



First Year Curriculum

Admission Year 2026-27

**Diploma Engineering
Electronics and Communication Engineering**

Faculty of Engineering & Technology

Parul University

Vadodara, Gujarat, India

Semester 1

- a) **Course Name:** Electronics Devices and Circuits
- b) **Course Code:** 03061801PC01
- c) **Prerequisite:** Basic knowledge of electrical engineering concepts, mathematics, and fundamentals of electronics.
- d) **Rationale:** Electronics Devices and Circuits lays the foundation for understanding semiconductor devices (diodes, BJTs, FETs, and Opto Electronic Devices), which are essential for the operation of modern electronic systems. Students need to understand how these devices function and how they can be used to design and analyze circuits. It also emphasizes hands-on practice, allowing students to build and test circuits. This practical aspect is critical for students aiming to enter the electronics industry, where they need to work with real-world components.
- e) **Course Learning Objective:**

CLOBJ 1	To understand the fundamentals of semiconductor physics, carrier transport mechanisms, and the operation and characteristics of semiconductor devices such as PN junction and Zener diodes.
CLOBJ 2	To analyze and design rectifier and filter circuits for conversion of AC to regulated DC power supplies.
CLOBJ 3	To study the construction, characteristics, configurations, and applications of Bipolar Junction Transistors (BJTs) in amplifier circuits.
CLOBJ 4	To understand the operation and applications of feedback amplifiers, oscillators, MOSFETs, and UJT-based circuits in electronic systems.
CLOBJ 5	To develop knowledge of optoelectronic devices such as LED, LCD, photodiode, phototransistor, optocoupler, and solar cells along with waveform shaping circuits like clippers and clampers.

f) Course Learning Outcomes:

CLO 1	Understand Semiconductor Physics.
CLO 2	Analyze Diode Characteristics and Applications.
CLO 3	Apply Rectifiers and Filters in Electronic Circuits.
CLO 4	Evaluate and Configure Bipolar Junction Transistors (BJT) and Field Effect Transistor (FET).
CLO 5	Design Amplifiers, Oscillators, Field Effect Transistor Circuits, and Photo Electronics Devices.

g) Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	-	0	20	20	-	60	-	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h) Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Semiconductor Theory and Diodes Introduction to Semiconductor Physics: Conductors, Insulators, and Semiconductors, Intrinsic and Extrinsic Semiconductors, Energy Bands, Carrier Concentration, Mobility, Conductivity, and Diffusion. Diode Characteristics: P-N Junction and Working of Diodes, Current-Voltage Characteristics, Ideal and Practical Diodes, Diode Applications, Zener Diodes and Zener Breakdown, Current-Voltage Characteristics of Zener Diodes Rectifiers: Half-Wave Rectifier, Full-Wave Rectifier, Bridge Rectifier, Filters (LC, RC, and Pi-filters).	24%	10
2	Bipolar Junction Transistor (BJT) Introduction to BJTs: Working of NPN and PNP Transistors, Operation regions of BJT Operation and characteristics: Common Base Configuration – characteristics and working, Common Emitter Configuration – characteristics and working, Common Base Configuration – characteristics and working.	18%	8
3	Amplifiers and Oscillators BJT Classification of amplifiers Feedback Amplifiers – Properties of negative Feedback, impact of feedback on different parameters, Basic Feedback Amplifier Topologies: Voltage Series, Voltage Shunt Current Series, Current Shunt, Oscillator – Basic Principles, Crystal Oscillator, Non-linear/ Pulse Oscillator.	18%	8
4	Field Effect Transistors Field Effect Transistor: Working Principle, Classification MOSFET Small Signal Model N- Channel/ P-Channel MOSFETs: characteristics, enhancement and depletion mode, MOSFET as a Switch, Common Source Amplifiers, Uni Junction Transistor: Construction, operation, Characteristics, UJT as a relaxation oscillator.	22%	10
5	Opto Electronics Devices	18%	9

	Classification of opto electronic devices: symbols, Characteristics, working of LDR, LED, 7 segment LED and LCD, Photo Diode, Photo transistor, Opto Coupler, Clipper, Clamper Circuits and waveforms only , Solar Cell: Principles, Applications.		
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i) Text Book and Reference Book:

1. "Electronics Devices and circuit theory, By Boyestad & Nashelsky | Pearson Education India; 11 edition (2015) ISBN: 978-9332542600
2. Electronics Devices & Circuits, By Jacob Millman | McGraw Hill Education; 4 edition (2015) ISBN: 978-9339219543
3. Electronic Devices and Circuits, By S. Salivahanan and N. Suresh Kumar | McGraw Hill Education; Fourth edition (1 July 2017) ISBN: 978-9339219505
4. Introduction to Optoelectronic Devices, By R. J. M. Vacca | Wiley-Interscience in 2009, Pub. Year 2009

Exp. No.	Name of the Experiment
1	Construct the circuit and plot the V-I characteristics of a PN-junction diode.
2	Construct the circuit and plot the Zener diode characteristics.
3	o design and test a Half-Wave Rectifier with and without filter.
4	To design and test a Full-Wave Rectifier with and without filter.
5	Construct a bridge rectifier and compare its performance with and without filter for smoothing the output.
6	To study the characteristics of a BJT in common-emitter configuration.
7	Develop a simulation model for Voltage Series and Voltage Shunt Feedback Amplifiers.
8	Develop a simulation model for Current Series and Current Shunt Feedback Amplifiers.
9	To Study MOSFET Characteristics (N-channel and P-channel)
10	To Study Opto Electronics Devices.
11	Study of Clipper and Clamper Circuits.

a. **Course Name:** Mathematics I

b. **Course Code:** 03069101BS01

c. **Prerequisite:** Student must have passed class 10th examination from recognized board of education. Also, students has knowledge of basic concept studied till 10th standard.

d. **Rationale:** The goal of this Mathematics course is to give students a strong foundation in fundamental ideas and procedures that are essential for both everyday problem-solving and future education. This course aims to foster logical reasoning and critical thinking skills while covering subjects that are directly relevant to a variety of engineering, technology, business, and scientific domains.

e. Course Learning Objective:

CLOBJ 1	Understand the concept of logarithms and partial fractions for algebraic simplifications with examples
CLOBJ 2	Understand trigonometric functions and relationship between them with examples
CLOBJ 3	Solve the complex numbers in various forms like modulus-amplitude (polar) form, Exponential (Euler) form for engineering applications with examples
CLOBJ 4	Understand the concept of functions and limits with examples
CLOBJ 5	Understand concept of differentiation engineering related problems based on applications of differentiation with examples

f. Course Learning Outcomes:

CLO 1	Apply logarithms for calculations and convert rational fractions into sums of partial fractions with examples
CLO 2	Analyze basic functions used in trigonometry with examples
CLO 3	Explain complex numbers in various forms like modulus-amplitude (polar) form, Exponential (Euler) form – illustrate with examples
CLO 4	Evaluate and Interpret the function graphically, numerically and analytically with limit of function
CLO 5	Solve engineering related problems based on applications of differentiation

g. Teaching and Examination Scheme :

Teaching Scheme				Examination Scheme					Total
L	T	L	C	Internal Evaluation			ESE		
				MSE	CE	P	T	P	
3	1	0	4	20	20	-	60	-	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content :

Sr.	Topics	Weightage	Teaching hours
1	Logarithms and Partial Fractions Logarithms: Definition, Logarithm as a transformation, Antilogarithm, Rules of Logarithms and examples, Use logarithmic functions for simplifying arithmetic computations. Partial fractions: Definition of partial fractions, Types of partial fraction (denominator containing non-repeated linear factors, repeated linear factors and irreducible non-repeated quadratic factors).	17 %	8

2	Trigonometry Units of Angles (degree and radian), Trigonometric Functions, Allied & Compound Angles, Multiple –Submultiples angles, Graph of Sine and Cosine, Periodic trigonometric functions, Sum and factor formulae.	23 %	9
3	Complex Numbers Definition of a complex number, real and imaginary parts of a complex number, Polar and Cartesian representations of complex number, Conjugate of complex number, Geometric representation of complex numbers and their operations, Modules and Amplitude form, De Moivre’s Theorem, Root of Complex Number, Use of De Moivre’s Theorem to simplify mathematical expressions.	20 %	9
4	Function and Limit Definition and concept of function, Concept of limits and standard forms of limits, Standard formulae of Limit and related simple examples.	17 %	8
5	Differentiation Definition of derivative, differentiation of standard function by first principle, Rule of Differentiation, Differentiation of algebraic, trigonometric, Exponential, Logarithmic, Implicit functions and Composite functions, Higher order derivatives.	23%	11

i. Text Book and Reference Book:

1. **Advanced Mathematics for Polytechnic**
By Pandya N R | Macmillan Publishers India Ltd.,2012
2. **Mathematics-I**
By Deepak Singh | Khanna Book Publishing Co
3. **Mathematics II**
By Garima Singh | Khanna Book Publishing Co.
4. **A text book of Engineering Mathematics**
By N.P. Bali and Manish Goyal | Laxmi Publications
5. **Polytechnic Mathematics**
By S P Deshpande | Pune Vidyarthi Gruh Prakashan
6. **Applied Mathematics**
By H.K.Das | S.Chand Publication
7. **Calculus and Analytic Geometry**
By G. B. Thomas, R. L. Finney | Addison Wesley | 9th Edition
8. **Engineering Mathematics(Third edition)**
By Croft, Anthony | Pearson Education, New Delhi
9. **Advanced Engineering Mathematics (9th Edition),**
By Erwin Kreyszig, Wiley India (13)

a. Course Name: Basic Physics

b. Course Code: 03069202BS01

c. Prerequisite: Knowledge of Physics, Chemistry and Mathematics up to 12th science level and Biology up to 10th science level

d. Rationale: Applied Physics aims to give an understanding of this world both by observation and by prediction of the way in which objects behave. Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content. The course will help the diploma engineers to apply the basic concepts and principles to solve broad-based engineering problems and to understand different technology-based applications.

e. Course Learning Objective

CLOBJ 1	Develop understanding of fundamental physics concepts including measurements, electricity, magnetism, semiconductors, and modern physics relevant to engineering applications.
CLOBJ 2	Apply principles of electrical and electronic physics to analyze basic circuits, semiconductor devices, and electromagnetic systems used in information technology and engineering fields.
CLOBJ 3	Build scientific and analytical skills through practical experiments, measurements, error analysis, and interpretation of physical phenomena for technological problem solving.
CLOBJ 4	Understand the working principles and applications of modern technologies such as lasers, optical fibers, solar cells, and nanotechnology used in communication and electronic systems.
CLOBJ 5	Develop competency in conducting physics laboratory experiments, interpreting observations, and presenting results systematically using scientific methods and engineering practices.

CLO 1	Apply concepts of units, measurements, and error analysis to perform accurate physical measurements and validate results using dimensional analysis.
CLO 2	Analyze basic electric and magnetic phenomena, including electrostatics, current electricity, and electromagnetic induction, and solve related numerical problems.
CLO 3	Interpret the characteristics and functioning of semiconductor devices such as diodes and transistors, and apply them in basic electronic circuits.
CLO 4	Explain the working principles and applications of modern physics tools including lasers, optical fibers, and nanotechnology-based devices.
CLO 5	Demonstrate the ability to relate theoretical physics concepts to practical engineering applications across electrical, electronics, and communication fields.

f. Course Learning Outcomes

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					Total
L	T	P	C	Internal Evaluation			ESE		
				MSE	CE	P	Theory	P	
3	0	2	4	20	20	50	60	-	150

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Sr.	Topics	Weightage	Teaching Hours
1	Physical world, Units and Measurements Physical quantities; fundamental and derived, Units and systems of units (FPS, CGS and SI units), Dimensions and dimensional formulae of physical quantities, Principle of homogeneity of dimensions, Dimensional equations and their applications (conversion from one system of units to other, checking of dimensional equations and derivation of simple equations), Limitations of dimensional analysis. Measurements: Need, measuring instruments, least count, types of measurement (direct, indirect), Errors in measurements (systematic and random), absolute error, relative error, error propagation, error estimation and significant figures.	15%	8
2	Electrostatics Current Electricity Coulombs law, unit of charge, Electric field, Electric lines of force and their properties, Electric flux, Electric potential and potential difference, Gauss law. Capacitor and its working, Types of capacitors, Capacitance and its units. Capacitance of a parallel plate capacitor, Series and parallel combination of capacitors (related numerical), dielectric and its effect on capacitance, dielectric break down. Electric Current and its units, Direct and alternating current, Resistance and its units, Specific resistance, Conductance, Specific conductance, Series and parallel combination of resistances. Factors affecting resistance of a wire, carbon resistances and color coding. Ohm's law and its verification, Kirchhoff's laws, Wheatstone bridge and its applications (slide wire bridge only), Concept of terminal potential difference and Electro motive force (EMF) Heating effect of current, Electric power, Electric energy and its units (related numerical problems), Advantages of Electric Energy over other forms of energy.	25%	10
3	Electromagnetism and Magnetic materials Types of magnetic materials; dia, para and ferromagnetic with their properties, Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and units, magnetization. Concept of electromagnetic induction, Faraday's Laws, Lorentz force (force on moving charge in magnetic field). Force on current carrying conductor, force on rectangular coil placed in magnetic field. Moving coil galvanometer; principle, construction and working, Conversion of a galvanometer into ammeter and voltmeter.	20%	8
4	Semiconductor Physics Energy bands in solids, Types of materials (insulator, semi-conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction, junction diode and V-I characteristics, types of junction diodes. Diode as rectifier – half wave and full wave rectifier (center taped). Transistor; description and three terminals, Types- pnp and npn, some electronic applications (list only). Photocells, Solar cells; working principle and engineering applications	20%	10
5	Modern Physics Lasers: Energy levels, ionization and excitation potentials; spontaneous and stimulated emission; population inversion, pumping methods, optical feedback, Types of lasers; Ruby, He-Ne and semiconductor, laser characteristics, engineering and medical applications of lasers. Fiber Optics: Introduction to optical fibers, light propagation, acceptance angle and numerical aperture, fiber types, applications in; telecommunication, medical and sensors. Nanoscience and Nanotechnology: Introduction, nanoparticles and nanomaterials, properties at nanoscale, nanotechnology, and nanotechnology-based devices and applications.	20%	9

i. Reference Books

1.	Comprehensive Practical Physics - Volume I and II By by IN Jaiswal Laxmi Publishers
2.	Text Book of Physics for Class XI& XII (Part-I, Part-II) By N.C.E.R.T., Delhi

j. List of Practical

1.	To measure length, radius of a given cylinder, a test tube and a beaker using a Vernier caliper and find volume of each object.
2.	To determine diameter of a wire, a solid ball and thickness of cardboard using a screw gauge.
3.	To verify Ohm's law by plotting graph between current and potential difference.
4.	To verify laws of resistances in series and parallel combination.
5.	To draw V-I characteristics of a semiconductor diode (Ge, Si) and determine its knee voltage.
6.	To verify Kirchhoff's law using electric circuits.
7.	To determine A.C. frequency with the help of sonometer.
8.	To calculate SA/V ratio of simple objects to understand nanotechnology.

- a. **Course Name:** Fundamentals of Electrical Engineering
 b. **Course Code:** 03061702ES01
 c. **Prerequisite:** Knowledge of Basic science and physics.
 d. **Rationale:** This syllabus provides foundational knowledge of electrical circuits, magnetic circuits, transformers, and electrical safety, essential for understanding electrical engineering concepts. It equips students with the ability to analyze and design electrical networks, understand electromagnetic principles, and apply them in practical applications like transformers and machines. The inclusion of safety and protection ensures awareness of industry standards and hazard prevention. By combining theoretical and practical learning, this course prepares students for further studies and real-world electrical applications.

d. Course Learning Objective:

CLOBJ 1	Covers magnetic circuits, related magnetic terms, comparison between electrical and magnetic circuits, Faraday's laws, Lenz's law, Fleming's rules, B-H curve, and concepts of induced emf, self-inductance, and mutual inductance.
CLOBJ 2	Covers magnetic circuits, related magnetic terms, comparison between electrical and magnetic circuits, Faraday's laws, Lenz's law, Fleming's rules, B-H curve, and concepts of induced emf, self-inductance, and mutual inductance.
CLOBJ 3	Introduces the basic working principle and classification of transformers, constructional types of transformers, and the construction, working, and applications of DC and AC machines.
CLOBJ 4	Explains the importance of earthing, types of earthing systems, and the working and applications of protective devices such as fuses, MCBs, and ELCBs used for electrical safety and protection.

e. Course Learning Outcomes:

CLO 1	Identify the fundamental concepts of electrical circuits, including AC & DC supply, circuit elements (Resistor, Inductor, Capacitor), and factors affecting resistance.
CLO 2	Explain the principles of magnetic circuits, electromagnetic induction, and the working of laws such as Faraday's law, Lenz's law, and Fleming's rules.
CLO 3	Demonstrate the working principles, classification, and applications of transformers and electrical machines (DC & AC).
CLO 4	Compare different types of earthing systems and analyze their role in electrical safety and protection. Analyze the performance and applications of protective devices such as fuses, MCBs, and ELCBs in electrical installations.

f. Teaching & Examination Scheme:

Teaching and Examination Scheme										
Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Seminar Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
2	0	2	0	4	20	20	50	60	-	150

