2023
ENGINEERING CURRICULUM
B.Tech. Regular / Honors
B. Tech (Regular-Full time)

(Effective for the students admitted into I year from the Academic Year 2023-24 onwards)

&

B.Tech.(Lateral Entry Scheme)

(Effective for the students admitted into II year through Lateral Entry Scheme from the Academic Year 2024 - 25 onwards)
B.TECH. - COURSE STRUCTURE – R23
(Applicable from the academic year 2023-24 onwards)

INDUCTION PROGRAMME

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**Group-A Branches:**
CSE, CSE (AI&ML), AI&DS, Information Technology

**Group-B Branches:**
ECE & EEE

**Group-C Branches:**
Aerospace Engineering, Civil Engineering, Mechanical Engineering
### B.Tech I and II semester course codes (R23 Regulations)

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**Total** | 14 | 0 | 10 | 19

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### B.Tech. – I Year I Semester (Group-B Branches- ECE, EEE - 05)

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**Total** | 13 | 0 | 12 | 19

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### B.Tech. – I Year I Semester (Group-C Branches- CE, ASE, ME - 03)

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## B.Tech. – I Year II Semester (Group-A Branches - CSE, CSM, AI&DS, IT - 10)

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Mandatory Community Service Project Internship of 08 weeks duration during summer vacation
# B.Tech. – III Year I Semester

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Mandatory Industry Internship of 08 weeks duration during summer vacation
### B.Tech. – IV Year I Semester

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FIRST YEAR SYLLABUS
COMMUNICATIVE ENGLISH
(Common to All Branches of Engineering)

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

Course Outcomes:
CO1 Understand the context, topic, and pieces of specific information from social or Transactional dialogues. Understand
CO2 Apply grammatical structures to formulate sentences and correct word forms. Apply
CO3 Use discourse markers to speak clearly on a specific topic in informal discussions. Apply
CO4 Read / Listen the texts and write summaries based on global comprehension of these texts. Understand
CO5 Prepare a coherent paragraph, essay, and resume. Apply

UNIT I
Lesson: HUMAN VALUES: Gift of Magi (Short Story)
Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.
Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.
Grammar: Parts of Speech, Basic Sentence Structures-forming questions
Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT II
Lesson: NATURE: The Brook by Alfred Tennyson (Poem)
Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts.
Speaking: Discussion in pairs/small groups on specific topics followed by short structure talks.
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing: Structure of a paragraph - Paragraph writing (specific topics)
Grammar: Cohesive devices - linkers, use of articles and zero article; prepositions.
Vocabulary: Homonyms, Homophones, Homographs.

UNIT III
Lesson: BIOGRAPHY: Elon Musk

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

UNIT IV
Lesson: INSPIRATION: The Toys of Peace by Saki

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

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

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

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

Reference Books:

Web Resources:

GRAMMAR:

1. www.bbc.co.uk/learningenglish
4. https://www.learngrammar.net/

VOCABULARY

2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA
COMMUNICATIVE ENGLISH LAB
(Common to All Branches of Engineering)

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

Course Outcomes:
CO1 Understand the different aspect of the English language proficiency with emphasis on LSRW skills. Understand
CO2 Apply Communication Skills through various language learning activities. Apply
CO3 Identifying the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking, comprehension. Understand
CO4 Exhibit professionalism in participating in debates and group discussions. Apply

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

Suggested Software:
- Walden Infotech
- Young India Films

Reference Books:
Web Resources:

Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

Voice & Accent:

1. https://www.youtube.com/user/letstalkaccent/videos
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUGJVeXc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA
LINEAR ALGEBRA & CALCULUS
(Common to All Branches of Engineering)

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

Course Outcomes: At the end of the course, the student will be able to

CO1 Apply matrix algebra techniques to solve engineering problems.  Apply
CO2 Use Eigen values and Eigen vectors concept to find nature of quadratic form, inverse and powers of matrix.  Apply
CO3 Expand various functions using Mean value theorems.  Understand
CO4 Understand the concepts of functions of several variables which are useful in optimization.  Understand
CO5 Evaluate areas and volumes by using double and triple integrals.  Apply

UNIT I  Matrices

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

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

UNIT IV  Partial differentiation and Applications (Multi variable calculus)
Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Directional derivative, Taylor’s and Maclaurin’s series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT V  Multiple Integrals (Multi variable Calculus)
Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).
Textbooks:


Reference Books:

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
(Common to All Branches of Engineering)

Course Objectives:

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

Course Outcomes: At the end of the course, the student will be able to

CO1 Solve the differential equations related to various engineering fields (Unit – I&II)        Apply
CO2 Apply knowledge of partial differentiation in modelling and solving of Partial differential equations. Apply
CO3 Interpret the physical meaning of different operators such as gradient, curl and divergence. Apply
CO4 Evaluate the work done against a field, circulation and flux using Vector Calculus. Apply

UNIT I                  Differential equations of first order and first degree


UNIT II                Linear differential equations of higher order (Constant Coefficients)

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

UNIT III                Partial Differential Equations


UNIT IV                 Vector differentiation

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

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

Textbooks:


Reference Books:

ENGINEERING CURRICULUM - 2023

B.Tech. R23 Regulations

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ENGINEERING PHYSICS
(Common for all branches of Engineering)

Course Objectives:

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

Course Outcomes:

CO1: Analyze the intensity variation of light due to interference, diffraction, and Polarization (Apply).
CO2: Understand the basics of crystals and their structures (Understand).
CO3: Summarize various types of polarization of dielectrics and classify the magnetic materials (Understand)
CO4: Explain fundamentals of quantum mechanics and free electron theory of metals (Understand).
CO5: Identify the type of semiconductor using Hall Effect (Apply).

