



First Year Curriculum

Admission Year 2026-27

**Diploma Engineering
Electrical Engineering**

Faculty of Engineering & Technology- Diploma Studies

Parul University

Vadodara, Gujarat, India

Semester 1

- a. **Course Name:** DC Circuit
- b. **Course Code:** 03061701PC01
- c. **Prerequisite:** Familiarity with fundamental principles of electricity and electromagnetism.
- d. **Rationale:** For students studying electrical engineering, the "D.C. Circuits" course is crucial since it covers the fundamentals of direct current (D.C.) electrical circuits. It lays the groundwork for comprehending increasingly complicated electrical systems by covering circuit laws and in series and parallel circuit analysis. Students obtain practical experience through problem-solving activities and applications, which improves their technical and analytical abilities. Before proceeding to more complex electrical engineering topics like electronics, electrical machines, and power systems, one must have a solid understanding of D.C. circuits.

e. Course Learning Objective:

| | |
|----------------|--|
| CLOBJ 1 | To develop understanding of fundamental electrical quantities, electrical properties of materials, Ohm's law, and electrical power concepts. |
| CLOBJ 2 | To explain basic electrical circuit laws and techniques including KCL, KVL, series-parallel circuits, source transformation, and divider rules. |
| CLOBJ 3 | To study network theorems such as Superposition, Thevenin's, Norton's, Reciprocity, and Maximum Power Transfer for circuit analysis. |
| CLOBJ 4 | To build knowledge of electrostatics and capacitors including capacitance, capacitor connections, charging and discharging phenomena. |
| CLOBJ 5 | To familiarize students with magnetic circuits, electromagnetic induction principles, B-H characteristics, and concepts of self and mutual inductance. |

f. Course Learning Outcomes:

| | |
|--------------|---|
| CLO 1 | Explain fundamental electrical concepts such as charge, current, voltage, resistance, conductance, capacitance, and electromotive force (EMF). |
| CLO 2 | Apply Kirchhoff's Laws, Ohm's Law, and circuit analysis techniques like series-parallel resistor networks, source transformation, and star-delta conversion. |
| CLO 3 | Analyze electrical networks using Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, and Reciprocity Theorem. |
| CLO 4 | Explain electrostatic principles, capacitor working, factors affecting capacitance, series-parallel capacitor connections, and capacitor charging/discharging behavior. |
| CLO 5 | Compare electrical and magnetic circuits, apply Faraday's Laws, Fleming's Rules, and Lenz's Law, and analyze self-inductance, mutual inductance, and induced EMF. |

g. Teaching & Examination Scheme:

| Teaching Scheme | | | | Examination Scheme | | | | | Total |
|-----------------|---|---|--------|--------------------|----|----|----------------|---|-------|
| L | T | P | Credit | Internal Marks | | | External Marks | | |
| | | | | T | CE | P | T | 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:

| Unit No | Topic | Weightage (%) | Teaching Hrs. |
|--------------|--|---------------|---------------|
| 1 | Essentials of Electric Circuits Concepts of electric charge, electric current, current density, potential, potential difference, electromotive force (EMF), and voltage. Properties of conductors, semiconductors, and insulators. Definition and explanation of resistance, resistivity, conductance, and conductivity, along with factors affecting the resistance of a material. Ohm's Law: Statement, applications, and limitations. Understanding of work, power, and energy in electrical systems. Joule's Law of Heating: Explanation and applications. | 25% | 10 |
| 2 | Basic Laws and Techniques in Electrical Circuits Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL). Series and parallel resistor connections and calculation of equivalent resistance. Source transformation techniques. Voltage divider and current divider principles. Conversion between star and delta configurations for circuit analysis. | 20% | 8 |
| 3 | Network Theorems for Circuit Analysis Concepts of electric circuit topology. Superposition theorems, Thevenin's theorem, Norton's Theorem, Maximum Power transfer theorem, Reciprocity theorem. Concept of duality. | 22% | 11 |
| 4 | Electrostatics and Capacitors Terms related to electrostatics and Coulomb's law. Capacitors: definition, working, factor affecting capacitance, types and applications. Series - parallel connection of capacitors. Charging/discharging of capacitor. | 18% | 8 |
| 5 | Magnetic Circuits and Electromagnetic Principles Magnetic circuits: overview, terms regarding magnetic Circuit and comparison with electrical circuits. Faraday's laws of electromagnetic induction: types of induced emf, Fleming's right-hand rule, Fleming's left-hand rule and Lenz's law. B-H Curve. Types of Induced emf, self-inductance and Mutual Inductance. | 15% | 8 |
| Total | | 100% | 45 |

i. Text Book and Reference Book:

1. Basic Electrical Engineering V. K. Mehta; S., Chand & Company (PVT) LTD
2. Elements of Electrical Engineering U. A. Patel
3. Electrical Technology Vol-1 Theraja, B. L.; S. Chand, New Delhi
4. Basic Electrical Engineering Rao, Uma. K; Pearson Education

j. List of Practical

| Sr. No. | Practical |
|----------------|---|
| 1. | Demonstrate different types of resistors and perform resistance measurement. |
| 2. | Verify Ohm's Law by analyzing the relationship between voltage, current, and resistance in a given electrical circuit. |
| 3. | Verify Kirchhoff's Current Law (KCL) by measuring and analyzing the sum of currents at a junction in the given electrical circuit. |
| 4. | Verify Kirchhoff's Voltage Law (KVL) by measuring and analyzing the sum of voltages around a closed loop in the given electrical circuit. |
| 5. | Determine the equivalent resistance of resistors connected in series by calculating and verifying the total resistance. |
| 6. | Determine the equivalent resistance of resistors connected in parallel by calculating and verifying the total resistance. |
| 7. | Verify the Superposition Theorem by analyzing the given circuit and determining the current and voltage in each branch for individual sources. |
| 8. | Verify Thevenin's Theorem by simplifying the given circuit into its Thevenin's equivalent and determining the current and voltage in each branch. |
| 9. | Verify Norton's Theorem by converting the given circuit into its Norton equivalent and determining the current and voltage in each branch. |
| 10. | Determine the equivalent capacitance for capacitors connected in series and parallel by calculating and verifying the total capacitance. |
| 11. | Study different types of capacitors and Inductors. |
| 12. | To Determine the B-H curve of a magnetic material. |

- 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 | | |
| | | | | T | 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:

| Unit No | Topics | Weightage (%) | Teaching Hrs. |
|---------|---|---------------|---------------|
| 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:** Applied Science

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 | To develop understanding of fundamental chemical principles including chemical bonding, catalysis, electrochemistry, corrosion, and water treatment relevant to engineering applications. |
| CLOBJ 2 | To apply concepts of industrial chemistry in the study of fuels, lubricants, polymers, elastomers, and adhesives for solving practical engineering and environmental problems. |
| CLOBJ 3 | To enhance analytical and laboratory skills through experimentation, calculations, and interpretation of chemical processes used in industrial and technological fields. |