SEE - Semester End Examination, T - Theory, P – Practical

g. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Electric Circuit Generation of electricity. Different terms related to electric circuit. Concept of AC and DC. Concept of 1-phase and 3-phase supply. Electrical circuit elements: Resistor Inductor and Capacitor. Factors affecting the value of resistance. Resistor in series and parallel. Ohm's law and its limitations	30%	8
2	Magnetic Circuit Magnetic circuits: overview, terms regarding to magnetic Circuit and comparison with electrical circuits. Faraday's laws of electromagnetic induction. Lenz's law, Fleming's right-hand rule and Fleming's left-hand rule. B-H curve. Types of Induced emf, self-inductance and Mutual Inductance	30%	8
3	Transformer and Machines Basic principle of transformer. Classification of transformer based on different parameter. Transformer types according to construction: Core and shell type, auto transformers. DC & AC machines: construction, working and applications.	20%	8
4	Electrical Safety and Protection Definition and Need for Earthing, Importance of Earthing in Electrical Safety, Types of Earthing Systems. Safety and Protection specification, working and applications of protective devices such as fuses, MCBs and ELCBs.	20%	6

h. Text Book and Reference Book:

1. Basic Electrical Engineering By V. K. Mehta | S., Chand & Company (PVT) LTD
2. Electrical Technology Vol-1 By Theraja, B. L. | S. Chand
3. Principles of Electrical Machines By V.K. Mehta and Rohit Mehta, | S. Chand
4. Electrical Technology Vol-II By Theraja, B.L. | S. Chand, New Delhi
5. Electrical Power systems
6. By C. L .Wadhwa | New Age International Publishers. | 5th

i. Experiment List:

Sr. NO.	Experiment List
1	To verify Ohm's Law by measuring voltage and current in an electric circuit.
2	To compare the theoretical and measured values of different resistors using a Digital Multimeter.
3	To determine the equivalent resistance of resistors connected in series and measure the voltage and current across each resistor.

4	To determine the equivalent resistance of resistors connected in parallel and measure the voltage and current across each resistor.
5	To Determine the B-H curve of a magnetic material.
6	Measure Voltage, Current and Power of pure Resistive circuit.
7	Determine the transformation ratio of single phase transformer.
8	Connect a single phase transformer and measure input and output quantities.
9	Study the different parts of DC machines.
10	Demonstrate different types of earthing systems.
11	To study the operation of protective devices.

- a. **Course Name:** Energy Conservation
- b. **Course Code:** 03061701UE01
- c. **Prerequisite:** A basic understanding of science and environmental studies at the 10th-grade level. No prior technical knowledge is required, but awareness of energy sources, electricity usage, and environmental impact will be beneficial.
- d. **Rationale:** Energy conservation is essential for reducing waste, lowering costs, and minimizing environmental harm by optimizing energy use, decreasing dependence on non-renewable resources, and mitigating greenhouse gas emissions. It also enhances sustainability, strengthens energy security, and promotes economic growth through innovation in energy-efficient technologies and job creation.

e. Course Learning Objective:

CLOBJ 1	Explains basic concepts of energy, types of energy sources, importance of energy conservation, energy problems in India, and concepts of energy efficiency and energy intensity.
CLOBJ 2	Covers the Energy Conservation Act, 2001, role of the Bureau of Energy Efficiency and Gujarat Energy Development Agency, energy conservation programs, star labelling, and energy audits.
CLOBJ 3	Focuses on energy-saving methods in lighting systems, motors, pumps, HVAC systems, compressed air systems, and household electrical appliances.
CLOBJ 4	Explains energy conservation techniques used in industries, homes, buildings, and IT systems including green computing and e-waste management.
CLOBJ 5	Covers fuel-efficient transportation methods, electric and hybrid vehicles, renewable energy in transport, and future trends in energy conservation.

f. Course Learning Outcomes:

CLO 1	Students will define energy, its various forms, energy resources (renewable and non-renewable), the need for energy conservation, and the environmental impacts of energy usage
CLO 2	Students will recall the Energy Conservation Act, 2001, the role of the Bureau of Energy Efficiency (BEE), energy labelling and star rating programs, and government schemes for energy conservation.
CLO 3	Students will explain the energy scenario in India, challenges in conventional energy sources, energy problems, the demand- supply gap, and future energy innovations and emerging technologies.
CLO 4	Students will describe energy conservation techniques in industries, energy-efficient building designs, energy-saving practices in households, and the role of automation and sensors in energy conservation.
CLO 5	Students will describe energy conservation techniques in industries, energy-efficient building designs, energy-saving practices in households, and the role of automation and sensors in energy conservation.

g. Teaching & Examination Scheme:

Teaching and Examination Scheme										
Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Seminar Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
3	0	0	0	3	20	20	-	60	-	100

SEE - Semester End Examination, T - Theory, P – Practical

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Introduction to Energy and Its Conservation Basics of energy: Types and sources (renewable & non-renewable), Need for energy conservation: Environmental and economic aspects, Energy problems in India: Demand-supply gap, dependency on fossil fuels, power shortages, Energy intensity and energy efficiency.	20%	9
2	Energy Conservation Act, Policies & Key Organizations Energy Conservation Act, 2001 – Key provisions, Bureau of Energy Efficiency (BEE) and its role, Flagship programs of BEE (PAT, S&L, ECBC, DSM), Gujarat Energy Development Agency (GEDA) – Roles and responsibilities, Star labelling of appliances, Energy audit types: Preliminary & detailed.	20%	9
3	Energy Conservation in Electrical & Mechanical Systems Energy-efficient lighting systems: LED, CFL, and automation, Energy conservation in motors, pumps, and HVAC systems, Energy-saving techniques in compressed air systems, Energy Conservation in Household Electrical Appliances.	22%	10
4	Energy Conservation in Industrial, Domestic & IT Applications Energy-saving measures in industries: Boilers, furnaces, and refrigeration, Case studies on energy-efficient buildings, Simple Energy Conservation Techniques for Homes and Small Businesses, Energy Conservation in Computers & IT (Power management in computers, green data centres, Energy-efficient software and hardware, Cloud computing for energy reduction, E-waste management and recycling).	20%	9
5	Energy Conservation in Transportation and Emerging Technologies Fuel-efficient driving techniques and electric vehicles, Energy efficiency in railways and aviation, Hybrid and renewable energy in transport systems, Future trends in energy conservation.	18%	8

i. Text Book and Reference Book:

1. Energy Conservation and Management By S. K. Kataria | S. K. Kataria & Sons
2. Energy Management Handbook By Wayne C. Turner | The Fairmount Press, Inc
3. Non-Conventional Energy Resources By G. D. Rai | Khanna Publishers
4. Guide to Energy Management By Barney L Capehart, William J Kennedy and Wayne C Turner | The Fairmount Press and CRC Press.

- a. **Course Name:** Fundamentals of Communication Skills
- b. **Course Code:** 03060001HM01
- c. **Prerequisite:** Knowledge of English Language till 10th standard.
- d. **Rationale:** Basic Communication Skills are essential for all Engineers.

a. Course Learning Objectives:

CLOBJ 1	Develop basic interpersonal communication skills through effective listening, structured self and peer introductions, ice-breaker activities, and role plays in everyday contexts.
CLOBJ 2	Understand and apply fundamental grammatical structures including parts of speech, tenses, and voice for accurate sentence construction.
CLOBJ 3	Enhance pronunciation and vocabulary usage through basic phonetics, IPA symbols, one-word substitutions, synonyms, antonyms, and contextual application.
CLOBJ 4	Develop reading and writing skills by applying reading strategies and constructing coherent narratives, picture-based descriptions, and functional written texts such as applications.
CLOBJ 5	Improve personal and academic development through goal-setting using SMARTER principles and reflective language use.

b. Course Learning Outcomes:

CLO 1	Remember and identify correct pronunciation patterns using basic phonetic symbols, and recall appropriate vocabulary—including one-word substitutions, synonyms, and antonyms—for accurate spoken and written communication.
CLO 2	Understand written texts using basic reading strategies and explain the concept of SMARTER goals for personal and academic development.
CLO 3	Demonstrate understanding of basic interpersonal communication skills through effective listening, structured self and peer introductions, ice-breaker activities, and simple role-plays in everyday contexts.
CLO 4	Apply fundamental grammatical structures including parts of speech, basic tenses, articles and determiners to construct grammatically correct sentences.
CLO 5	Analyse and organize information to produce coherent written texts such as short narratives, and formal or informal applications.

a. Mapping of Course Learning Outcomes and Bloom's Taxonomy:

Course Learning Outcomes		Bloom's Level
CLO 1	Remember and identify correct pronunciation patterns using basic phonetic symbols, and recall appropriate vocabulary—including one-word substitutions, synonyms, and antonyms—for accurate spoken and written communication.	1,2