UNIT I Wave Optics
Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative). Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol’s Prism -Half wave and Quarter wave plates.

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

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

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


UNIT IV Quantum Mechanics and Free electron Theory
Quantum Mechanics: Dual nature of matter – Heisenberg’s Uncertainty Principle – Significance and properties of wave function – Schrodinger’s time independent and dependent wave equations – Particle in a one-dimensional infinite potential well.
Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy

UNIT V Semiconductors

Textbooks:

Reference Books:
3. Engineering Physics” - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press. 2010

Web Resources: https://www.loc.gov/rr/scitech/selected-internet/physics.html
ENGINEERING PHYSICS LAB
(Common to All Branches of Engineering)

Course Objectives:

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

Course Outcomes: The students will be able to

CO1: Analyze the wave properties of light using optical instruments (Apply).

CO2: Estimate the elastic modulii of various materials and acceleration due to gravity (Apply).

CO3: Demonstrate the vibrations in stretched strings (Understand).

CO4: Evaluate dielectric constant and magnetic field of circular coil carrying current (Apply).

CO5: Examine the characteristics of semiconductor devices (Apply).

List of Experiments:

1. Determination of radius of curvature of a given Plano-convex lens by Newton’s rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Verification of Brewster’s law
4. Determination of dielectric constant using charging and discharging method.
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
7. Estimation of Planck’s constant using photoelectric effect.
8. Determination of the resistivity of semiconductors by four probe methods.
10. Magnetic field along the axis of a current carrying circular coil by Stewart Gee’s Method.
11. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
13. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
15. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
17. Determination of young’s modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde’s experiment.
Note: Any TEN of the listed experiments are to be conducted. Out of which any TWO experiments may be conducted in virtual mode.

References:

Web Resources
- www.vlab.co.in
ENGINEERING CHEMISTRY
(Common to Civil, Chemical, Mechanical Engineering and allied branches)

Course Objectives:
- To enable the students to understand the fundamental concepts of chemistry and to provide them with the knowledge of industrial problems and finding the solutions.
- To understand quality of water, fuels for various applications, polymers, electrochemistry and batteries.
- To learn the basic concepts of surface chemistry and identify the significance of modern engineering materials.

Course Outcomes: At the end of the course, the students will be able to
CO1: Identify the troubles due to hardness of water and its maintenance in industrial applications. (Understand)
CO2: Apply Nernst equation in calculating cell potentials, compare batteries for different applications and outline the principles of corrosion for design and effective maintenance of various devices. (Understand)
CO3: Outline the importance of polymers and alternate fuels. (Understand)
CO4: Summarize the suitability of engineering materials like composites, refractories, lubricants, and building materials. (Understand)
CO5: Understand the concepts of collides, micelles and nanomaterials. (Understand)

UNIT I Water Technology
Soft and hardwater, Estimation of hardness of water by EDTA Method, Estimation of dissolved Oxygen - Boiler troubles – Priming, foaming, scale and sludge, Caustic embrittlement, Industrial water treatment – Specifications for drinking water, Bureau of Indian Standards (BIS) and World health organization (WHO) standards, Ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electrodialysis.

UNIT II Electrochemistry and Applications
Electrodes – electrochemical cell, Nernst equation, cell potential calculations. Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (NiCad), and lithium ion batteries- working principle of the batteries including cell reactions; Fuel cells-Basic Concepts, the principle and working of hydrogen-oxygen Fuel cell.
Corrosion: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry electrochemical corrosion, Pilling Bedworth ratios and uses, Factors affecting the corrosion, cathodic and anodic protection, electroplating and electro less plating (Nickel and Copper).

UNIT III Polymers and Fuel Chemistry
Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth polymerization. Thermoplastics and Thermo-setting plastics-: Preparation, properties and applications of poly styrene. PVC Nylon 6,6 and Bakelite.
Elastomers – Preparation, properties and applications of Buna S, Buna N, Thiokol rubbers.

Fuels – Types of fuels, calorific value of fuels, numerical problems based on calorific value; Analysis of coal (Proximate and Ultimate analysis), Liquid Fuels, refining of petroleum, Octane and Cetane number- alternative fuels- propane, methanol, ethanol and bio fuel-bio diesel.

UNIT IV Modern Engineering Materials

Composites- Definition, Constituents, Classification- Particle, Fibre and Structural reinforced composites, properties and Engineering applications
Refractories- Classification, Properties, Factors affecting the refractory materials and Applications.
Lubricants- Classification, Functions of lubricants, Mechanism, Properties of lubricating oils – Viscosity, Viscosity Index, Flash point, Fire point, Cloud point, saponification and Applications.
Building materials- Portland Cement, constituents, Setting and Hardening of cement.