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. |

g. **Teaching & Examination Scheme:**

| Teaching Scheme | | | | Examination Scheme | | | | | Total |
|-----------------|---|---|--------|--------------------|----|----|----------------|---|-------|
| L | T | P | Credit | Internal Marks | | | External marks | | |
| | | | | T | CE | P | T | 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:

| Unit No | Topics | Weightage (%) | Teaching Hrs. |
|---------|---|---------------|---------------|
| 1 | <p>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.</p> <p>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</p> <p>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.</p> | 10% | 6 |
| 2 | <p>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.</p> <p>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 laws of electrolysis ., Industrial application of</p> | 20% | 8 |
| 3 | <p>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.</p> <p>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.</p> | 10% | 5 |

| | | | |
|---|--|-----|----|
| 4 | <p>Water Treatment</p> <p>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,</p> <p>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.</p> <p>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.</p> | 20% | 7 |
| 5 | <p>Lubricants and Fuels</p> <p>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.</p> <p>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.</p> | 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.</p> <p>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,</p> <p>Definition of adhesives and Examples, Characteristics of adhesives Classification of adhesives and their uses</p> | 20% | 6 |

i. Text book and Reference Book:

1. ENGINEERING CHEMISTRY

By Jain and Jain

2. A Text Book of Polytechnic Chemistry

By V. P. Mehta, Jain Brothers

3. Engineering Chemistry

By S. S. Dara

4. Applied Chemistry

N Krishnamurthy (New Edition) Edition, Tata McGraw-Hill

5. Textbook Environmental Chemistry and Pollution Control

By S. S. Dara

j. List of Practical

| Sr. No. | Experiment List |
|----------------|--|
| 1. | Determine the strength of given acidic solution using standard solution of base |
| 2. | Standardize KMnO_4 solution by preparing standard oxalic acid and to estimate ferrous ions. |
| 3. | Standardize $\text{Na}_2\text{S}_2\text{O}_3$ solution by preparing standard potassium dichromate and to estimate percentage of copper from brass. |
| 4. | Determination of viscosity of given lubricating oil by using Red-wood Viscometer |
| 5. | Determination of pH-Values of given samples of Solution by using Universal Indicator and pH-meter. |
| 6. | To determine Acid Value of given lubricating Oil. |
| 7. | To determine % of moisture content in given coal sample by proximate analysis |
| 8. | To determine of saponification value of lubricating oil |
| 9. | Determine Flash & Fire point of given lubricating oil. |
| 10. | Study of Corrosion of Metals in the Acidic and Alkali Mediums |

- a. **Course Name:** Basic Engineering Drawing
- b. **Course Code:** 03061901ES01
- c. **Prerequisite:** Drawing Basic Knowledge.
- d. **Rationale:** Engineering Drawing is a fundamental language of engineers and an essential communication tool in all fields of engineering. This subject builds the foundation for interpreting and preparing technical drawings.
- e. **Course Learning Objective:**

| | |
|----------------|--|
| CLOBJ 1 | Identify and utilize drawing instruments, equipment, and materials effectively for engineering drawing applications. |
| CLOBJ 2 | Apply BIS standards, scale factors, line conventions, lettering, and dimensioning techniques in technical drawings. |
| CLOBJ 3 | Construct geometrical figures such as polygons, tangents, circles, and other basic shapes using standard methods. |
| CLOBJ 4 | Draw engineering curves including conic sections, cycloidal curves, involutes, and spirals accurately using geometrical constructions. |
| CLOBJ 5 | Develop and interpret orthographic projections of points, lines, planes, and simple pictorial objects according to BIS projection standards. |

f. **Course Learning Outcomes:**

| | |
|--------------|--|
| CLO 1 | Identify and use various drawing equipment, instruments, and materials as per their specifications and applications. |
| CLO 2 | Apply standard practices and appropriate scale factors as per BIS norms for planning and layout of drawings. |
| CLO 3 | Demonstrate different types of lines, lettering styles, and dimensioning methods in technical drawings. |
| CLO 4 | Construct basic geometric shapes, angles, polygons, tangents, and circles using standard construction methods. |
| CLO 5 | Draw conic sections, cycloidal curves, involutes, and spirals using standard geometric methods. |
| CLO 6 | Develop orthographic projections of points, lines, and planes with correct inclination and true lengths. |
| CLO 7 | Convert simple pictorial views into orthographic views by applying projection methods as per BIS standards. |

g. **Teaching & Examination Scheme:**

| Teaching Scheme | | | | Examination Scheme | | | | | Total |
|-----------------|---|---|--------|--------------------|----|----|----------------|---|-------|
| Lect | T | P | Credit | Internal Marks | | | External Marks | | |
| | | | | T | CE | P | T | P | |
| 1 | 0 | 2 | 2 | 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:

| Unit No | Topics | Weightage (%) | Teaching Hrs. |
|--------------|---|---------------|---------------|
| 1 | Drawing instruments and materials. Equipment's- types, specifications, method to use them, applications. Instruments-types, specifications, methods to use them and applications. Pencils-grades, applications, types of points and applications. Other materials types and applications. | 5% | 1 |
| 2 | Planning, layout and scaling of drawing Follow and apply standard practice as per bureau of i.s. For planning and layout, choose appropriate scale factor for the drawing as per given situation. | 5% | 2 |
| 3 | Lines, Lettering and Dimensioning Different Types of Lines. Vertical Capital and Lower Case Letters. Inclined Capital and Lower Case Letters. Numerals And Greek Alphabets. Dimensioning Methods. Aligned Method. Unilateral With Chain, Parallel, Progressive and Combined Dimensioning | 5% | 2 |
| 4 | Geometric construction Geometric construction related with line like bisecting a line, to draw perpendicular with a given line, divide a line, etc. Geometric construction related with angle like bisect an angle, trisect an angle, etc. To construct polygon. Triangle, square / rectangle, pentagon with special method. Hexagon with special method. To draw tangents. Geometric construction related with circle & arc. | 10% | 2 |
| 5 | Engineering curves Conic sections: concept and understanding of focus, directrix, vertex and eccentricity and drawing of conic sections. using various methods, understand construction of :ellipse. Parabola. Hyperbola. Cycloidal curves (cycloid, epicycloid, hypocycloid)involutes. Involutes of a circle, involutes of a polygon, spiral (Archimedean spiral only) | 25% | 3 |
| 6 | Projection of points, lines and planes Reference planes, orthographic projections. Concept of quadrant.1st angle and 3rd angle projection and their symbols. Projection of points. Projection of lines – determination of true length and inclinations for following cases. Line parallel to one or both the plane. Line perpendicular to one of the plane. Line inclined to one plane and parallel to another. Line inclined to both the planes. Projection of planes: types of planes, projection of planes parallel to one of the reference planes, projection of plane inclined to one reference plane and perpendicular to another, projection of planes inclined to both reference planes | 25% | 2 |
| 7 | Orthographic projections Types of projections-orthographic, perspective, isometric and oblique: concept and applications. Various term associated with orthographic projections. Theory of projection, methods of projection, orthographic projection, n planes of projection. Conversion of simple pictorial views into orthographic views. Illustrative problems on orthographic projection b.i.s. code of practice. | 25% | 3 |
| Total | | 100% | 15 |

i. Text Book and Reference Book:

1. A Text Book of Engineering Graphics, P J Shah
2. ENGINEERING GRAPHICS, P J Shah
3. Engineering Graphics & Design, Jain & Gautam
4. Engineering Drawing, N D Bhatt
5. Engineering Drawing, R. K. Dhawan

j. List of Pracical

| Sr. NO. | Experiment List |
|--------------------|--|
| 1. | Practice Sheet Which Includes Dimensioning Methods, Different Types of Line, Construction of Different Polygon, Divide the Line and Angle in Parts, Use of Stencil |
| 2. | Engineering curves Draw Different types of curves like Ellipse, Parabola, Hyperbola, Cycloid, Involute and Spiral |
| 3. | Projection of Points and line Draw at Least Four Problems of Projections of Lines and One problem of Projections of Points. |
| 4. | Projection of Plane Draw at least four Problems of Projections of Plane Like Reactangle, Hexagon,Circle and Triangle Plane. |
| 5. | Orthographic projection Draw at least two Problems of Orthographic Projection from Given 3D Object |

- a. **Course Name:** Foundation of IT and Web Design Application
- b. **Course Code:** 03061601ES02
- c. **Prerequisite:** Basic computer usage and internet familiarity.
- d. **Rationale:** g. This course equips students with essential computing skills, including MS Office, HTML, and CSS, enhancing digital literacy, productivity, and web development proficiency for academic and professional success.

e. Course Learning Objective:

| | |
|----------------|---|
| CLOBJ 1 | Understand the basic concepts and working principles of computer hardware components, storage devices, operating systems, and application software. |
| CLOBJ 2 | Develop practical skills in using operating system commands, email communication, and file management in UNIX/Linux environments. |
| CLOBJ 3 | Apply MS Excel functionalities for data entry, analysis, sorting, calculations, conditional formatting, and report generation. |
| CLOBJ 4 | Design professional documents, presentations, resumes, macros, and mail merge applications using MS Word and PowerPoint tools. |
| CLOBJ 5 | Enhance problem-solving, communication, and presentation skills through hands-on computer applications and office automation tasks. |

f. Course Learning Outcomes:

| | |
|--------------|--|
| CLO 1 | Understand the Fundamentals of Computers & MS Excel. |
| CLO 2 | Develop Presentations and Documents Using MS PowerPoint & MS Word. |
| CLO 3 | Build Basic Web Pages Using HTML. |
| CLO 4 | Enhance Web Pages with Advanced HTML & HTML5 Features. |
| CLO 5 | Create Web Pages Using CSS |

g. Teaching & Examination Scheme:

| Teaching Scheme | | | | Examination Scheme | | | | | Total |
|-----------------|---|-----|--------|--------------------|----|-----|----------------|---|-------|
| Lect | T | Lab | Credit | Internal Marks | | | External Marks | | |
| | | | | T | CE | P | T | P | |
| - | - | 4 | 2 | - | - | 100 | - | - | 100 |

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

h. Text Book and Reference Book:

1. Computer Fundamentals, By: P.K. Sinha & Priti Sinha | Publisher: BPB Publications

2. Microsoft Office PowerPoint 2019 Step by Step,By: Joan Lambert | Publisher: Microsoft Press
3. Microsoft Excel 2019 Bible,By: Michael Alexander, Richard Kusleika | Publisher: Wiley
4. Microsoft Word 2019 Step by Step, By: Joan Lambert | Publisher: Microsoft Press
5. HTML and CSS: Design and Build Websites, By: Jon Duckett | Publisher: Wiley

i. List of Practical

| Sr. No. | List of Practical |
|---------|---|
| 1. | Describe below components with its working: <ol style="list-style-type: none"> 1. CPU 2. GPU 3. Motherboard |
| 2. | Explain the different types of computer storage devices: <ol style="list-style-type: none"> 1. Hard Disk Drive 2. Floppy Disk 3. HDD 4. USB Flash Drive 5. Compact Disc 6. DVD 7. RAM 8. ROM |
| 3. | Perform the following email-related tasks: <ol style="list-style-type: none"> 1. Create an email account and compose a formal email. 2. Draft an invitation email for an event or gathering. 3. Design a custom email signature and include it in the message. 4. Send the email to at least four recipients. 5. Add your teacher's email ID in the CC field and your mentor's email ID in the BCC field. |
| 4. | Explain basics of UNIX OS. <ol style="list-style-type: none"> 1. Structure of UNIX OS 2. UNIX Kernal 3. Shell |
| 5. | Explain following commands for LINUX OS: cd, ls, cat, touch, mkdir, pwd, echo, rmdir, mv, rm, chmod, wc |
| 6. | Develop an excel sheet which has record of 50 students result of 5 subjects and marks following analysis: <ol style="list-style-type: none"> 1. Fetch the data of the students who has distinction. 2. Fetch the data of students with minimum mark in each subject. 3. Sort the data based on percentage. |
| 7. | Prepare a table for the student mark sheet using MS Excel. Containing Student Name, 5 Subject name, Total and performing following operation : <ol style="list-style-type: none"> 1. Percentage 2. Sorting 3. Result with grading 4. Pass/fail |

| | |
|-----|---|
| 8. | <p>Create an MS Excel sheet with the following columns: Product Name, Quantity Sold, Price per Unit, Total Price and perform the following tasks:</p> <ol style="list-style-type: none"> 1. Calculate Total Price (Quantity Sold × Price per Unit) 2. Sort Data (Arrange products in descending order based on Total Price) 3. Categorize Products (Label products as "Low Sales" or "High Sales" based on quantity sold) 4. Highlight Expensive Products (Use conditional formatting to highlight products with a high price per unit) |
| 9. | <p>Create an MS Excel sheet containing the following columns: Employee Name, Basic Salary, HRA, DA, Deductions, Net Salary and perform the following operations:</p> <ol style="list-style-type: none"> 1. Calculate Net Salary (Basic Salary + HRA + DA - Deductions) 2. Apply Sorting (Sort employees based on Net Salary in descending order) 3. Assign Tax Slab (Based on Net Salary, categorize employees into tax slabs) 4. Highlight High Earners (Use conditional formatting to highlight employees with a Net Salary above a certain threshold) |
| 10. | <p>Prepare PowerPoint Presentation of your favourite movie using animation.</p> |
| 11. | <p>Create a PowerPoint presentation on your dream travel destination, including images, key attractions, and animations to enhance the visual appeal.</p> |
| 12. | <p>Design a PowerPoint presentation on a famous personality, highlighting their achievements, life journey, and contributions, using transitions and animations.</p> |
| 13. | <p>Create a word file for your resume, containing</p> <ol style="list-style-type: none"> 1. Personal details 2. Education details 3. Experience 4. Achievement 5. Objective 6. Internship 7. Key skills |
| 14. | <p>Create and apply a Macro in MS Word to automate formatting tasks:</p> <ol style="list-style-type: none"> 1. Record a Macro to apply the following formatting: <ul style="list-style-type: none"> • Change font to Times New Roman, size 12. • Set 1.5 line spacing. • Apply Bold and Underline to headings. • Justify paragraph text. 2. Save the Macro and apply it to a sample document. |
| 15. | <p>Create a formal letter using Mail Merge for sending invitations:</p> <ol style="list-style-type: none"> 1. Write an invitation letter for an annual college event. 2. Use Mail Merge to insert recipient names and addresses from an Excel sheet. 3. Format the letter with: <ul style="list-style-type: none"> • Bold and Center-aligned title. • Left-aligned body text. • 1.5 line spacing. 4. Preview and generate multiple letters with recipient details |