CLO 2	Understand written texts using basic reading strategies and explain the concept of SMARTER goals for personal and academic development.	2
CLO 3	Demonstrate understanding of basic interpersonal communication skills through effective listening, structured self and peer introductions, ice-breaker activities, and simple role-plays in everyday contexts.	2,3
CLO 4	Apply fundamental grammatical structures including parts of speech, basic tenses, articles and determiners to construct grammatically correct sentences. .	3
CLO 5	Analyse and organize information to produce coherent written texts such as short narratives, and formal or informal applications.	4,6

b. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	Tut	Lab	C	Internal Evaluation			ESE		Total
				T	CE	P	Theory	P	
0	-	2	1	-	-	20	-	30	50

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

c. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Ice Breaker + Introducing your Friend <ul style="list-style-type: none"> Fun Fact Exchange (e.g., Two Truths and a Lie) Describing Personality and Hobbies Using Adjectives to Talk About People (Link to Parts of Speech) Structured Self and Peer Introduction (Name, Interests, Goals)	8%	2
2	Parts of Speech & Tenses <ul style="list-style-type: none"> Identification of Parts of Speech in Simple Sentences Sentence Formation Using Basic Parts of Speech Concept of time and verb forms Sentence Construction and Error Correction Using Tenses	12%	6
3	Introduction to Phonetics - symbols and pronunciation <ul style="list-style-type: none"> Basics of Phonetics Introduction to IPA (International Phonetic Alphabet) English Vowel & Consonant Sounds Pronunciation Practice 	10%	4
4	Articles & Determiners <ul style="list-style-type: none"> Definite, Indefinite Articles and Zero Articles 	10%	2

	<ul style="list-style-type: none"> • Demonstrative & Possessive Determiners • Quantifiers & Numerals Common errors of Articles & Determiners		
5	Vocabulary Building : One-word Substitution, Synonyms, and Antonyms <ul style="list-style-type: none"> • List and Practice Common One-word Substitutions • Synonym-Antonym Match-Up Games Use New Words in Sentences/Short Paragraphs	10%	2
6	Listening Skills <ul style="list-style-type: none"> • Introduction and Importance of Good Listening • Difference Between Listening and Hearing • Types of listening • Barriers to effective Listening • Traits of a good listener 	8%	2
7	Types of Application <ul style="list-style-type: none"> • Formal vs Informal Applications • Structure and Format of an Application (Salutation, Body, Closing) • Writing Leave Applications 	10%	2
8	Role Play <ul style="list-style-type: none"> • Generic Situations (Buying, Asking for Directions, At a Doctor, etc.) • Customer Service and Complaint Handling 	12%	6
9	Goal Setting <ul style="list-style-type: none"> • SMARTER Goals (Specific, Measurable, Achievable, Relevant, Time-bound, Evaluate, Revise) • Short-term vs. Long-term Goals • Overcoming Obstacles to Goals 	10%	2
10	Reading Skills – Basic Level <ul style="list-style-type: none"> • Types of reading • Strategies of reading • Reading comprehension 	10%	2
		100%	30

d. Reference Books:

- Murphy, Raymond. *English Grammar in Use*. Cambridge University Press, 2019.
- Mohan, Krishna, and Meera Banerji. *Developing Communication Skills*. Macmillan Publishers India, 2009.
- Lewis, Norman. *Word Power Made Easy*. Goyal Publishers, 2014.
- Rizvi, M. Ashraf. *Soft Skills: Enhancing Employability and Career Development*. McGraw Hill Education, 2010.
- Wren, P. C., and H. Martin. *High School English Grammar and Composition*. S. Chand Publishing, 2017.

- a. **Course Name:** Environmental Science
- b. **Course Code:** 03061501MC01
- c. **Prerequisite:** Basic knowledge of science (biology, chemistry, physics), environmental awareness, geography, data interpretation, and ethical responsibility towards sustainability.
- d. **Rationale:** Sustainable development is essential for a nation's progress, making environmental conservation and hazard management crucial for every Indian citizen. The country has endured numerous natural disasters, and significant energy wastage remains a challenge. Saving energy is as valuable as producing it. Industrial mismanagement and lack of discipline have led to rising environmental pollution. Embracing renewable energy is a key solution to both the energy crisis and pollution control. This course aims to raise awareness of these pressing issues, inspiring students to act responsibly and contribute to a cleaner, more sustainable future for the country and the world.
- e. **Course Learning Objective:**

CLOBJ 1	To introduce the fundamental concepts of ecological balance and the flow of energy/matter in nature.
CLOBJ 2	To provide knowledge on pollutants affecting the atmosphere and sound levels, and the legal framework for control.
CLOBJ 3	To examine the chemical/biological nature of water and soil contaminants and evaluate technical treatment solutions.
CLOBJ 4	To explore the mechanics and benefits of green energy technologies like solar, wind, and biomass.
CLOBJ 5	To categorize different waste streams and understand the "3R" principles (Reduce, Reuse, Recycle) for waste management.
CLOBJ 6	To impart an understanding of seismic risks and the protocols for managing natural and man-made disasters.

f. Course Learning Outcomes:

CLO 1	Explain ecosystem structure, biotic/abiotic components, food chains, webs, and cycles.
CLO 2	Identify sources, types, effects, and control of air and noise pollution, including regulations.
CLO 3	Analyse water and soil pollution sources, characteristics, treatment, and prevention.
CLO 4	Describe various renewable energy sources, working principles, and environmental impacts.
CLO 5	Classify solid waste types, management techniques, recycling, and disposal methods.
CLO 6	Explain seismic engineering principles and disaster management strategies.

g. Mapping of Course Learning Outcomes and Bloom's Taxonomy:

Course Learning Outcomes		Bloom's Level
CLO 1	Explain ecosystem structure, biotic/abiotic components, food chains, webs, and cycles.	2
CLO 2	Identify sources, types, effects, and control of air and noise pollution, including regulations.	5

CLO 3	Analyze water and soil pollution sources, characteristics, treatment, and prevention.	4
CLO 4	Describe various renewable energy sources, working principles, and environmental impacts.	3
CLO 5	Classify solid waste types, management techniques, recycling, and disposal methods.	3
CLO 6	Explain seismic engineering principles and disaster management strategies.	2

h. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
1	-	-	0	20	20	-	-	-	40

- L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

i. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Ecosystem Structure of ecosystem, Biotic & Abiotic components, Food chain and food web Carbon, Nitrogen, Sulphur, Phosphorus cycle.	10%	2
2	Air and Noise Pollution Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler). Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator). Gaseous Pollution Control: Absorber, Catalytic Converter, and Effects of air pollution due to Refrigerants, I.C., Boiler, Noise pollution: sources of pollution, measurement of pollution level, Effects of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000.	25%	3
3	Water and Soil Pollution Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Turbidity, pH, total suspended solids, total solids BOD and COD: Definition, calculation. Waste Water Treatment: Primary methods: sedimentation, froth floatation, Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method: Membrane separation technology, RO (reverse osmosis), Causes, Effects and Preventive measures of Soil Pollution: Causes-Excessive use of Fertilizers, Pesticides and Insecticides, Irrigation, E-Waste.	25%	3
4	Renewable Sources of Energy Solar Energy: Basics of Solar energy. Flat plate collector (Liquid & Air). Theory of flat plate collector. Importance of coating. Advanced collector. Solar pond. Solar water heater, solar dryer. Solar stills. Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. Anaerobic digestion. Biogas production mechanism. Utilization and storage of biogas. Wind energy: Current status and future prospects of wind energy. Wind energy in India. Environmental benefits and problem of wind energy. New Energy Sources: Need of new sources. Different types	10%	2

	new energy sources. Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion.) Concept, origin and power plants of geothermal energy.		
5	Solid Waste Management Solid waste generation- Sources and characteristics of: Municipal solid waste, E- waste, biomedical waste. Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries. Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste.	5%	2

j. Text Book and Reference Book:

1. "Principles of Solar Engineering" By Yogi Goswami D., Frank Kreith, Jan F. Kreider | Taylor & Francis, 2003 | Second.
2. "Environmental Studies" By M.P. Poonia, S.C. Sharma | Khanna Publishing House, NewDelhi | 2017.
3. "Renewable Energy Sources" By Twidell J.W. and Weir. A | EFN Spon Ltd"Linear Systems and Signals" by B.P. Lathi.
4. "Environmental Sciences", By Daniel B Botkin & Edward A Keller, | John Wiley & Sons
5. "Air Pollution", By M. N. Rao and H. V. N. Rao | Tata McGraw-Hill Publishing Company
6. "Environmental Pollution Control Engineering", By Rao C.S | 2nd edition
"Solid Waste Treatment and Disposal", By G. Tchabanoglous | McGraw Hill

Semester 2

- a) **Course Name:** Electronics Circuits and Networks
 b) **Course Code:** 03061802PC01
 c) **Prerequisite:** Knowledge of Basic Mathematics
 d) **Rationale:** Electronic Circuits and networks is a core area, the knowledge of which is essential for electronic engineering diploma holders and they need to assimilate it in order to succeed in the Industry. In this regard, the basic knowledge of various theorems, resonance, filtering and attenuation related to passive electronic components is essential. Understanding of these concepts will be useful to determine the various parameters required to solve various problems and applications. This course has been designed to achieve these aims.
 e) **Course Learning Objective:**