UNIT V Surface Chemistry and Nanomaterials

Introduction to surface chemistry, colloids, nanometals and nanometal oxides, micelle formation, synthesis of colloids (Braggs Method), chemical and biological methods of preparation of nanometals and metal oxides, stabilization of colloids and nanomaterials by stabilizing agents, adsorption isotherm (Freundlich and Longmuir), BET equation (no derivation) applications of colloids and nanomaterials – catalysis, medicine, sensors, etc.

Textbooks:
2. Peter Atkins, Julio de Paula and James Keeler, Atkins’ Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:
ENGINEERING CHEMISTRY LAB
(Common to Civil, Chemical, Mechanical Engineering & allied branches)

Course Objectives:
- To enable the students to analyze water samples and perform different types of volumetric titrations.
- To provide an overview of preparation of polymers, nanomaterials and analytical techniques.
- To measure the important parameters of fuels, lubricants and composition of cement.

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

CO1: Analyze important parameters of water to check its suitability for drinking purposes and industrial applications. (Analyze)

CO2: Acquire practical knowledge related to preparation of Bakelite and nanomaterials. (Apply)

CO3: Distinguish different types of titrations in volumetric analysis after performing the experiments listed in the syllabus. (Apply)

CO4: To estimate the amount of calcium in cement and the strength of acid present in Pb-Acid battery. (Apply)

CO5: Improve individual / teamwork skills, communication and report writing skills with ethical values. (Apply)

List of Experiments:
1. Determination of Hardness of a groundwater sample.
2. Estimation of Dissolved Oxygen by Winkler’s method
3. Determination of Strength of an acid in Pb-Acid battery
4. Preparation of a polymer (Bakelite)
5. Determination of percentage of Iron in Cement sample by colorimetry
6. Estimation of Calcium in port land Cement
7. Preparation of nanomaterials by precipitation method.
8. Adsorption of acetic acid by charcoal
9. Determination of percentage Moisture content in a coal sample
10. Determination of Viscosity of lubricating oil by Redwood Viscometer 1
11. Determination of Viscosity of lubricating oil by Redwood Viscometer 2
12. Determination of Calorific value of gases by Junker’s gas Calorimeter

Reference:
CHEMISTRY
(Common to EEE, ECE, CSE, IT & allied branches)

Course Objectives:
- To enable the students to understand the fundamental concepts of chemistry and to provide them with the knowledge of industrial problems and finding the solutions.
- To strengthen the basic concepts of bonding models, advanced engineering materials, electrochemistry, batteries and polymers.
- To introduce instrumental methods and their applications.

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

CO1: Understand the fundamentals of quantum mechanics and molecular orbital energy diagrams for molecules. (Understand)

CO2: Summarize the suitability of advanced materials like semiconductors, superconductors, super capacitors and nano materials, in advanced fields. (Understand)

CO3: Apply Nernst equation in calculating cell potentials and understand conduct metric, potentiometric titrations, electrochemical sensors and compare batteries for different applications. (Understand)

CO4: Outline the importance of polymers and conducting polymers in advanced technologies. (Understand)

CO5: Understand the fundamentals of UV-Visible, IR spectroscopic techniques and basic principles of chromatographic techniques. (Understand)

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

UNIT II Modern Engineering materials
Semiconductors – Introduction, basic concept, application
Super conductors-Introduction basic concept, applications.
Supercapacitors: Introduction, Basic Concept-Classification – Applications.
Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

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

Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

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

UNIT IV Polymer Chemistry

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.

Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.

Elastomers–Buna-S, Buna-N–preparation, properties and applications.


UNIT V Instrumental Methods and Applications


Textbooks:
2. Peter Atkins, Julio de Paula and James Keeler, Atkins’ Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:
CHEMISTRY LAB  
(Common to EEE, ECE, CSE, IT & allied branches)

Course Objectives:  
- To enable the students to perform different types of volumetric titrations.  
- To provide an overview of preparation of polymers, nanomaterials and analytical techniques.

Course Outcomes: At the end of the course, the students will be able to  
CO1: Distinguish different types of titrations in volumetric analysis after performing the 
  experiments listed in the syllabus. (Analyze)  
CO2: Acquire practical knowledge related to preparation of Bakelite and nanomaterials. (Apply)  
CO3: Measure the strength of acid present in Pb-Acid battery. (Apply)  
CO4: Analyze important parameters of water to check its suitability for drinking purpose and 
  industrial applications. (Analyze)  
CO5: Improve individual / teamwork skills, communication and report writing skills with ethical 
  values. (Apply)

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

Reference:  
  by J. Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar
PART A: BASIC CIVIL ENGINEERING

Course Objectives:
- Get familiarized with the scope and importance of Civil Engineering sub-divisions.
- Introduce the preliminary concepts of surveying.
- Acquire preliminary knowledge on Transportation and its importance in nation’s economy.
- Get familiarized with the importance of quality, conveyance and storage of water.
- Introduction to basic civil engineering materials and construction techniques.