- 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.

e. 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. |

f. 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. |

g. 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

h. Course Content:

| Unit No | Topics | Weightage (%) | Teaching Hrs. |
|----------------|--|----------------------|----------------------|
| 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 <ul style="list-style-type: none">• 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• Demonstrative & Possessive Determiners• Quantifiers & Numerals• Common errors of Articles & Determiners | 10% | 2 |
| 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 | <p>Goal Setting</p> <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 | <p>Reading Skills – Basic Level</p> <ul style="list-style-type: none"> • Types of reading • Strategies of reading • Reading comprehension | 10% | 2 |

i. Text Book and Reference Books:

1. Murphy, Raymond. *English Grammar in Use*. Cambridge University Press, 2019.
2. Mohan, Krishna, and Meera Banerji. *Developing Communication Skills*. Macmillan Publishers India, 2009.
3. Lewis, Norman. *Word Power Made Easy*. Goyal Publishers, 2014.
4. Rizvi, M. Ashraf. *Soft Skills: Enhancing Employability and Career Development*. McGraw Hill Education, 2010.
5. 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. **Teaching & Examination Scheme:**

| Teaching Scheme | | | | Evaluation Scheme | | | | | |
|-----------------|---|---|---|---------------------|----|---|--------|---|-------|
| L | T | P | C | Internal Evaluation | | | ESE | | Total |
| | | | | T | 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

h. Course Content:

| Unit No | Topics | Weightage (%) | Teaching Hrs. |
|----------------|--|----------------------|----------------------|
| 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 new energy sources. Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion.) Concept, origin and power plants of geothermal energy. | 10% | 2 |
| 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 |

i. 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 Pub.

- a. **Course Name:** Programming with Python
- b. **Course Code:** 03061601UE01
- c. **Prerequisite:** Basic Computer Knowledge and familiar with program concepts.
- d. **Rationale:** The course aims to develop proficiency in writing efficient Python code for problem-solving and real-world applications. It also covers core concepts like data structures, functions, and OOP principles.

e. Course Learning Objective:

| | |
|----------------|--|
| CLOBJ 1 | To develop understanding of Python programming fundamentals, history, features, syntax and Python development environment setup. |
| CLOBJ 2 | To explain Python data types, variables, operators and different data structures such as lists, tuples, sets and dictionaries. |
| CLOBJ 3 | To study control statements including conditional statements and looping structures for program development. |
| CLOBJ 4 | To build problem-solving skills using user-defined functions, built-in functions and Python modules. |

f. Course Learning Outcomes:

| | |
|--------------|---|
| CLO 1 | Understand the Core Syntax & Structure of Python Programming. |
| CLO 2 | Perform Data Handling Using Python's Data Structure. |
| CLO 3 | Implement Control flow Mechanism & Loops. |
| CLO 4 | Implement Function & Utilize Module. |

g. Teaching & Examination Scheme:

| Teaching Scheme | | | | Examination Scheme | | | | | Total |
|-----------------|---|---|--------|--------------------|----|----|----------------|---|-------|
| L | T | P | Credit | Internal Marks | | | External Marks | | |
| | | | | T | CE | P | T | 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:

| Unit No | Topics | Weightage (%) | Teaching Hrs. |
|---------|--|---------------|---------------|
| 1 | Basics of Python History of python, comparison of different versions of python, difference of C and Python, different python editors, Installation of IDLE and setting up python environment, Basic python syntax, Comments in python, Features of Python. | 22% | 6 |
| 2 | Data Type & Operator Variable, Datatype, User Input, Operators, List Tuples, Set, Dictionaries, Data Structure, String Inbuilt Function. | 26% | 8 |

| | | | |
|--------------|---|-------------|-----------|
| 3 | Control Statements If.. else, while loops, for loops, range, break, Continue. | 26% | 8 |
| 4 | Function and Module Introduction of functions, Defining user function, function documentation, optional parameter, default parameter, Inbuilt function, math module, random module. | 26% | 8 |
| Total | | 100% | 30 |

i. Text Book and Reference Book:

1. Introducing Python by Lubanovic Bill, O' ReILLY (TextBook)
2. Beginning Python: Using Python 2.6 and Python 3.1 James Payne

j. Experiment List:

| Sr. NO. | Experiment List |
|---------|--|
| 1. | Write a program to print Hello word. |
| 2. | Write a program to demonstrate use of comments. |
| 3. | Write a program which accepts the radius of a circle from the user and compute the area. |
| 4. | Write a program to demonstrate all data type in Python. |
| 5. | Write a program to do arithmetical operations. |
| 6. | Write a program to do Logical operations. |
| 7. | Write a program to find area of circle, rectangle & Triangle. |
| 8. | Write a program to demonstrate List & Tuple. |
| 9. | Write a program to demonstrate Set & Dictionary. |
| 10. | Write a program to demonstrate 10 function of string. |
| 11. | Write a program to find the Maximum number from three numbers. |
| 12. | Write a program to find Fractural of given number. |
| 13. | Write a program to Print Right Triangle using While loop. |
| 14. | Write a program to print Hello word. |
| 15. | Write a program to use of Random & Math module. |

Semester 2

- a. **Course Name:** A.C. Circuit
- b. **Course Code:** 03061702PC01
- c. **Prerequisite:** Familiarization with fundamental concepts and laws of electrical and magnetic circuits.
- d. **Rationale:** Alternating current (AC) is used for the majority of electrical power generation, transmission, distribution, and consumption. In order to properly analyze and solve electrical circuits, diploma students of electrical engineering must comprehend the basic ideas of AC as well as the principles of series, parallel, and three-phase AC circuits. This course gives students the skills they need to troubleshoot electrical circuits in power systems and industries and is a prerequisite for advanced electrical studies. To succeed in their professional careers, prospective electrical technocrats must grasp the foundations of AC circuits, a core engineering subject.