CLOBJ 1	Analyze Passive Circuits: Evaluate the behavior and performance of passive circuits involving resistors (R), inductors (L), and capacitors (C), specifically in RC, RL, and RLC configurations.
CLOBJ 2	Apply Network Theorems: Utilize fundamental network theorems—including Superposition, Thevenin, Norton, Reciprocity, and Maximum Power Transfer—to solve complex multisource electrical networks.
CLOBJ 3	Utilize Mathematical Transforms: Apply the Laplace Transform to conduct detailed circuit analysis, moving from time-domain to frequency-domain perspectives.
CLOBJ 4	Implement Graph Theory: Use the principles of graph theory as a mathematical tool for solving and analyzing various electrical networks.

f) **Course Learning Outcomes:**

CLO 1	To analyze behavior of passive circuits such as RC, RL and RLC.
CLO 2	To apply Laplace Transform for circuit analysis
CLO 3	To apply various network theorems such as Superposition, Thevenin, Norton, Reciprocity, Maximum Power Transfer etc..
CLO 4	Ability to apply graph theory in solving networks.

g) **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	1	2	5	20	20	50	60	-	150

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h) Course Content:

Sr. No	Content	Weightage	Teaching Hours
1	Basics of Network and Network Theorem Node and Mesh Analysis, Superposition Theorem, Thevenin Theorem, Norton Theorem, Maximum Power transfer theorem, Reciprocity Theorem	20	10
2	Time Domain and Frequency Domain Analysis Solution of first and second 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 (unit, Ramp, Step)	30	12
3	Trigonometric and exponential Fourier series Discrete spectra and symmetry of waveform Steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values Fourier transform and continuous spectra	25	10
4	Two Port Network Two Port Network, Open Circuit Impedance Parameters, Short Circuit Admittance Parameters, Transmission Parameters, Hybrid Parameters, Interrelationship of Two Port Network, Inter Connection of Two Port Network	25	10

i) Text Book and Reference Book:

- 1) Engineering Circuit Analysis (TextBook)
By W H Hayt, S M Durbin | Tata McGraw-Hill Education
- 2) Network Analysis
By M. E. Van Valkenburg | PHI Learning
- 3) Electric Circuits and Networks
By K. S. Suresh Kumar | Pearson Education India, 2008 | ISBN : 9788131713907

- a) **Course Name:** Electronics Materials and Components
 b) **Course Code:** 03061802ES01
 c) **Prerequisite:** Knowledge of Semiconductor Electronics
 d) **Rationale:** This course aims to provide Diploma Engineering students with insights into various electronic materials and components used in the electronics industry. It will familiarize students with the appropriateness of different electronic materials and components for various applications. The course is designed to enhance the skills necessary for testing components required for projects and for conducting numerous experiments in both basic and applied technology courses.

e) **Course Learning Objective:**

CLOBJ 1	Select Electronic Materials: Identify and differentiate between various materials—including semiconductors, dielectrics, magnetic materials, and photo-emissive materials—based on their properties and suitability for specific electronic applications.
CLOBJ 2	Specify Electronic Components: Suggest appropriate passive and active components (such as resistors, capacitors, inductors, and various diodes or transistors) for given technical requirements.
CLOBJ 3	Utilize Surface Mount Technology: Identify Surface Mount Devices (SMD) and understand the assembly, rework, and soldering techniques required for SMT packages.
CLOBJ 4	Develop Printed Circuit Boards (PCBs): Understand the construction, types (flexible, multilayer), and manufacturing methods (screen printing, photo-printing, wave soldering) necessary to develop a PCB for a specific application.
CLOBJ 5	Implement Solar Energy Components: Identify and use specific components for rooftop solar energy systems, including photovoltaic materials, solar panels, and energy storage systems.

f) **Course Learning Outcomes:**

CLO 1	Identify the relevant material for the Electronic Applications.
CLO 2	Suggest relevant electronic component(s) for the given application.
CLO 3	Identify the Surface Mount Devices for specific applications.
CLO 4	Develop the PCB for the given application.
CLO 5	Use specific components for roof top Solar Energy Systems

g) **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	3	0	3	20	20	-	60	-	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h) **Course Content:**

Sr. No	Content	Weightage	Teaching Hours
1	<p>Unit - I Electronic Materials</p> <p>Factors affecting the resistivity of material like temperature, area of cross-section, length (or distance) of the element.</p> <p>Semiconductor materials: Intrinsic, extrinsic, charge carriers, P type and N Type, applications</p> <p>Photo emissive materials: Properties, applications</p> <p>Dielectric Materials: Types, Properties, Effect of frequency on performance of dielectric materials</p> <p>Magnetic Materials: Properties, classification: Permanent magnetic dipole, diamagnetism, paramagnetism, ferromagnetism.</p> <p>Soldering materials: Alloys and fluxes.</p>	15	8
2	<p>Unit - II Electronic Components</p> <p>Passive Components: Concepts of Resistance, Capacitance , Inductance . Specifications, type and applications Voltage Dependent Resistor(VDR), Temperature Dependent Resistor(TDR), Light Dependent Resistor(LDR).</p> <p>Electronic Materials and doping level for PN junction diode, Zener diode, LEDs, PNP and NPN transistor,</p> <p>Construction, working principle and applications of OLED</p> <p>Integrated Circuit: Introduction to Monolithic IC, thick & thin film IC, Hybrid IC, Linear IC, Digital IC and IC packages (SIP, TO5, Flat, DIP), Pin , Device Identification, Temperature ranges.</p> <p>Types and applications of micro electronic components: Micro motors, Micro relay, Micro switches.</p>	20	9
3	<p>Unit - III Surface Mount Devices</p> <p>Introduction to Surface Mount Technology(SMT) and Surface mount Devices (SMD).</p> <p>Assembly and rework techniques: Contact and noncontact types of soldering and de-soldering</p> <p>Advantages and Disadvantages of SMT</p> <p>SMD packages : Two terminal package for passive and active components, Three or four terminal packages, five or six</p>	20	8

	terminal packages, More than six terminal packages; Examples of each Automatic component insertion technique.		
4	Unit - IV Printed Circuit Board Introduction to PCB, Advantages, disadvantages of PCB, Types of PCB and applications Constructional features of PCB Flexible PCB, Multilayer PCB, plated through hole (PTH) Screen printing, photo-printing methods Soldering Techniques: Dip, wave.reflow PCB testing Need of Electronic waste management , E-Waste Recycling.	25	10
5	Unit - V Solar system components Photovoltaic materials,properties and applications Solar Cell: Working Principle and Construction Materials used in a Solar Panel Energy storage system used in solar panel, its ratings and selection factors Terminologies used in energy storage system like capacity, power ratings, depth of discharge (DoD), round-trip efficiency, warranty and life span	20	7

i) Text Book and Reference Book:

1. Electronic Components and Materials
Dhir S M I Tata McGraw Hill ISBN: 9780074630822
2. Electronic Components and Materials
Grover & Jamwal I Dhanpat Rai & Sons, I ISBN-13 5551234023845
3. Electronic Components and Materials
Madhuri Joshi I Shroff Publishers & Distributors private ltd. ISBN-13: 978-8173669002

- a) **Course Name:** Mathematics - II
 b) **Course Code:** 03069102BS01
 c) **Prerequisite:** Knowledge of Basic concept of mathematics studied till first semester.
 d) **Rationale:** This course is an extension of the course Mathematics-I of first semester namely Mathematics II. Using the methods of differentiation, integration, differential equations, matrix theory, geometry, and differential equations, the course aims to in still its applications in pertinent engineering and technological fields.
 e) **Course Learning Objective:**

CLOBJ 1	Solve Matrix-Based Engineering Problems: Utilize determinants and matrix algebra, including inversion methods and Cramer’s rule, to solve systems of linear equations and other engineering-related mathematical challenges.
CLOBJ 2	Analyze Vector-Based Problems: Apply concepts of vector algebra—including addition, subtraction, and scalar/vector products—to analyze engineering problems related to work, moment, and angular velocity.
CLOBJ 3	Evaluate Geometric Conditions: Understand and solve basic engineering problems involving coordinate geometry, specifically focusing on the properties and equations of straight lines and circles under various given conditions.
CLOBJ 4	Apply Integral Calculus: Use integration techniques (substitution, parts, and partial fractions) and definite integrals to solve engineering problems, such as calculating areas bounded by curves and volumes of solids of revolution.
CLOBJ 5	Solve Differential Equations: Obtain mathematical solutions for first-order and first-degree differential equations using variable separation, linear, and exact methods to address significant applied problems.