Course Outcomes: On completion of the course, the student should be able to:

CO1: Describe various sub-divisions of Civil Engineering and to appreciate their role in societal development. (Understand)

CO2: Outline the concepts of surveying and obtain the theoretical measurement of distances, angles and levels through surveying. (Understand)

CO3: Classify the various materials used in construction and highway engineering and identify their appropriate usage as per the needs. (Understand)

CO4: Illustrate the fundamental principles involved in transportation network system, their individual components and their engineering importance. (Understand)

CO5: Explain the quality parameters of various water sources and functions of selected water storage and conveyance structures. (Understand)

UNIT I

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


Textbooks:

Reference Books:

PART B: BASIC MECHANICAL ENGINEERING

Course Objectives: The students after completing the course are expected to
• Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
• Explain different engineering materials and different manufacturing processes.
• Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

Course Outcomes: On completion of the course, the student should be able to

CO1: Summarize the different manufacturing processes.(Remember)
CO2: Explain the basics of thermal engineering and its applications. (Understand)
CO3: Illustrate the working of different mechanical power transmission systems and power plants. (Understand)
CO4: Describe the basics of robotics and its applications. (Understand)
UNIT I

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

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

UNIT II

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

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

UNIT III

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

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

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

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

Textbooks:

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.

Reference Books:

1. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.
3. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications
ENGINEERING WORKSHOP
(Common to All branches of Engineering)

Course Objectives:
To familiarize students with wood working, sheet metal operations, fitting, electrical house wiring skills, and basic repairs of two-wheeler vehicle.

Course Outcomes:

CO1: Identify workshop tools and their operational capabilities. (Remember)
CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry, and welding. (Understand)
CO3: Modal various basic prototypes in fitting trade. (Apply)
CO4: Apply basic electrical engineering knowledge for House Wiring Practice (Apply)

SYLLABUS

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


Reference Books:

Course Objectives
To expose to the field of electrical & electronics engineering, laws and principles of electrical/electronic engineering and to acquire fundamental knowledge in the relevant field.

Course Outcomes: After the completion of the course students will be able to
CO1: Extract electrical variables of AC & DC circuits using fundamental laws. (Understand)
CO2: Understand the operation of electrical machines and measuring instruments. (Understand)
CO3: Classify various energy resources, safety measures and interpret electricity bill generation in electrical systems. (Understand)

PART A: BASIC ELECTRICAL ENGINEERING

UNIT I DC & AC Circuits


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

UNIT II Machines and Measuring Instruments

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

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

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

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


Textbooks:

Reference Books:

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

PART B: BASIC ELECTRONICS ENGINEERING

Course Objectives:
- To teach the fundamentals of semiconductor devices and its applications, principles of digital electronics.

Course Outcomes: After the completion of the course students will be able to

CO4: Interpret the characteristics of various semiconductor devices (Knowledge)
CO5: Infer the operation of rectifiers, amplifiers. (Understand)
CO6: Contrast various logic gates, sequential and combinational logic circuits. (Understand)
UNIT I  SEMICONDUCTOR DEVICES


UNIT II  BASIC ELECTRONIC CIRCUITS AND INSTRUMENTATION

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

UNIT III  DIGITAL ELECTRONICS

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

Textbooks:


Reference Books:


End examination pattern:

i) Question paper shall be in two parts viz., Part A and Part B with equal weightage of 35 marks each.
ii) In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 1 mark.
iii) In each part, questions from 2 to 4, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
iv) The questions from 2 to 4 shall be set by covering one unit of the syllabus for each question.
ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP
(Common to All branches of Engineering)

Course Objectives:

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

Course Outcomes:

After completion of this course, the student will be able to

CO1. Compute voltage, current and power in an electrical circuit. (Apply)
CO2. Compute medium resistance using Wheat stone bridge. (Apply)
CO3. Discover critical field resistance and critical speed of DC shunt generators. (Apply)
CO4. Estimate reactive power and power factor in electrical loads. (Understand)
CO5. Plot the characteristics of semiconductor devices. (Apply)
CO6. Demonstrate the working of various logic gates using ICs. (Understand)

Activities:

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Breadboard, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
   • Provide some exercises so that hardware tools and instruments are learned to be used by the students.

2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
   • Provide some exercises so that measuring instruments are learned to be used by the students.

3. Components:
   • Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC’s etc.) – Functionality, type, size, colour coding package, symbol, cost etc.

   • Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments
PART A: ELECTRICAL ENGINEERING LAB

List of experiments:

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
7. Calculation of Electrical Energy for Domestic Premises

Reference Books:

Note: Minimum Six Experiments to be performed.

PART B: ELECTRONICS ENGINEERING LAB

Course Objectives:
• To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

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

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

References:

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.
IT WORKSHOP
(Common to all branches of Engineering)

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

Course Outcomes:

CO1: Identify the components of a PC and troubleshooting the malfunctioning of PC. (Apply)
CO2: Develop presentation/documentation using Office tools and LaTeX. (Apply)
CO3: Build dialogs and documents using ChatGPT. (Apply)
CO4: Improve individual / teamwork skills, communication and report writing skills with ethical values.