e. Course Learning Objective:

| | |
|----------------|---|
| CLOBJ 1 | To develop understanding of alternating voltage and current, sinusoidal waveforms and vector representation of AC quantities. |
| CLOBJ 2 | To explain the behavior of single-phase AC circuits containing resistance, inductance and capacitance under different operating conditions. |
| CLOBJ 3 | To study AC series and parallel circuits, resonance, impedance, admittance and power factor concepts for circuit analysis. |
| CLOBJ 4 | To build fundamental knowledge of active, reactive and apparent power along with power triangle and resonance phenomena in AC circuits. |
| CLOBJ 5 | To familiarize students with three-phase systems, generation of three-phase voltage, star and delta connections, and balanced and unbalanced loads. |

f. Course Learning Outcomes:

| | |
|--------------|---|
| CLO 1 | Explain the fundamental differences between AC and DC systems and describe the principle of alternating EMF generation. |
| CLO 2 | Analyze the behavior of AC through resistive, inductive, capacitive and RLC circuits by deriving equations for voltage, current, power, and power factor. |
| CLO 3 | Solve AC parallel circuits using admittance and complex algebra methods and determine resonance conditions. |
| CLO 4 | Explain the generation of three-phase voltage, compare single-phase and three-phase systems and analyze star and delta connections. |
| CLO 5 | Evaluate active, reactive, and apparent power in single-phase and three-phase circuits using the power triangle. |

g. Teaching & Examination Scheme:

| Teaching Scheme | | | | Examination Scheme | | | | | Total |
|-----------------|---|---|--------|--------------------|----|----|----------------|---|-------|
| L | T | P | Credit | Internal Marks | | | External Marks | | |
| | | | | T | CE | P | T | P | |
| 3 | 0 | 2 | 4 | 20 | 20 | 50 | 60 | - | 150 |

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

h. Course Content:

| Unit No | Topics | Weightage (%) | Teaching Hrs. |
|---------|--|---------------|---------------|
| 1 | <p>Essentials of AC Voltage and Current Comparison between AC and DC System. Principle of Alternating emf Generation (single phase). Terminology of Sinusoidal Functions, Definition of Key Sinusoidal Terms: Waveform, Cycle, Time Period, Frequency, Amplitude, and Angular Frequency, Mathematical Relationships Between Sinusoidal Parameters. Various Values of Sinusoidal Alternating Quantities: Definition of Instantaneous Value, Maximum Value, Average Value, RMS Value, Peak Factor, and Form Factor, Mathematical Relationships Among Different Sinusoidal Values. Phase difference between alternating quantities: lagging and leading quantities. Vector representation of alternating quantity, Transfer of vector from rectangular form to polar form and vice versa.</p> | 30% | 12 |
| 2 | <p>Single Phase A.C Circuit Behaviour of AC through pure resistive, inductive and capacitive circuit: (1) State equations of voltage, current, power and power factor (2) Define term - inductive and capacitive reactance (3) draw waveform and vector diagram of voltage, current and power. Behaviour of AC through RL, RC, and RLC series circuit: (a) Derive equation of current, power and power factor (b) Draw waveform and vector diagram of voltage and current (c) Draw impedance triangle. Concepts of power factor: lagging, leading and unity power factor. Active power, reactive power, apparent power and power triangle. Resonant condition and resonance frequency in RLC series circuit.</p> | 30% | 12 |
| 3 | <p>Single phase A.C Parallel Circuit Terms related to AC parallel circuits :(1) Define terms- admittance, conductance and susceptance (2) Draw admittance triangle. Admittance method for solving AC parallel circuits. Complex algebra method for solving AC parallel circuits. Resonance condition and resonant frequency in parallel AC Circuits. Comparison between series and parallel resonance.</p> | 20% | 9 |
| 4 | <p>Three Phase System and Circuits</p> | 20% | 12 |

| | | | |
|--------------|--|-------------|-----------|
| | Principle of generation of three phase alternating voltage. Comparison between single and three phase systems. Three phase system terminology: (a) Define term – phase Sequence, balanced & un- balanced supply, balanced & unbalanced load (b) state importance of these terminologies. Values of voltage and current in three phase systems: Define terms- line voltage, phase voltage, line current and phase current. Three phase star connection. Three phase delta connection. | | |
| Total | | 100% | 45 |

i. Text Book and Reference Book:

1. Elements of Electrical Engineering U. A. Patel
2. Electrical Technology Vol-1 Theraja, B. L.; S. Chand, New Delhi
3. Fundamentals of Electrical Engineering Tarlok Singh; S. K. Kataria & Sons, New Delhi
4. Basic Electrical Engineering Rao, Uma. K; Pearson Education

j. Experiment List:

| Sr. NO. | Experiment List |
|------------|---|
| 1. | Demonstrate waveforms of alternating quantities using CRO and function generator. |
| 2. | Measure voltage, current, and power through a pure resistor. |
| 3. | Measure inductance and internal resistance of choke coil. |
| 4. | Measure voltage, current, power and power factor in RL series circuit. |
| 5. | Measure voltage, current, power and power factor in RC series circuit. |
| 6. | Measure voltage, current, power and power factor in RLC series circuit. |
| 7. | Measure resonance frequency and resonant impedance in RLC series circuit. |
| 8. | Measure voltage, current, power and power factor in RL Parallel circuit. |
| 9. | Measure voltage, current, power and power factor in RC parallel circuit. |
| 10. | Measure voltage, current, power and power factor in RLC parallel circuit. |
| 11. | Verify line & phase voltage and line & phase current relation for three phase star connection. |
| 12. | Verify line & phase voltage and line & phase current relation for three phase delta connection. |

- 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 instill its applications in pertinent engineering and technological fields.

e. **Course Learning Objective:**

| | |
|----------------|---|
| CLOBJ 1 | To develop understanding of determinants and matrices and apply them for solving systems of linear equations. |
| CLOBJ 2 | To explain vector algebra concepts including vector operations, scalar product and vector product for engineering applications. |
| CLOBJ 3 | To study coordinate geometry of straight lines and circles and solve related geometrical problems. |
| CLOBJ 4 | To build fundamental knowledge of integral calculus and apply integration techniques for area and volume calculations. |
| CLOBJ 5 | To familiarize students with differential equations and basic MATLAB concepts for solving simple engineering 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 | | | | Examination Scheme | | | | | Total |
|-----------------|---|---|--------|--------------------|----|---|----------------|---|-------|
| L | T | P | Credit | Internal Marks | | | External Marks | | |
| | | | | T | CE | P | T | P | |
| 3 | 1 | 0 | 4 | 20 | 20 | - | 60 | - | 100 |

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

h. **Course Content:**

| Unit No | Topics | Weightage (%) | Teaching Hrs. |
|---------|---|---------------|---------------|
| 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 |
| | Total | 100% | 45 |

i. Text Book and Reference Book:

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

j. Tutorial List:

| Sr. NO. | Tutorial List |
|----------------|---|
| 1. | Determinants and Matrices: Properties of determinant with examples, Solve equations by using cramer's rule and matrix inversion method, Examples of multiplication, addition of matrix, Adjoint and inverse of matrix. |
| 2. | Vector Algebra: Examples to find addition, subtraction, dot product, cross product of vectors Examples to find work done, moment and angular velocity of vectors. |
| 3. | Coordinate Geometry: Examples to find slope, intercepts, two point form of line, slope intercept form of line, Parallel and perpendicular condition of line by using examples, Examples to find centre and radius for equation of circle, Examples to find tangent and normal at a point on a circle. |
| 4. | Integral Calculus: Examples to find integral of functions, area and volume by using standard formula, Examples by using method of partial fractions and substitution with different properties. |
| 5. | Differential Equations: Examples to find order and degree of differential equation, Examples by using method of variable separable, linear differential equation, exact differential equation. |