f) **Course Learning Outcomes:**

CLO 1	Solve engineering related problems based on Matrices.
CLO 2	Analysis engineering related problems based on concepts of vectors.
CLO 3	Understand basic engineering problems under given conditions of straight lines and circle.
CLO 4	Apply integral calculus to engineering related problems.
CLO 5	Obtain solution of differential equations to significant applied problems.

g) **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	1	0	4	20	20	-	60	-	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h) Course Content:

Sr. No	Content	Weightage	Teaching Hours
1	Determinants and Matrices Elementary properties of determinants up to 3rd order, consistency of equations, Cramer's rule. Algebra of matrices, Inverse of a matrix, matrix inversion method to solve a system of linear equations in 3 variables.	23	10
2	Vector Algebra Definition notation and rectangular resolution of a vector. Addition and subtraction of vectors. Scalar and vector products of 2 vectors. Simple problems related to work, moment and angular velocity.	20	9
3	Co-Ordinate Geometry Straight line Inclination and slope of a line, different forms of equations to a straight line, Slope-intercept form, Point slope form, Two-point form, Intercept form. General equation of a Straight line, Family of lines. Conditions for concurrency of lines. Circle Definition, Equation of a circle with given center and radius, General form of equation of circle, Equation of a circle when intercepts are given, circle passing through three points, Equation of chord, Equations of tangents and normal at a point on a circle	17	8
4	Integral Calculus Integration as inverse operation of differentiation, Integration of simple functions, Integration by substitution, by parts and by partial fractions (for linear factors only). Definite integral: Definition, Properties of Definite integral, Odd and Even functions, Use of formulas, and for solving problems Where m and n are positive integers. Applications of integration for i. Simple problem on evaluation of area bounded by a curve and axes. ii. Calculation of Volume of a solid formed by revolution of an area about axes. (Simple problems)	23	10
5	Differential Equations Solution of first order and first degree differential equation by variable separation method (simple problems), Exact differential equations (simple problems), Linear differential equations (simple problems), MATLAB – Simple Introduction.	17	8

i) Text Book and Reference Book:

1. Polytechnic Mathematics
By S P Deshpande | Pune Vidyarthi Gruh Prakashan
2. Mathematics-I
By Deepak Singh | Khanna Book Publishing Co
3. Mathematics II
By Garima Singh | Khanna Book Publishing Co.
4. Elementary Engineering Mathematics
By Dr. B. S. Grewal | Khanna Publishers | 15th Edition
5. Calculus and Analytic Geometry
By G. B. Thomas, R. L. Finney | Addison Wesley | 9th Edition
6. Higher Engineering Mathematics
By B. S. Grewal | Khanna Publications
7. Engineering Mathematics (Third edition)
By Croft, Anthony | Pearson Education, New Delhi, 2014.
8. Calculus and Its Applications
By Marvin L. Bittinger, David J. Ellenbogen, Scott A. Surgent | Addison-Wesley |
10th Edition
9. Advanced Engineering Mathematics (9th Edition),
By Erwin Kreyszig, Wiley India (13)

- a) **Course Name:** Applied Chemistry
- b) **Course Code:** 03069501BS01
- c) **Prerequisite:** Understanding of Basic knowledge of Science for application.
- d) **Rationale:** Bridges the gap between theoretical chemistry and real-world industrial applications providing fundamental knowledge of chemical principles and their relevance in materials science, environmental sustainability, energy production, and various engineering processes.
- e) **Course Learning Objective:**

CLOBJ 1	Understand Matter and Atomic Structure: Explain the fundamental concepts of matter, atomic orbitals, and electronic configurations to understand how materials exist and interact in nature.
CLOBJ 2	Apply Electrochemistry Principles: Gain proficiency in the mechanisms of energy conversion and the practical applications of electrochemistry, including pH calculations, buffer solutions, and electrolysis.
CLOBJ 3	Interpret and Control Corrosion: Identify various types of corrosion mechanisms (dry and wet) and apply specific prevention methods, such as protective coatings and anodic/cathodic protection, to preserve engineering materials.
CLOBJ 4	Implement Water Treatment Skills: Develop technical skills to analyze water hardness and apply treatment methods like Reverse Osmosis (RO), Ion Exchange, and Zeolite processes to meet industrial and drinking water standards.
CLOBJ 5	Evaluate Industrial Lubricants: Understand the fundamentals of lubrication and the selection criteria for lubricants (based on viscosity, flash point, and cloud point) in various industrial applications like gears and steam turbines.
CLOBJ 6	Assess Polymers and Engineering Materials: Distinguish between different types of polymers, elastomers, and adhesives based on their molecular structure and thermal behavior for engineering use.

f) **Course Learning Outcomes:**

CLO 1	Understand the concept of matter and Existence of material in nature.
CLO 2	Acquainted with the various Mechanism energy conversion and application of electrochemistry.
CLO 3	Interpret corrosion concept types and mechanism with prevention methods.
CLO 4	Develop skills and understand water treatment methods .
CLO 5	Understand fundamentals of Lubricant in industrial applications.
CLO 6	Idea of different types of polymers and its properties with application in all engineering fields.

g) Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	0	2	4	20	20	50	60	-	150

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h) Course Content:

Sr. No	Content	Weightage	Teaching Hours
1	Chemical Bonding and Catalysis Atomic structure and Orbital concept. Shapes of s,p and d orbitals, Pauli's exclusion principle, Hund's rule of maximum multiplicity Aufbau rule, electronic configuration, Theory Of Valency, Electronic Configuration. Types of chemical bonds - Electrovalent bond, & its characteristics ,Covalent bond & its characteristics ,Co- ordinate bond , Hydrogen bond, its types and Significance , Metallic bond, Explanation of Metallic properties based on Electron Sea Model , Intermolecular force of attraction ,Vander Waals force of attraction, Structures of solids: Ionic solids, Molecular solids, Network solids, and Metallic solids Catalysis, Types of catalysis, Theory of Catalysis, Characteristics of Catalyst, Types of Catalyst, Positive Catalyst, Negative Catalyst, Auto-catalyst Catalytic Promoter and Catalytic inhibitor Industrial Application of Catalyst.	10	6
2	Concepts of Electrochemistry Introduction , Arrhenius theory of ionization., Degree of ionization,Factors affecting the degree of ionization , Definition of pH , pH of acid, base and neutral solution , pH calculations of acid, base and salt solution at different concentration , Importance of pH in various fields, Definition of buffer solution, Buffer Action & Types of buffer Solution, Application of buffer solutions,. Electrolytes and Non-electrolytes, Types of electrolytes Definition the term 'Electrode' the Types of Electrodes Inert electrode, Working electrode & Reference electrode; with suitable Illustrations. Construction and working of electrochemical cell , Standard conditions ,Standard hydrogen electrodes , Nernst theory of single electrode potential & Nernst equation (No derivation), Electrochemical series, galvanic series ,Electrolysis, Faradays	20	9

	laws of electrolysis ,. Industrial application of Electrolysis , conductance of solution (a) Conductivity (b) Specific Conductivity (c) Equivalent conductivity (d) Molar conductivity.		
3	Corrosion & its Control Definition of corrosion, Types of corrosion, Dry corrosion: Oxidation corrosion mechanism corrosion-mechanism, Nature of oxide film, Wet corrosion-mechanism, Concentration cell corrosion, Pitting corrosion, Waterline corrosion, Crevice corrosion, Stress Corrosion, Erosion Corrosion. Factors affecting the rate of corrosion,- Nature of film, Nature of Environment, pH of Solution, Area of cathode anode and, Temperature, Moisture ,Purity of metal. Methods of prevention of corrosion, Modification of environment, Modification of the properties of metal, Use of protective coatings, Anodic and cathodic protection, Modification in design and choice of material.	10	5
4	Water Treatment Hard water and soft water. Types of hardness of water, Salts producing hardness of water, Method to express the hardness of water, Estimation of total hardness by EDTA Method, Examples to calculate the hardness, Effect of hard water in Boiler operation. Scale and sludge formation and it's Prevention,. Priming, foaming, its prevention, Caustic embrittlement, and its prevention. Corrosion and its prevention. Softening of Water, Soda-Lime process, Permutit process, Ion Exchange process , Reverse Osmosis process , Treatment of Drinking water ,Sedimentation , Coagulation , Filtration , Sterilization of water by chlorination Break-point chlorination- Graph. Enlist Indian standard specification of drinking water.	20	8
5	Lubricants and Fuels Introduction and definition of lubricants and lubrication ,function of lubricants Types of lubrication, Fluid film lubrication, Boundary lubrication, Classification of lubricants, Solid lubricants, Semi-solid lubricants, Liquid lubricants, Synthetic oils, Physical Properties of lubricants and their significance like. Viscosity and viscosity index, Flash point and fire point, Pour point and cloud point, oiliness Chemical Properties of lubricants: Saponification value, Neutralization number, Emulsification number, Selection Criteria of lubricants for Gears, Cutting tools and Steam turbine applications. Definition of fuel and combustion of fuel, classification of fuels, calorific values (HCV and LCV), Bomb Calorimeter, calculation of HCV and LCV, Ultimate and Proximate analysis of coal, Liquid fuels (Octane and Cetane number) Biofuels and Gaseous Fuels.	20	10