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

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

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

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

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

Internet & World Wide Web
Task 1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is
no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

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

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

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

**LaTeX and WORD**

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

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

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

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

**EXCEL**

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

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

**Task 2:** Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,
LOOKUP/VLOOKUP
Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

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


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

AI TOOLS – ChatGPT
Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.
   - Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas
   - Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.
   - Ex:Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Reference Books:
1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
ENGINEERING CURRICULUM - 2023

B.Tech. R23 Regulations

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ENGINEERING GRAPHICS
(Common to All branches of Engineering)

Course Objectives:

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
- To impart knowledge on the projection of points, lines and plane surfaces
- To improve the visualization skills for better understanding of projection of solids
- To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
- To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

Course Outcomes:

CO1: Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections. (Understand)

CO2: Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views. (Apply)

CO3: Understand and draw projection of solids in various positions in first quadrant. (Apply)

CO4: Able to draw the development of surfaces of simple objects (Apply)

CO5: Prepare isometric and orthographic sections of simple solids. (Apply)

UNIT I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods. (Covered theoretically in class. Not for the end examination)

Scales: Plain scales, diagonal scales and vernier scales. (Covered theoretically in class. Not for the end examination)

Curves: Construction of ellipse, parabola and hyperbola by general method only, Cycloids, Involutes, Normal and tangent to Curves.

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

**Projections of Straight Lines:** Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes.

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

UNIT III

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

UNIT IV

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

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

UNIT V

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

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

Textbook:

Reference Books:
INTRODUCTION TO PROGRAMMING
(Common to All branches of Engineering)

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

Course Outcomes: A student after completion of the course will be able to

CO1: Understand basics of computers, concept of algorithms and flowcharts. (Understand)
CO2: Understand the features of C language. (Understand)
CO3: Interpret the problem and develop an algorithm to solve it. (Apply)
CO4: Implement various algorithms using the C programming language. (Apply)
CO5: Develop skills required for problem-solving and optimizing the code (Apply)

UNIT I Introduction to Programming and Problem Solving
History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program-Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.

Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

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

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

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

UNIT V Functions & File Handling
Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Basics of File Handling
**Note:** The syllabus is designed with C Language as the fundamental language of implementation.

**Textbooks:**

**Reference Books:**
COMPUTER PROGRAMMING LAB
(Common to All branches of Engineering)

Course Objectives:

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

Course Outcomes:
CO1: Read, understand, and trace the execution of programs written in C language. (Understand)
CO2: Apply the right control structure for solving the problem. (Apply)
CO3: Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, pointers and files in C. (Apply)
CO4: Improve individual / teamwork skills, communication and report writing skills with ethical values.

UNIT I

WEEK 1
Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:
Tutorial 1: Problem-solving using Computers.
Lab1: Familiarization with programming environment
   i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
   ii) Exposure to Turbo C, gcc
   iii) Writing simple programs using printf(), scanf()

WEEK 2
Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

Suggested Experiments/Activities:
Lab 1: Converting algorithms/flow charts into C Source code.
Developing the algorithms/flowcharts for the following sample programs
   i) Sum and average of 3 numbers
   ii) Conversion of Fahrenheit to Celsius and vice versa
   iii) Simple interest calculation
WEEK 3
Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:
Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.
   i) Finding the square root of a given number
   ii) Finding compound interest
   iii) Area of a triangle using heron’s formulae
   iv) Distance travelled by an object

UNIT II

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

Suggested Experiments/Activities:
Tutorial 4: Operators and the precedence and as associativity:
Lab 4: Simple computational problems using the operator’ precedence and associativity
   i) Evaluate the following expressions.
      a. A+B*C+(D*E) + F*G
      b. A/B*C+B+A*D/3
      c. A+++B---A
      d. J= (i++) + (++i)
   ii) Find the maximum of three numbers using conditional operator
   iii) Take marks of 5 subjects in integers, and find the total, average in float

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

Suggested Experiments/Activities:
Tutorial 5: Branching and logical expressions:
Lab 5: Problems involving if-then-else structures.
   i) Write a C program to find the max and min of four numbers using if-else.
   ii) Write a C program to generate electricity bill.
   iii) Find the roots of the quadratic equation.
   iv) Write a C program to simulate a calculator using switch case.
   v) Write a C program to find the given year is a leap year or not.

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

Suggested Experiments/Activities:

**Tutorial 6:** Loops, while and for loops

**Lab 6:** Iterative problems e.g., the sum of series
- i) Find the factorial of given number using any loop.
- ii) Find the given number is a prime or not.
- iii) Compute sine and cos series
- iv) Checking a number palindrome
- v) Construct a pyramid of numbers.

UNIT III

**WEEK 7:**

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

Suggested Experiments/Activities:

**Tutorial 7:** 1 D Arrays: searching.

**Lab 7:** 1D Array manipulation, linear search
- i) Find the min and max of a 1-D integer array.
- ii) Perform linear search on 1D array.
- iii) The reverse of a 1D integer array
- iv) Find 2’s complement of the given binary number.
- v) Eliminate duplicate elements in an array.