- a. **Course Name:** Basic Physics
- b. **Course Code:** 03069202BS01
- c. **Prerequisite:** High School Level Physics.
- 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 | To develop understanding of physical quantities, units, dimensions, measurements and errors used in engineering and scientific applications. |
| CLOBJ 2 | To explain the concepts of electrostatics, capacitance, current electricity and electrical circuits with their practical applications. |
| CLOBJ 3 | To study electromagnetism, magnetic materials, electromagnetic induction and the working of galvanometer, ammeter and voltmeter. |
| CLOBJ 4 | To build fundamental knowledge of semiconductor physics including p-n junction diodes, rectifiers, transistors, photocells and solar cells. |
| CLOBJ 5 | To familiarize students with modern physics concepts such as lasers, fiber optics, nanoscience and their engineering and medical applications. |

f. Course Learning Outcomes:

| | |
|--------------|--|
| 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. |

g. Teaching & Examination Scheme:

| Teaching Scheme | | | | Examination Scheme | | | | | Total |
|-----------------|---|---|--------|--------------------|----|----|----------------|---|-------|
| L | T | P | Credit | Internal Marks | | | External Marks | | |
| | | | | T | CE | P | T | P | |
| 3 | 0 | 2 | 4 | 20 | 20 | 50 | 60 | - | 150 |

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

h. Course Content:

| Unit No | Topics | Weightage (%) | Teaching Hrs. |
|---------|---|---------------|---------------|
| 1 | <p>Physical world, Units and Measurements Comparison between AC and DC System. Principle of Alternating 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.</p> | 15% | 8 |
| 2 | <p>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.</p> | 25% | 10 |
| 3 | <p>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.</p> | 20% | 8 |

| | | | |
|--------------|---|-------------|-----------|
| | 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. | | |
| 4 | Semiconductor Physics Energy bands in solids, Types of materials (insulator, semiconductor, 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 tapped). 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 |
| Total | | 100% | 45 |

i. Text Book and Reference Book:

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

j. List of Practical:

| Sr. NO. | Experiment List |
|--------------------|--|
| 1. | To measure length, radius of a given cylinder, a test tube and a beaker using a Vernier calliper 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:** Basic Electronics
- b. **Course Code:** 03061801ES01
- c. **Prerequisite:** Knowledge of Basic science and physics.
- d. **Rationale:** Basic Electronics introduces fundamental concepts of electronic components, circuits and their practical applications. It helps students develop essential skills in designing, analyzing, and troubleshooting electronic systems. The subject forms the foundation for advanced topics like communication systems, embedded systems, and automation. With its wide industrial relevance, it enables students to innovate and solve real-world engineering problems effectively.

e. Course Learning Objective:

| | |
|----------------|--|
| CLOBJ 1 | To develop understanding of basic electronic components, including active and passive devices, signal types, and their practical applications in electronic systems. |
| CLOBJ 2 | To explain the characteristics and working principles of semiconductor materials, PN junction diodes, rectifiers, and filter circuits used in power supply applications. |
| CLOBJ 3 | To design and implement transistor-based amplifier and switching circuits using suitable biasing methods for electronic circuit applications. |
| CLOBJ 4 | To analyse and simplify digital electronic circuits using Boolean algebra, number systems, logic gates, and combinational logic design techniques. |
| CLOBJ 5 | To identify and classify various cables, connectors, and electronic measuring instruments based on their construction, characteristics, and industrial applications. |

f. Course Learning Outcomes:

| | |
|--------------|--|
| CLO 1 | Identify basic electronic components, including active and passive components and different types of signals. |
| CLO 2 | Explain the properties of semiconductors, PN junction diodes and their applications in rectifiers and filters. |
| CLO 3 | Design and implement transistor-based amplifier and switching circuits using appropriate biasing techniques. |
| CLO 4 | Analyse and simplify digital logic circuits using Boolean algebra, number systems and combinational logic design techniques. |
| CLO 5 | Classify different types of cables, connectors and measuring instruments based on their construction and applications. |

g. Teaching & Examination Scheme:

| Teaching Scheme | | | | Examination Scheme | | | | | Total |
|-----------------|---|---|--------|--------------------|----|----|----------------|---|-------|
| L | T | P | Credit | Internal Marks | | | External Marks | | |
| | | | | T | CE | P | T | P | |
| 3 | 0 | 2 | 4 | 20 | 20 | 50 | 60 | - | 150 |

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

h. Course Content:

| Unit No | Topics | Weightage (%) | Teaching Hrs. |
|--------------|---|---------------|---------------|
| 1 | Basic Electronic Components Introduction to electronics, active and passive components explanation with example, Active components: voltage source, current source, Signal Processing components. Passive components: Resistors: Concept of resistors, Capacitors: Concept of capacitor, Inductors: Concept of Inductor. Types of Signals: Periodic signal & non- periodic signal with example. | 15 | 7 |
| 2 | Semiconductor Components and its application Review of basic atomic structure and energy levels, concept of insulators, conductors and semiconductors, atomic structure of Germanium (Ge) and Silicon (Si), covalent bonds, Concept of intrinsic and extrinsic semiconductor, Process of doping, P and N type semiconductors, PN junction diode, forward and reverse biased PN junction, V-I characteristics of P-N junction diode, Zener diode, Application of diode as half-wave, full wave and bridge rectifiers. C, L, LC, π filters. | 22 | 10 |
| 3 | Transistor and amplifiers Introduction of Transistor, PNP and NPN transistors. Working of Transistor, Transistor configuration & Characteristics. Biasing methods of Transistor. Relation between current gain, alpha and beta. CE Transistor as Amplifier, Transistor as switch. | 20 | 8 |
| 4 | Digital logic and circuits Number System: Decimal number, binary number, octal and Hexadecimal number and Conversion: Binary, Octal, Decimal and Hexadecimal number systems. Perform binary arithmetic operations: Binary addition, subtraction. Complements: 1's, 2's, 9's and 10's complement. Symbol, operation and truth-table: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR. Universal gates. Laws and theorems of Boolean algebra. Combinational logic Circuit: Half Adder, Full Adder, Half subtractor, Full subtractor, Multiplexer (2 to 1, 4 to 1), Demultiplexer (1 to 2, 1 to 4). | 30 | 14 |
| 5 | Cable, connectors and Measuring Instruments Analog and Digital display. Cables: coaxial cable, twisted pair cable and fiber optic cable. Connectors: coaxial cable connectors, RJ45, RS-232, HDMI connectors. Multimeters: Analog and digital multimeter. CRO: front panel controls and application. | 13 | 6 |
| Total | | 100% | 45 |

i. Text Book and Reference Book:

1. Principles of Electronics, By V.K. Mehta | S. Chand and Company
2. Digital Electronics, By Anand Kumar
3. Electronics devices and circuits, By J.B.Gupta | S.K.kataria & Sons, 2013
4. Basic Electronics and Linear Circuits, By N.N. Bhargava, D.C. Kulshreshtha, S.C. Gupta, | McGraw Hill Education

j. List of Practical:

| Sr. NO. | Experiment List |
|----------------|---|
| 1. | To identify and understand the characteristics of passive components. |
| 2. | Perform the V-I Characteristics of PN Junction Diode. |
| 3. | Measure voltage and frequency of any given signal using oscilloscope. |
| 4. | Test performance of Half-wave rectifier using CRO. |
| 5. | Test performance of full wave and bridge rectifier using CRO. |
| 6. | Test the performance of V-I characteristics of Zener diode. |
| 7. | Perform the characteristics of CE NPN Transistor. |
| 8. | Realize the basic logic gates. |
| 9. | Realize the NAND gate as a universal building block. |
| 10. | Realize the NOR gate as a universal building block. |
| 11. | Design and implement Half Adder and full adder circuit. |
| 12. | Design and implement Half Subtractor and full Subtractor circuit. |
| 13. | Realize Multiplexer and Demultiplexer circuit. |
| 14. | Identify various cables and connectors & draw their diagram. |

- a. **Course Name:** Electrical and Electronics Workshop LAB
- 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 | To develop understanding of electrical installation symbols, tools and switches used in domestic and industrial applications. |
| CLOBJ 2 | To explain the operation and proper usage of electrical measuring and testing instruments such as voltmeter, ammeter, wattmeter, multimeter, clip-on meter and megger. |
| CLOBJ 3 | To study the working and application of protective devices including fuse, MCB and ELCB for electrical safety. |
| CLOBJ 4 | To build practical knowledge in preparing, testing and analyzing electrical and electronic circuits using function generators, CRO/DSO and measuring instruments. |
| CLOBJ 5 | To familiarize students with electronic components, semiconductor devices, soldering/de-soldering techniques and PCB circuit assembly for practical applications. |

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 | | | | Examination Scheme | | | | | Total |
|-----------------|---|---|--------|--------------------|----|-----|----------------|---|-------|
| L | T | P | Credit | Internal Marks | | | External Marks | | |
| | | | | T | CE | P | T | P | |
| 0 | 0 | 4 | 2 | - | - | 100 | - | - | 100 |

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

h. List of Practical:

| Sr. NO. | Experiment List |
|---------|---|
| 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. |

- 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 | To develop effective listening and speaking skills for confident communication in academic and professional environments. |
| CLOBJ 2 | To enhance vocabulary and language proficiency through the study of homophones, homonyms, homographs, phrasal verbs and idioms. |
| CLOBJ 3 | To explain and apply grammatical concepts such as subject-verb agreement and direct-indirect speech in written and spoken communication. |
| CLOBJ 4 | To build professional communication skills through letter writing, e-mail writing, presentations and story writing activities. |
| CLOBJ 5 | To familiarize students with personality development and reasoning skills through SWOT analysis, blood relation and alphabetical series exercises. |

f. Course Learning Outcomes:

| | |
|--------------|--|
| CLO 1 | Demonstrate effective listening skills to comprehend and respond appropriately to spoken English in academic contexts. |
| CLO 2 | Use vocabulary including homonyms, idioms, and phrasal verbs correctly in communication. |
| CLO 3 | Apply grammar rules such as subject-verb agreement and direct-indirect speech accurately. |
| CLO 4 | Write letters, emails, and story with clarity and appropriate structure. |
| CLO 5 | Exhibit SWOT analysis, logical reasoning, and empathetic communication in personal and group settings. |

g. Teaching & Examination Scheme:

| Teaching Scheme | | | | Examination Scheme | | | | | Total |
|-----------------|---|---|--------|--------------------|----|----|----------------|----|-------|
| L | T | P | Credit | Internal Marks | | | External Marks | | |
| | | | | T | CE | P | T | P | |
| 1 | 0 | 2 | 2 | 40 | - | 20 | 60 | 30 | 150 |

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

h. Course Content:

| Sr. No. | Content | Weightage (%) | Teaching Hrs. |
|---------|--|---------------|---------------|
| 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 → could, will → 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% | 1 |
| | Total | 100% | 45 |

i. Text Book and Reference Book:

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

j. List of Practical:

| Sr. NO. | Experiment List |
|---------|--|
| 1. | Listening Skills – Basic level: Audio Comprehension Practice (e.g., TED Talks, dialogues, interviews), Note-Taking While Listening (key points, summarizing), Fill in the Blanks from Audio Clips, Listening for Tone and Emotion. |
| 2. | Crazy Scientist – Practice: Group Activity: Invent & Present a Scientific Invention, Create a Poster or Diagram of an invention. |
| 3. | Advanced Building Vocabulary: Homophones, Homonyms, Homographs, Phrasal verbs & Idioms - Practice: Sorting Game: Match Homophones/Homographs to Meanings, Fill in the Blanks with Correct Homonyms, Vocabulary Crossword or Word Jumble Challenges, Finding the meaning of different Phrasal verbs & Idioms. |
| 4. | Subject Verb Agreement- Practice: Spot the Error Exercises in Paragraphs, Group Quiz: “Choose the Correct Verb”, Rewrite Sentences with Correct Agreement. |
| 5. | SWOT Analysis – Practice: Individual SWOT Chart Creation, Peer Review: Partner Reviews Your SWOT, Case Study Analysis (SWOT of a famous person or company), Group Discussion: Present Your SWOT Plan, Goal-Setting Activity Based on SWOT Insights. |
| 6. | Letter Writing & E-Mail Writing – Practice: Writing practice of different types of Formal Letters, Drafting Emails with Subject, Salutation, Body, and Sign-off, Email Etiquette Activity (Identify Dos and Don'ts). |
| 7. | Direct-Indirect Speech – Practice: Convert Dialogue into Reported Speech, Rewriting News Headlines from Direct to Indirect, Mixed Tense Exercises Involving Speech Conversion. |
| 8. | Blood Relation & Alphabetical Series – Practice: Diagram Drawing Practice: Family Tree, solving questions of Blood Relation, Solving questions of Alphabetical series. |
| 9. | Story writing by using hints – Practice: Story Starters: Continue the Given Opening, Peer Feedback: Review and Improve Stories, Group Story Chain (Each Student Adds a Sentence), Edit and Rewrite: Improve a Poorly Written Story. |
| 10. | Speaking Skill Building Activity: Self-Introduction and Peer Introduction, Extempore Speech Practice (1–2 min topics), Pronunciation Practice Using Tongue Twisters or Audio Aids. |

- a. **Course Name:** Universal Human Values
 b. **Course Code:** 03060002MC01
 c. **Prerequisite:** Basic knowledge of Grammar and Communication.
 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 | To develop understanding about value education, self-exploration and the importance of happiness and prosperity in human life. |
| CLOBJ 2 | To explain harmony in human beings through understanding of self, body, self-regulation and health. |
| CLOBJ 3 | To study harmony in family and society by understanding values such as trust, respect, justice and mutual relationships. |
| CLOBJ 4 | To build awareness about harmony in nature and existence through interconnectedness, co-existence and mutual fulfilment among all orders of nature. |
| CLOBJ 5 | To familiarize students with professional ethics, human values and strategies for developing a value-based personal and professional life. |