6	<p>Polymer, Elastomers & Adhesives</p> <p>Introduction and Definition of Polymer and Monomer , Classification of Polymer on basis of Molecular structure as Linear, Branch and Cross-linked polymers , Classification on basis of monomers (homo polymer and copolymer) Classification of Polymers on basis of Thermal behavior(Thermoplastics& Thermosetting) , Types polymerization Reaction , Addition Polymerization , Condensation Polymerization , Synthesis(only statement), properties and application of I. Polyethylene ,Polypropylene iii. Polyvinyl chloride iv. Teflon v. Polystyrene vi. Phenol formaldehyde vii. Acrylonitrile viii. Epoxy Resin. Elastomer- Natural rubber and its properties. Vulcanization of rubber, Synthetic rubber, Synthesis (only statement), properties and uses, Buna-S Rubber ii. Buna-N Rubber, Neoprene Rubber, Definition of adhesives and Examples, Characteristics of adhesives Classification of adhesives and their uses.</p>	20	7
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i) Text Book and Reference Book:

1. ENGINEERING CHEMISTRY
By JAIN & JAIN | DHANPAT RAI
2. A Text Book of Polytechnic Chemistry
By V.P. Mehta | Jain Brothers
3. Engineering Chemistry
By S S dhara
4. Applied Chemistry
By N Krishnamurthy(New Edition)Edition | Tata McGraw-Hil
5. Textbook Environmental Chemistry and Pollution Control
By By S. S. Dara

- a) **Course Name:** Verbal Ability
- b) **Course Code:** 03060002HM01
- c) **Prerequisite:** Basic knowledge of Grammar and Communication.
- d) **Rationale:** Practical language proficiency and essential soft skills for academic and professional success.
- e) **Course Learning Objective:**

CLOBJ 1	Identify Fundamentals of Communication: Recognize and explain the essential elements of listening skills, vocabulary building (such as homonyms and idioms), and basic English grammar concepts.
CLOBJ 2	Demonstrate Effective Verbal Skills: Exhibit competent listening and speaking abilities in both academic environments and everyday communication scenarios.
CLOBJ 3	Apply Grammar and Vocabulary Rules: Correct use of advanced vocabulary—including phrasal verbs and idioms—and grammatical rules like subject-verb agreement and direct-indirect speech in both oral and written forms.
CLOBJ 4	Utilize Logical and Analytical Tools: Apply logical reasoning and SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) to analyze situations for effective personal and professional decision-making.
CLOBJ 5	Create Structured Content: Produce clear and well-organized written and spoken materials, including formal letters, professional emails, stories, presentations, and short speeches, using an appropriate tone.

f) **Course Learning Outcomes:**

CLO 1	Identify and explain the fundamentals of listening skills, vocabulary elements, and basic grammar concepts used in English communication.
CLO 2	Demonstrate effective listening and speaking skills in academic and everyday communication situations.
CLO 3	Apply appropriate vocabulary (homonyms, idioms, phrasal verbs) and grammar rules (subject-verb agreement, direct-indirect speech) in spoken and written communication.
CLO 4	Analyze situations using logical reasoning and SWOT analysis for personal and professional decision-making.
CLO 5	Create structured written and spoken content such as letters, emails, stories, presentations, and short speeches with clarity and appropriate tone.

g) Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
1	0	2	2	40	-	20	60	30	150

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h) Course Content:

Sr. No	Content	Weightage	Teaching Hours
1	Listening Skills- Basic level Introduction and importance of good Listening, Difference between listening and hearing, Types of listening, Barriers to effective Listening, Traits of a good listener.	10	1
2	Crazy Scientist Invent a product, Presentation of a product.	8	1
3	Advanced Building Vocabulary: Homophones, Homonyms, Homographs, Phrasal verbs & Idioms Homophones and Their Confusing Pairs, Homographs and Contextual Meaning, Homonyms: Words with Multiple Meaning, Common Phrasal Verbs in Conversation, Popular Idioms and Their Real-Life Application.	10	2
4	Subject Verb Agreement Basic Rules and Exceptions, Spot the Error & Correction Exercises.	8	2
5	SWOT Analysis Introduction to SWOT, Creating a Personal SWOT Chart, Applying SWOT for Goal Setting.	10	1
6	Letter Writing & E-mail Writing Formal vs Informal Letter Format, Structure of a Professional Email (Subject, Greeting, Body, Sign-off), Tone and Language Appropriateness, Common Mistakes in Letters/Emails.	13	2
7	Direct-Indirect Speech Rules for Changing Tenses, Pronouns, and Time Expressions, Reporting Statements, Questions, Commands, and Requests, Reporting Modal Verbs (can & rarr; could, will & rarr; would), Conversion Exercises.	8	2
8	Blood Relation & Alphabetical series Introduction to Family Tree Terms, Types of Blood Relation Questions, Introduction to Alphabetical Series, Common Patterns in Alphabetical Series.	8	1

9	Story Writing by using hints Elements of a Story (Characters, Setting, Plot, Conflict, Resolution, Types of Stories (Narrative, descriptive, imaginative, moral-based, fables).	10	1
10	Speaking Skill Building Introduction Overcoming Stage Fear and Speaking Anxiety, Voice Modulation and Pronunciation Tips, Organizing Thoughts Before Speaking, Basic Public Speaking Formats (Self-Intro, Small Speeches).	15	2

i) Text Book and Reference Book:

1. English Grammar in Use
By Raymond Murphy | Cambridge University Press, Pub. Year 2019
2. Word Power Made Easy
By Norman Lewis | Goyal Publishers, Pub. Year 2014
3. A Modern Approach to Logical Reasoning
By R.S. Aggarwal | S. Chand Publishing, Pub. Year 2018
4. Developing the Leader Within You
By John C. Maxwell | Thomas Nelson, Pub. Year 2013
5. Cambridge Listening and Speaking Skills Series
By Cambridge University Press | Cambridge University Press, Pub. Year 2017
6. The 7 Habits of Highly Effective People
By Stephen R. Covey | Simon & Schuster, Pub. Year 2020

- a) **Course Name:** Universal Human Values
- b) **Course Code:** 03060002MC01
- c) **Prerequisite:**
- d) **Rationale:** The Universal Human Values (UHV) course aims to develop a holistic understanding of life, fostering ethical behavior, responsible decision-making, and harmonious living. It helps students align their personal and professional actions with core human values, ensuring happiness, well-being, and sustainable development in society.
- e) **Course Learning Objective:**

CLOBJ 1	Understand Value-Based Education: Demonstrate an understanding of the necessity of human values and value-based education in achieving continuous happiness and prosperity.
CLOBJ 2	Analyze Multidimensional Harmony: Examine the principles of harmony within the individual, the family, society, and nature, and apply these concepts to ensure personal well-being and self-regulation.
CLOBJ 3	Identify Ethical Conduct: Identify and exhibit the role of trust and ethical conduct in both personal human relationships and professional environments.
CLOBJ 4	Develop a Holistic Perspective: Build a comprehensive outlook on social responsibility and sustainable living through self-exploration and practical, real-life applications.
CLOBJ 5	Apply Principles to Decision-Making: Use the principles of Universal Human Values to guide responsible decision-making in daily life and professional settings.

f) **Course Learning Outcomes:**

CLO 1	Demonstrate an understanding of the need for human values and value-based education to achieve happiness and prosperity.
CLO 2	Analyze the harmony within the human being, in the family, society, and nature, and apply the concepts for self-regulation and well-being.
CLO 3	Exhibit the ability to identify the role of ethical conduct and trust in human relationships and professional life.
CLO 4	Develop a holistic perspective on sustainable living and social responsibility through self-exploration and real-life applications.
CLO 5	Apply principles of Universal Human Values to make responsible decisions in day-to-day life and professional settings.

g) Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
1	0	0	0	20	20	-	-	-	40

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h) Course Content:

Sr. No	Content	Weightage	Teaching Hours
1	Introduction to Value Education Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations.	20	3
2	Harmony in the Human Being Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health	20	3
3	Harmony in the Family and Society Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order	20	3
4	Harmony in the Nature/Existence Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence	20	3
5	Implications of the Holistic Understanding – a Look at Professional Ethics Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-	20	3

	Typical Case Studies, Strategies for Transition towards Value-based Life and Profession		
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i) Text Book and Reference Book:

1. A. Nagraj, 1998, Jeevan Vidyaek Parichay, Divya Path Sansthan, Amarkantak.
2. A.N. Tripathy, 2003, Human Values, New Age International Publishers
3. The Story of My Experiments with Truth
By M K Gandhi
4. Small is Beautiful
By E. F Schumacher
5. Rediscovering India
By Dharampal