**WEEK 8:**

**Objective:** Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:

**Tutorial 8:** 2 D arrays, sorting and Strings.

**Lab 8:** Matrix problems, String operations, Bubble sort
- i) Addition of two matrices
- ii) Multiplication two matrices
- iii) Sort array elements using bubble sort
- iv) Concatenate two strings without built-in functions
- v) Reverse a string using built-in and without built-in string functions

UNIT IV

**WEEK 9:**

**Objective:** Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array
and memory de-allocation using malloc(), calloc(), realloc() and free() functions. Gain experience processing command-line arguments received by C

**Suggested Experiments/Activities:**
**Tutorial 9:** Pointers, structures and dynamic memory allocation
**Lab 9:** Pointers and structures, memory dereference.
   i) Write a C program to find the sum of a 1D array using malloc()
   ii) Write a C program to find the total, average of n students using structures
   iii) Enter n students data using calloc() and display failed students list
   iv) Read student name and marks from the command line and display the student details along with the total.
   v) Write a C program to implement realloc()

**WEEK 10:**
**Objective:** Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

**Suggested Experiments/Activities:**
**Tutorial 10:** Bitfields, Self-Referential Structures, Linked lists
**Lab10:** Bitfields, linked lists
Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit-fields
   i) Create and display a singly linked list using self-referential structure.
   ii) Demonstrate the differences between structures and unions using a C program.
   iii) Write a C program to shift/rotate using bitfields.
   iv) Write a C program to copy one structure variable to another structure of the same type.

**UNIT V**

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

**Suggested Experiments/Activities:**
**Tutorial 11:** Functions, call by value, scope and extent,
**Lab 11:** Simple functions using call by value, solving differential equations using Eulers theorem.
   i) Write a C function to calculate NCR value.
   ii) Write a C function to find the length of a string.
   iii) Write a C function to transpose of a matrix.
   iv) Write a C function to demonstrate numerical integration of differential equations using Euler’s method

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

**Tutorial 12:** Recursion, the structure of recursive calls

**Lab 12:** Recursive functions

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

**WEEK 13:**

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

**Suggested Experiments/Activities:**

**Tutorial 13:** Call by reference, dangling pointers

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

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

**WEEK 14:**

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

**Suggested Experiments/Activities:**

**Tutorial 14:** File handling

**Lab 14:** File operations

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

**Textbooks:**


**Reference Books:**

2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE
ENGINEERING MECHANICS
(Common to Civil, Mechanical Engineering & Allied branches)

Course Objectives:
- To get familiarized with different types of force systems.
- To draw accurate free body diagrams representing forces and moments acting on a body to analyze the equilibrium of system of forces.
- To teach the basic principles of center of gravity, centroid and moment of inertia and determine them for different simple and composite bodies.
- To apply the Work-Energy method to particle motion.
- To understand the kinematics and kinetics of translational and rotational motion of rigid bodies.

Course Outcomes: On Completion of the course, the student should be able to

CO1: Determine the resultant of coplanar concurrent and non-concurrent force systems (Apply)

CO2: Apply static equilibrium conditions to determine unknown planar force systems and determine the frictional forces for bodies in contact. (Apply)

CO3: Calculate the centroids, center of gravity and moment of inertia of different geometrical shapes. (Apply)

CO4: Apply the principles of work-energy and impulse-momentum to solve the problems of rectilinear and curvilinear motion of a particle. (Apply)

CO5: Solve the problems involving the translational and rotational motion of rigid bodies. (Apply)

UNIT I

Systems of Forces: Coplanar Concurrent Forces– Coplanar Non-Concurrent Forces, moment of force, applications- Couples and Resultant of Force Systems.

UNIT II

Friction: Introduction, Coulomb’s laws of dry friction, coefficient of friction, Cone of Static friction, limiting friction and impending motion of blocks resting on horizontal and inclined planes.
UNIT III

Centroid: Centroids of simple figures (from basic principles)–Centroids of I, T, C, L Sections.
Centre of Gravity: Centre of gravity of simple bodies (from basic principles).
Area Moments of Inertia: Definition, Moment of inertia of I, T, C, L Sections– Polar Moment of Inertia, Transfer Theorem.
Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia for simple objects.

UNIT IV


UNIT V

Rigid body Motion: Kinematics and Kinetics of rigid bodies in translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse Momentum method and simple applications.

Textbooks:

Reference Books:
ENGINNEERING MECHANICS & BUILDING PRACTICES LAB
(Civil Engineering & allied branches)

Course Objectives: The students completing the course are expected to
- Understand the layout of a building, concepts of Non-Destructive Testing and different Alternative Materials.
- Verify the Law of Parallelogram of Forces and Lami’s theorem.
- Determine the coefficients of friction of Static and Rolling friction and Centre of gravity of different plane Lamina.

Course Outcomes: On completion of the course, the student should be able to:

Course Outcomes: On completion of the course, the student should be able to:
CO1: Illustrate the purpose and working of various tools and materials used in Civil Engineering practice (Understand).
CO2: Demonstrate the plumbing and safety practices adopted in construction industry and documentation aspects of quality testing of civil engineering materials (Understand).
CO3: Verify the fundamentals involved in the applications of engineering mechanics (Apply)

Students have to perform any 10 of the following Experiments:

PART-A
1. To study various types of tools used in construction.
2. Study of Alternative Materials like M-sand, Fly ash, Sea Sand etc.
3. Field-Visit to understand the Quality Testing - report.
4. Safety Practices in Construction industry
5. Demonstration of Non-Destructive Testing - using Rebound Hammer & UPV

PART-B
1. Forces in Pin Jointed Trusses
2. Experimental Proof of Lami’s Theorem
3. Verification of Law of Parallelogram of Forces.
4. Determination of Centre of Gravity of different shaped Plane Lamina.
5. Determination of coefficient of Static and Rolling Friction.
6. Verification of Law of Moment using Rotation Disc Apparatus and Bell Crank Lever
ENGINEERING MECHANICS LAB
(Mechanical Engineering & allied branches)

Course Objectives: The students completing the course are expected to:
- Verify the Law of Parallelogram and Triangle of Forces.
- Determine the coefficients of friction of Static and Rolling friction and Centre of gravity of different plane Lamina.
- Analyse the system of Pulleys and Moment of Inertia of Compound Pendulum and Flywheel.

