate & multiple plate clutch, centrifugal clutch and fluid fly wheel.

Suspension system function and requirement, leaf spring, torsion bar, telescopic shock absorber.

UNIT-IV

Brakes: Function and requirement, brake efficiency, wheel skidding, types of brake, electrical, mechanical and hydraulic & pneumatic brakes, master cylinder, wheel cylinder, self-actualizing brakes, brake drum, brake liners, brake shoe, trouble shooting.

UNIT-V

Front axle and suspension wheel alignment purpose: Factor of front wheel alignment, steering geometry, correct steering angle, steering mechanism, under steer and over steer, steering gear, power steering, reversibility of steering gears, steering gear ratio, calculation of turning radius.

Engine emission: Emission standard of vehicle in India, Euro norms, emission, testing. Principle of multipoint fuel injection (MPFI), component of MPFI, different sensors of MPFI

system, vehicle air conditioning.

Text/Reference Books:

1. Kripal Singh, Automobile Engineering - Vol. I, II.
2. Joseph Heitner, "Automobile Mechanics".
3. N.K Giri, "Automobile Engineering".
4. Shrinivasan, "Automobile Engineering", T.M.H.
5. K.K. Jain, R.B. A,sthana, "Automobile Engineering" ,T.M.H.
6. R.B. Gupta, "Automobile Engineering - Tech India Publication Series".

Course Outcomes:

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

CO1 Graduates will gain a strong foundation in core automobile engineering, both in theoretical andapplied concepts.

CO2 Acquire knowledge and hands-on competence in the design and development of automobile.

CO3 Graduates will develop an ability to identify and solve automobile engineering maintenance problems.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1								1	3	1	1
CO2	3	3	3	3								2	3	1	1
CO3	3	3	2	1								1	3	1	2
CO4															
CO5															

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EEUDLT1	-	-	2	3 Hours	25	25	100	1

Electrical Machines Lab – I

List of Experiments:

1. Determination of magnetizing or open circuit characteristics (OCC) of a separately-excited DC shunt generator.
2. Determination of load characteristics of self-excited DC generator.
3. Speed control of DC shunt motor using armature voltage and field current control methods.
4. Determination of performance characteristics of DC Shunt motor using brake test.
5. Predetermination of efficiency of a DC shunt motor using Swinburne's test.
6. Hopkinson test on DC shunt machines.
7. Predetermination of efficiency of a single-phase transformer using open circuit (OC) and short circuit (SC) test.
8. Determination of efficiency and regulation of a single-phase transformer using load test.
9. Determination of efficiency of a transformer using Sumner's test.
10. Separation of no-load losses of a single-phase transformer.
11. Scott connection of single-phase transformers.
12. To study the parallel operation of two transformers.
13. To study the voltage/current ratios for different types of three phase transformer connection.
14. To study the various routine tests performed on three phase transformers as per IS code.

Text/Reference Books:

1. D.P. Kothari, B.S. Umre, "Laboratory manual for Electrical Machines", Wiley Publishers, 2020, 2nd ed.
2. D.K. Chaturvedi, "Electrical Machines Lab Manual with Matlab", Laxmi Publications, 2020, 1st ed.

Course Outcomes:

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

CO1 Select apparatus based on the ratings of DC machines and transformers.

CO2 Determine equivalent circuit parameters and performance of transformers.

CO3 Evaluate the performance of DC machines and transformers by direct and indirect loading methods.

CO4 Select braking and speed control methods of DC machines.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2	2	1	2	3	1	2	3	1	1
CO2	3	2	1	2	1	2	1	1	2	3	1	2	3	1	1
CO3	3	3	2	1	2	2	1	1	2	3	1	2	3	1	1
CO4	3	2	3	1	1	2	2	1	2	3	1	2	3	1	1
CO5	3	2	3	1	2	2	1	2	3	3	1	2	3	1	2

Weightage**: 1 - Slightly;2 - Moderately;3 - Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EEUDLT2	-	-	2	3 Hours	25	25	100	1

POWER SYSTEM-I LAB

List of experiments: (Minimum 10 experiments are to be performed)

1. To measure ABCD constants of short transmission lines.
2. To measure ABCD constants of medium transmission line.
3. To measure ABCD constants of long transmission lines.
4. To study the types of cables.
5. To locate fault in cable by Murray loop test.
6. To study the types of insulators ie pin insulator and string insulator.
7. To study Ferranti effect.
8. T measure capacitance between conductor-conductor and conductor-earth.
9. Comparison of GMD and GMR for different groups of conductors.
10. To study the Bus Bar arrangement of college power supply Sub Station.
11. To draw the lay out diagram of college power supply system.
12. To draw the lay out diagram of 132/220/400 KV transmission Sub Station.
13. Technical visit of nearby transmission Sub Station.
14. To study Lightning Arrester and Surge Absorbers.

Text/Reference Books:

1. C. L. Wadhwa, "Electrical Power Systems", New Age International Publishers.
2. Ashfaq Hussain, "Electrical power Systems", CBS Publishers.
3. J. Arrillaga and N. R. Watson, "Computer Modelling of Electrical Power Systems", Wiley International Publisher.

Course Outcomes:

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

CO1 Demonstrate various types of insulators used in power system.

CO2 Demonstrate various types of cables used in power system.

CO3 Measure ABCD constants of short, medium and long lines.

CO4 Locate fault in a length of cable.

CO5 Describe the various equipments/components used in transmission Sub Station.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2				2	3	1	2	3	1	1
CO2	3	2	1	2	1				2	3	1	2	3	1	1
CO3	3	3	2	1	2				2	3	1	2	3	1	1
CO4	3	2	3	1	1				2	3	1	2	3	1	1
CO5	3	2	3	1	1				2	3	1	2	3	1	1

Weightage**: 1 - Slightly;2 - Moderately;3 - Strongly**