- a) **Course Name:** Introduction to Electrical Safety and Management
- b) **Course Code:** 03061702UE01
- c) **Prerequisite:** Students should have a basic understanding of general science concepts, particularly from physics and a fundamental knowledge of mathematics, including arithmetic and basic algebra.
- d) **Rationale:** Electrical safety is critical for preventing accidents and ensuring the safe operation of electrical systems in homes, industries, and workplaces. This subject equips students with foundational knowledge of electrical concepts, hazards, risk assessment, and safety management. It also emphasizes practical skills in emergency response, first aid, and compliance with safety standards, preparing students to handle electrical systems safely and responsibly in various environments.
- e) **Course Learning Objective:**

CLOBJ 1	Describe Basic Electrical Principles: Explain fundamental concepts of electricity, including voltage, current, resistance, power, and Ohm's Law.
CLOBJ 2	Identify Electrical Hazards: Recognize and categorize various electrical hazards and risks present in different environments.
CLOBJ 3	Apply Risk Assessment and Mitigation: Use risk assessment techniques and mitigation strategies to reduce the likelihood of electrical accidents.
CLOBJ 4	Understand Safety Management Systems: Demonstrate knowledge of electrical safety management systems, including relevant safety standards and legal requirements.
CLOBJ 5	Demonstrate Emergency Response Skills: Perform appropriate emergency response procedures, including first aid for electrical shock and handling electrical fires.

f) **Course Learning Outcomes:**

CLO 1	Students will define fundamental electrical concepts (voltage, current, resistance) and explain the importance of electrical safety, including common hazards (shock, arc flash) and safety practices such as grounding, insulation, and PPE.
CLO 2	Students will identify electrical hazards (shock, arc flash) and perform risk assessments, applying appropriate risk control measures and safety tools to prioritize electrical safety in various environments.
CLO 3	Students will explain the components of Safety Management Systems (SMS), develop basic electrical safety policies, and understand the role of safety officers in ensuring compliance and conducting safety audits.
CLO 4	Students will describe key electrical safety standards (IS, IEC) and legal regulations, explaining employer and worker responsibilities, and identifying penalties for non-compliance with safety laws.
CLO 5	Students will demonstrate proper emergency response procedures for electrical accidents, perform basic first aid (CPR, shock

g) Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	0	2	3	20	20	50	60	-	150

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h) Course Content:

Sr. No	Content	Weightage	Teaching Hours
1	Basics of Electricity and Electrical Safety Introduction to Electricity: Definition of electricity: Voltage, current, resistance, power, Ohm's Law and applications in basic circuits, Types of electric current: AC and DC. Electrical Safety Basics: Importance of electrical safety, Overview of common electrical hazards: Electric shock, arc flash, electrical fires, Essential safety practices in handling electrical devices, Introduction to Personal Protective Equipment (PPE). Electrical System Protection: Role of grounding, insulation, and circuit protection (fuses, circuit breakers), Safe installation practices in homes and industries.	20	6
2	Electrical Hazards and Risk Assessment Electrical Hazards: Electric shock, arc flash, fire hazards, and burns, Risk factors and types of electrical injuries, Preventing electrical accidents in residential and industrial settings. Conducting Risk Assessments: Steps in identifying and evaluating electrical risks, Introduction to risk control measures, Tools for evaluating electrical systems and prioritizing safety issues.	20	6
3	Electrical Safety Management Systems Safety Management in Electrical Work: Importance of Safety Management Systems (SMS), Key components: Policies, training, audits, and inspections, Responsibilities of electrical safety officers. Developing Safety Policies: How to create basic electrical safety policies, Ensuring compliance and training workers, Role of documentation and record-keeping in safety management.	20	6
4	Legal Aspects and Standards in Electrical Safety Electrical Safety Standards: Introduction to Indian Standards (IS) and international standards (IEC), Key safety standards for wiring, installations, and electrical equipment, Importance of	20	6

	certifications and inspections. Legal Compliance in Electrical Work: Overview of electrical safety laws and regulations (e.g., Electricity Act, Factories Act), Employer and worker responsibilities for electrical safety, Penalties for non-compliance with safety standards.		
5	Emergency Procedures and First Aid for Electrical Accidents Emergency Response Procedures: Immediate response to electrical shock and fire, Step-by-step emergency procedures for rescuing victims safely, when to call emergency services and how to report accidents. First Aid for Electrical Injuries: CPR and first aid for electrical burns, shock, and injuries, Treatment protocols for electrical accidents, Importance of training in first aid and safety drills. Fire Safety and Evacuation Plan: How to prevent and respond to electrical fires, Safe use of fire extinguishers (Class C for electrical fires) and Developing electrical fire evacuation plans.	20	6

i) Text Book and Reference Book:

1. NFPA 70E: Standard for Electrical Safety in the Workplace
2. National Fire Protection Association (NFPA)
3. Electrical Safety Handbook
By John Cadick, Mary Capelli-Schellpfeffer | McGraw-Hill Education | forth,
Pub. Year 2012
4. Electrical Safety Engineering
By W. Fordham Cooper
5. Industrial Power System Safety
By Ralph Fehr

- a) **Course Name: Electrical and Electronics Workshop**
- b) **Course Code: 03061702ES02**
- c) **Prerequisite:** Students should have basic knowledge of electrical concepts, components, measuring instruments, wiring, safety, circuit diagrams, electrical machines, and hands-on skills like soldering, crimping, and troubleshooting.
- d) **Rationale:** Electrical engineers must have knowledge about electronics devices because nowadays in industry many electronics components are used, so to meet industrial demands this course discusses construction, working and applications of various types of semiconductor devices, which are used in electronics circuits. Students must be equipped with the fundamental knowledge about electronic components like diode, transistors for successful handling of industrial problems. The skill developed in this course is handling all types of electronics devices.
- e) **Course Learning Objective:**

CLOBJ 1	Identify Professional Tools and Symbols: Recognize various electrical symbols, specialized tools, and measuring instruments utilized in electrical and electronic workshops.
CLOBJ 2	Conduct Component Testing: Demonstrate the ability to test various electrical and electronic components using standard measuring instruments to ensure functional integrity.
CLOBJ 3	Solder and Assemble Circuits: Master soldering and de-soldering techniques to successfully assemble and test electronic circuits on Printed Circuit Boards (PCBs).
CLOBJ 4	Operate Advanced Testing Equipment: Gain proficiency in using advanced instruments such as Function Generators and Cathode Ray Oscilloscopes (CRO) or Digital Storage Oscilloscopes (DSO) for signal analysis.
CLOBJ 5	Identify Semiconductor Terminals: Accurately identify the terminals of various semiconductor devices using a multimeter for correct circuit integration.

f) **Course Learning Outcomes:**

CLO 1	Identify various electrical symbols, tools, and measuring instruments used in electrical and electronics installations.
CLO 2	Explain the working principles and applications of various measuring instruments (Voltmeter, Ammeter, Wattmeter), testing instruments (Multimeter, Clip-on meter, Megger, Line tester), and protective devices (Fuse, MCB, ELCB).
CLO 3	Demonstrate hands-on practice of different switches, protective devices, electrical circuits, and semiconductor devices, and test their functionalities using appropriate instruments.
CLO 4	Compare theoretical and measured values of resistors, inductors, capacitors, and potentiometers using a Digital Multimeter, and analyze waveforms generated by Function Generator and observed using CRO/DSO.
CLO 5	Analyze the performance of electronic circuits assembled on PCB by applying soldering and de-soldering techniques and testing those using appropriate tools.

g) Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
0	0	4	2	-	-	100	-	-	100

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h) List of Experiment:

Exp. No.	Name of the Experiment
1	Identify Different symbols used in electrical installation and prepare sheets.
2	To identify and learn the proper usage of various tools used in electrical and electronics installations.
3	Hand on practice on different measuring instruments Voltmeter, Ammeter and Wattmeter.
4	Hand on practice on different testing instruments: Multimeter, Clip-on meter, Megger, Line tester.
5	Hand on practice of different switches used in electrical installation.
6	Hand on practice of different switches used in electrical installation.
7	Hand on practice on different protective devices: Fuse, MCB and ELCB.
8	Prepare and test different Electrical Circuits.
9	To compare the theoretical and measured values of resistors, inductors, capacitors, and potentiometers using a Digital Multimeter.
10	To identify the terminals of various semiconductor devices using multimeter.
11	To generate and analyze different waveforms such as sine, square, and triangular signals using a Function Generator for testing and measurement applications.
12	To observe, measure, and analyze the waveform characteristics of electrical signals using a Cathode Ray Oscilloscope (CRO) or Digital Storage Oscilloscope (DSO).
13	Demonstrate soldering- de-soldering techniques on circuit board.
14	Assembling an electronic circuit on PCB and testing it.