Course Outcomes:

CO1: Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller. (Apply)

CO2: Verify Law of Polygon of forces and Law of Moment using force polygon and bell crank lever. (Apply)

CO3: Determine the Centre of gravity and Moment of Inertia of different configurations. (Apply)

CO4: Apply the equilibrium conditions of a rigid body under the action of different force systems (Apply)

Students have to perform any 10 of the following Experiments:

List of Experiments:

1. Verification of Law of Parallelogram of Forces.
2. Verification of Law of Triangle of Forces.
3. Verification of the Law of polygon for coplanar-concurrent forces acting on a particle in equilibrium and to find the value of unknown forces considering particle to be in equilibrium using universal force table.
4. Determination of coefficient of Static and Rolling Frictions
5. Determination of Centre of Gravity of different shaped Plane Lamina.
6. Verification of the conditions of equilibrium of a rigid body under the action of coplanar non-concurrent, parallel force system with the help of a simply supported beam.
7. Study of the systems of pulleys and draw the free body diagram of the system.
8. Determine the acceleration due to gravity using a compound pendulum.
9. Determine the Moment of Inertia of the compound pendulum about an axis perpendicular to the plane of oscillation and passing through its centre of mass.
10. Determine the Moment of Inertia of a Flywheel.
11. Verification of Law of Inertia using Rotation Disc Apparatus and Bell Crank Lever.

References:

ELECTRICAL CIRCUIT ANALYSIS -I
(EEE & allied branches)

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

Course Outcomes:
CO1. Understand various circuit elements and network reduction techniques (Understand)
CO2. Compute variables associated with magnetic circuits (Apply)
CO3. Apply fundamental laws to compute electrical variables in DC & AC circuits (Apply)
CO4. Analyze resonance circuits and construct locus diagrams (Apply)
CO5. Apply circuit theorems to compute electrical variables in DC & AC circuits (Apply)

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

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

UNIT  III SINGLE PHASE CIRCUITS
UNIT IV RESONANCE AND LOCUS DIAGRAMS
Series Resonance: Characteristics of a series resonant circuit, Q-factor, selectivity and bandwidth, expression for half power frequencies; Parallel resonance: Q-factor, selectivity and bandwidth; Locus diagram: RL, RC, RLC with R, L and C variables.

UNIT V NETWORK THEOREMS (DC & AC EXCITATIONS)
Superposition theorem, Thevenin’s theorem, Norton’s theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman’s theorem and compensation theorem

Textbooks:

Reference Books:

Web Resources:
1. https://onlinecourses.nptel.ac.in/noc23_ee81/preview
2. https://nptel.ac.in/courses/108104139
3. https://nptel.ac.in/courses/108106172
4. https://nptel.ac.in/courses/117106108
ELECTRICAL CIRCUITS LAB
(EEE & allied branches)

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

Course Outcomes:

CO1: Demonstrate fundamental circuit laws, network theorems, node and mesh analysis of electrical circuits (Apply).
CO2: Design resonance circuit for given specifications (Apply).
CO3: Analyze the RL and RC circuits with respect to parameter variation using locus diagrams (Analyze).
CO4: Determine self, mutual inductances and coefficient of coupling values, parameters of choke coil (Apply).

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

Reference Books:
Network Analysis
(ECE & allied branches)

Course Objectives:

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

Course Outcomes: At the end of this course students will demonstrate the ability to

CO1: Apply fundamental laws and theorems to compute electrical variables of DC circuits (Apply)
CO2: Analyze electrical networks during transients in the Laplace domain (Apply).
CO3: Apply fundamental laws and theorems to compute electrical variables of AC electrical circuits (Apply)
CO4: Analyze resonance circuits (Analyse)
CO5: Evaluate variables associated with magnetic circuits (Apply)
CO6: Compute the parameters of a two-port network (Apply).

UNIT I

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

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

UNIT II

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

UNIT III


UNIT IV

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

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

UNIT V


Textbooks:


Reference Books:

NETWORK ANALYSIS AND SIMULATION LABORATORY
(ECE & allied branches)

Course Objectives:
- To gain hands on experience in verifying Kirchoff’s laws and network theorems
- To analyze transient behavior of circuits
- To study resonance characteristics
- To determine 2-port network parameters

Course Outcomes:
CO1: Demonstrate fundamental circuit laws, network theorems, node and mesh analysis of electrical circuits (Apply).
CO2: Design resonance circuit for given specifications (Analyze).
CO3: Measure time constants of RL & RC circuits (Apply).
CO4: Analyze the 1st and 2nd order circuits with respect to parameter variation (Analyze).
CO5: Characterize and model the network in terms of all network parameters (Apply).

The following experiments need to be performed using both Hardware and simulation Software.