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 | | | | Examination Scheme | | | | | Total |
|-----------------|---|---|--------|--------------------|----|---|----------------|---|-------|
| L | T | P | Credit | Internal Marks | | | External Marks | | |
| | | | | T | CE | P | T | P | |
| 1 | 0 | 0 | 0 | 20 | 20 | - | - | - | 40 |

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

h. Course Content:

| Unit No | Topics | Weightage (%) | Teaching Hrs. |
|---------|---|---------------|---------------|
| 1. | Introduction to Value Education Right Understanding, Relationship and Physical Facility | 20% | 3 |

| Unit No | Topics | Weightage (%) | Teaching Hrs. |
|----------------|---|----------------------|----------------------|
| | (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. | | |
| 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-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession. | 20% | 3 |
| | Total | 100% | 45 |

i. Text Book and Reference Book:

1. 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 M K Gandhi.
4. Small is Beautiful E. F Schumacher.
5. Rediscovering India Dharampal.

- a. **Course Name:** E Waste Management
- b. **Course Code:** 03061802UE01
- c. **Prerequisite:** Basic understanding of environmental science and general waste management concepts is recommended for this subject.
- d. **Rationale:** E-waste management is critical for environmental sustainability and public health. With the increasing consumption of electronic devices, understanding the impact of e-waste and implementing proper disposal and recycling methods is essential. This subject equips students with the knowledge to contribute to sustainable e-waste management practices, ensuring minimal harm to the environment and human health.

e. Course Learning Objective:

| | |
|----------------|---|
| CLOBJ 1 | To develop understanding of e-waste, its sources, disposal methods and the importance of effective e-waste management. |
| CLOBJ 2 | To explain the environmental and health impacts caused by improper handling, disposal and recycling of e-waste. |
| CLOBJ 3 | To study e-waste collection systems, recycling processes and technologies used for recovery of valuable materials. |
| CLOBJ 4 | To build knowledge of e-waste management strategies, policies, regulations and the role of stakeholders in sustainable waste management. |
| CLOBJ 5 | To familiarize students with emerging technologies, sustainable solutions and consumer responsibilities for the future of e-waste management. |

f. Course Learning Outcomes:

| | |
|--------------|--|
| CLO 1 | Understand the sources, types, and environmental significance of e-waste and the need for proper e-waste management practices. |
| CLO 2 | Analyze the environmental and health impacts caused by improper e-waste disposal through case studies and real-life examples. |
| CLO 3 | Explain the collection, dismantling, and recycling processes of e-waste along with technological and practical challenges in recycling. |
| CLO 4 | Evaluate national and international e-waste policies, frameworks, and the roles of various stakeholders in sustainable e-waste management. |
| CLO 5 | Explore innovations, sustainable practices, and the role of consumers in minimizing the future environmental impact of e-waste. |

g. Teaching & Examination Scheme:

| Teaching Scheme | | | | Examination Scheme | | | | | Total |
|-----------------|---|---|--------|--------------------|----|---|----------------|---|-------|
| L | T | P | Credit | Internal Marks | | | External Marks | | |
| | | | | T | CE | P | T | P | |
| 3 | 0 | 0 | 3 | 20 | 20 | - | 60 | - | 100 |

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

h. Course Content:

| Unit No | Topics | Weightage (%) | Teaching Hrs. |
|---------|---|---------------|---------------|
| 1 | <p>Introduction to E-Waste Management</p> <p>Overview of E-Waste: Definition of e-waste and its components, Sources and types of e-waste: Consumer electronics, computers, mobile phones, etc. Importance of E-Waste Management: Environmental and health impacts of improper disposal of e-waste, Global statistics on e-waste production and recycling rates. E-Waste Disposal Methods: Common disposal practices and their environmental effects, The importance of recycling and proper disposal. Key Regulations and Policies for E-Waste: International regulations and agreements, Indian E Waste Management Rules and their implications.</p> | 20 | 09 |
| 2 | <p>Environmental Impact of E-Waste:</p> <p>Contamination of soil, water, and air from hazardous substances, E-Waste dumping in landfills and illegal exports to developing countries. Health Risks from E-Waste: Exposure to toxic chemicals from e-waste and its effects on human health, Long-term consequences for workers and communities involved in e-waste recycling. Case Studies of E-Waste Disposal and Impact: Case studies of e-waste disposal in various countries and its effects, Local examples of e-waste impact in India.</p> | 20 | 09 |
| 3 | <p>E-Waste Collection and Recycling Processes</p> <p>E-Waste Collection Mechanisms: Methods for collecting e-waste from households, industries, and institutions, Role of take-back programs, collection centres, and awareness campaigns. E-Waste Recycling Techniques: Dismantling of electronic devices: Manual and automated methods, Extraction and recycling of valuable materials. E-Waste Recycling Technologies: Introduction to mechanical, chemical, and biological recycling technologies, Advanced recycling processes like shredding, thermal processes, and material recovery. Challenges in E-Waste Recycling: Technical and financial barriers in the e-waste recycling process, Lack of awareness, illegal recycling, and improper handling of toxic materials</p> | 20 | 09 |
| 4 | <p>E-Waste Management Strategies and Policies</p> <p>E-Waste Management Framework: Understanding a circular economy model in relation to e-waste, Effective e waste management strategies. E-Waste Policy and Regulations: National and international policies regarding e waste, India's E-Waste Management Rules 2016 and Extended Producer Responsibility (EPR). Role of Stakeholders in E-Waste</p> | 20 | 09 |

| | | | |
|----------|--|-----------|-----------|
| | Management: Roles of government, industry, manufacturers, and consumers in managing e-waste, Importance of public-private partnerships and collaborations for sustainable e-waste management. | | |
| 5 | Future of E-Waste Management and Sustainable Solutions Innovations in E-Waste Management: Emerging technologies for safer e-waste recycling, Development of ecofriendly alternatives to hazardous materials in electronics. Role of Consumers in E-Waste Management: Importance of consumer awareness in e-waste management (e.g., responsible disposal, repair, and reuse), Programs like take-back schemes and drop-off locations for consumers to recycle their electronics. The Future Outlook of E-Waste Management: Predictions for e-waste growth in the coming years and solutions to address this issue, the potential role of global collaboration and new technologies in reducing the environmental impact of e-waste. | 20 | 09 |

i. Text Book and Reference Book:

1. EE-Waste Management: From Waste to Resource by S. K. Agarwal.
2. E-Waste Management and Recycling: A Handbook for the Environmentally Conscious by L. E. L. C. M. G. Gupta,
3. Environmental Impact of E-Waste Recycling by R. K. Gupta
4. Handbook of E-Waste Management: From Waste to Resources by B. D. Agrawal