The experiments need to be simulated using software and the same need to be verified using the hardware.

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

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

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

References:

DATA STRUCTURES
(Common to CSE, IT & allied branches)

Course Objectives:

- To provide the knowledge of basic data structures and their implementations.
- To understand importance of data structures in context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving.

Course Outcomes: At the end of the course, Student will be able to

CO1: Understand the role of linear and non linear data structures in organizing and accessing data (Understand)
CO2: Implement abstract data type (ADT) and data structures for given application. (Apply)
CO3: Design algorithms based on techniques like linked list, stack, queue, trees etc. (Apply)
CO4: Apply the appropriate linear and nonlinear data structure techniques for solving a problem. (Apply)
CO5: Design hash-based solutions for specific problems. (Apply)

UNIT I
Introduction to Linear Data Structures: Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures. Searching Techniques: Linear & Binary Search, Sorting Techniques: Bubble sort, Selection sort, Insertion Sort

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

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

UNIT IV
Queues: Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc.
Deques: Introduction to deques (double-ended queues), Operations on deques and their applications.

UNIT V
Trees: Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversal
Hashing: Brief introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching, etc.
Textbooks:

Reference Books:
1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick
DATA STRUCTURES LAB
(Common to CSE, IT & allied branches)

Course Objectives:
The course aims to strengthen the ability of the students to identify and apply the suitable data structure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures.

Course Outcomes: At the end of the course, Student will be able to

CO1: Apply Linear Data Structures for organizing the data efficiently (Apply)

CO2: Apply Non-Linear Data Structures to organize data efficiently (Apply)

CO3: Develop and implement hashing techniques for solving problems. (Apply)

CO4: Improve individual / teamwork skills, communication and report writing skills with ethical values.

List of Experiments:

Exercise 1: Array Manipulation
   i) Write a program to reverse an array.
   ii) C Programs to implement the Searching Techniques – Linear & Binary Search
   iii) C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort

Exercise 2: Linked List Implementation
   i) Implement a singly linked list and perform insertion and deletion operations.
   ii) Develop a program to reverse a linked list iteratively and recursively.
   iii) Solve problems involving linked list traversal and manipulation.

Exercise 3: Linked List Applications
   i) Create a program to detect and remove duplicates from a linked list.
   ii) Implement a linked list to represent polynomials and perform addition.
   iii) Implement a double-ended queue (deque) with essential operations.

Exercise 4: Double Linked List Implementation
   i) Implement a doubly linked list and perform various operations to understand its properties and applications.
   ii) Implement a circular linked list and perform insertion, deletion, and traversal.
Exercise 5: Stack Operations
   i) Implement a stack using arrays and linked lists.
   ii) Write a program to evaluate a postfix expression using a stack.
   iii) Implement a program to check for balanced parentheses using a stack.

Exercise 6: Queue Operations
   i) Implement a queue using arrays and linked lists.
   ii) Develop a program to simulate a simple printer queue system.
   iii) Solve problems involving circular queues.

Exercise 7: Stack and Queue Applications
   i) Use a stack to evaluate an infix expression and convert it to postfix.
   ii) Create a program to determine whether a given string is a palindrome or not.
   iii) Implement a stack or queue to perform comparison and check for symmetry.

Exercise 8: Binary Search Tree
   i) Implementing a BST using Linked List.
   ii) Traversing of BST.

Exercise 9: Hashing
   i) Implement a hash table with collision resolution techniques.
   ii) Write a program to implement a simple cache using hashing.

Textbooks:

Reference Books:
   1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
   2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
   3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
HEALTH AND WELLNESS, YOGA AND SPORTS
(Common to All branches of Engineering)

Course Objectives:

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

Course Outcomes: After completion of the course the student will be able to

- **CO1**: Understand the importance of yoga and sports for Physical fitness and sound health. *(Understand)*
- **CO2**: Demonstrate an understanding of health-related fitness components. *(Apply)*
- **CO3**: Compare and contrast various activities that help enhance their health. *(Understand)*
- **CO4**: Assess current personal fitness levels. *(Apply)*
- **CO5**: Develop Positive Personality *(Apply)*

UNIT I

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

Activities:

1. Organizing health awareness programmes in community
2. Preparation of health profile
3. Preparation of chart for balance diet for all age groups

UNIT II

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

Activities:

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

UNIT III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.
Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc. Practicing general and specific warm up, aerobics

ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

Reference Books:

2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice

General Guidelines:

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

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.
NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE
(Common to All branches of Engineering)

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

Course Outcomes: After completion of the course the students will be able to
CO1: Understand the importance of discipline, character and service motto. (Understand)
CO2: Solve some societal issues by applying acquired knowledge, facts, and techniques. (Apply)
CO3: Explore human relationships by analyzing social problems. (Understand)
CO4: Determine to extend their help for the fellow beings and downtrodden people (Apply)
CO5: Develop leadership skills and civic responsibilities. (Apply)

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

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

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

UNIT III  Community Service
Activities:
i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities-experts etc.
ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS.

iii) Conducting consumer Awareness. Explaining various legal provisions etc.

iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.

v) Any other programmes in collaboration with local charities, NGOs etc.

Reference Books:


General Guidelines:

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

Evaluation Guidelines:

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