



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
ANANTAPUR.**

**COLLEGE OF ENGINEERING (AUTONOMOUS)
ANANTHAPURAMU – 515002 (A.P) INDIA**

B. Tech (Regular-Full time)

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

CHEMICAL ENGINEERING

I YEAR COURSE STRUCTURE AND SYLLABUS

**B.TECH.-CHEMICAL ENGINEERING - COURSE
STRUCTURE & SYLLABUS – R23**

(Applicable from the academic year 2023-24 onwards)

INDUCTION PROGRAMME

| S. No. | Course Name | Category | L-T-P-C |
|---------------|----------------------------------------------------------------------------|-----------------|----------------|
| 1 | Physical Activities--Sports, Yoga and Meditation, Plantation | MC | 0-0-6-0 |
| 2 | Career Counseling | MC | 2-0-2-0 |
| 3 | Orientation to all branches --career options, tools, etc. | MC | 3-0-0-0 |
| 4 | Orientation on admitted Branch—corresponding labs, tools and platforms | EC | 2-0-3-0 |
| 5 | Proficiency Modules & Productivity Tools | ES | 2-1-2-0 |
| 6 | Assessment on basic aptitude and mathematical skills | MC | 2-0-3-0 |
| 7 | Remedial Training in Foundation Courses | MC | 2-1-2-0 |
| 8 | Human Values & Professional Ethics | MC | 3-0-0-0 |
| 9 | Communication Skills—focus on Listening, Speaking, Reading ,Writing skills | BS | 2-1-2-0 |
| 10 | Concepts of Programming | ES | 2-0-2-0 |

B. Tech. – I Year I Semester (Chemical Engineering)

| S. No. | Subject Code | Subject | L/D | T | P | Credits |
|--------|--------------|------------------------------------------------------------------------------------|-----|---|----|---------|
| 1 | 23A15201 | Engineering Physics Common to CIVIL, MECH, CHEM | 3 | 0 | 0 | 3 |
| 2 | 23A15101 | Linear Algebra & Calculus Common to All Branches | 3 | 0 | 0 | 3 |
| 3 | 23A12401 | Basic Electrical and Electronics Engineering Common to CIVIL, MECH, CHEM | 3 | 0 | 0 | 3 |
| 4 | 23A10301 | Engineering Graphics Common to CIVIL, MECH, CHEM | 1 | 0 | 4 | 3 |
| 5 | 23A10501 | Introduction to Programming Common to All Branches | 3 | 0 | 0 | 3 |
| 6 | 23A10503 | IT Work Shop Common to CIVIL, MECH, CHEM | 0 | 0 | 2 | 1 |
| 7 | 23A15202 | Engineering Physics Lab Common to CIVIL, MECH, CHEM | 0 | 0 | 2 | 1 |
| 8 | 23A12402 | Electrical and Electronics Engineering Work Shop Common to CIVIL, MECH, CHEM | 0 | 0 | 3 | 1.5 |
| 9 | 23A10502 | Computer Programming Lab Common to All Branches | 0 | 0 | 3 | 1.5 |
| 10 | 23A15902 | NSS/NCC /SCOUTS and Guides/ Community Service Common to CIVIL, MECH, CHE) | - | - | 1 | 0.5 |
| Total | | | 13 | 0 | 15 | 20.5 |

B. Tech. – I Year II Semester

| S. No. | Subject Code | Subject | L/D | T | P | Credits |
|--------|--------------|---------------------------------------------------------------------------|-----|---|----|---------|
| 1 | 23A25501 | Communicative English Common to CE, ME, CHEM | 2 | 0 | 0 | 2 |
| 2 | 23A25301 | Engineering Chemistry Common to CE, ME, CHEM | 3 | 0 | 0 | 3 |
| 3 | 23A25101 | Differential Equations and Vector Calculus (Common to All Branches) | 3 | 0 | 0 | 3 |
| 4 | 23A21301 | Basic Civil and Mechanical Engineering Common to CE, ME, CHEM | 3 | 0 | 0 | 3 |
| 5 | 23A20801 | Introduction to Chemical Engineering | 3 | 0 | 0 | 3 |
| 6 | 23A25502 | Communicative English Lab Common to CE, ME, CHEM | 0 | 0 | 2 | 1 |
| 7 | 23A25302 | Engineering Chemistry Lab Common to CE, ME, CHEM | 0 | 0 | 2 | 1 |
| 8 | 23A20301 | Engineering Workshop Common to CE, ME, CHEM | 0 | 0 | 3 | 1.5 |
| 9 | 23A20802 | Elements of Chemical Engineering Lab | 0 | 0 | 3 | 1.5 |
| 10 | 23A25901 | Health and Wellness, Yoga and Sports Common to CE, ME, CHEM | - | - | 1 | 0.5 |
| Total | | | 14 | 0 | 11 | 19.5 |



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**B. Tech. – I Year I Semester
(Common to Civil, Mechanical & Chemical Engineering)**

| Subject Code | Title of the Subject | L | T | P | C |
|--------------|----------------------|---|---|---|---|
| 23A15201 | Engineering Physics | 3 | 0 | 0 | 3 |

PREAMBLE

There has been an exponential growth of knowledge in the recent past opening up new areas and challenges in the understanding of basic laws of nature. This helped to the discovery of new phenomena in macro, micro and nano scale device technologies. The laws of physics play a key role in the development of science, engineering and technology. Sound knowledge of physical principles is of paramount importance in understanding new discoveries, recent trends and latest developments in the field of engineering.

To keep in pace with the recent scientific advancements in the areas of emerging technologies, the syllabi has been thoroughly revised keeping in view of the basic needs of all 0branches of Engineering by including the topics like Physical Optics, Dielectric and Magnetic materials, Crystallography and X-ray Diffraction, Quantum Mechanics ,Free Electron Theory, Semiconductors and superconductors.

| COURSEOBJECTIVES | |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Bridging the gap between the Physics in school at 10+2 level and UG level engineering courses. |
| 2 | To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications. |
| 3 | Enlighten the periodic arrangement of atoms in Crystalline solids by Bragg's law – Learning the structural analysis through X-ray diffraction techniques. |
| 4 | Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of de Broglie matter waves, quantum mechanical wave equation and its application, the importance of free electron theory for metals. |
| 5 | To Understand the Physics of Semiconductors and their working mechanism, Concepts utilization of transport phenomenon of charge carriers in semiconductors. To give an impetus on the subtle mechanism of superconductors using the concept of BCS theory and their fascinating applications. |
| 6. | To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging microdevices. |
| | |

| COURSE OUTCOMES | |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | Explain the need of coherent sources and the conditions for sustained interference (L2). Identify the applications of interference in engineering (L3). Analyze the differences between interference and diffraction with applications (L4). Illustrate the concept of polarization of light and its applications (L2). Classify ordinary refracted light and extraordinary refracted rays by their states of polarization (L2). |
| CO2 | Interpret various crystal systems (L2) and analyze the characterization of materials by XRD(L4). Identify the important properties of crystals like the presence of long-range order and periodicity, structure determination using X-ray diffraction technique (L3). Analysis of structure of the crystals by Laue's method (L2). |
| CO3 | Describe the dual nature of matter (L1). Explain the significance of wave function (L2). Identify the role of Schrodinger's time independent wave equation in studying particle in one-dimensional infinite potential well (L3). Identify the role of classical and quantum free electron theory in the study of electrical conductivity (L3). |
| CO4 | Classify the crystalline solids (L2). Outline the properties of charge carriers in semiconductors(L2). Identify the type of semiconductor using Hall effect (L2). Classify superconductors based on Meissner's effect (L2). Explain Meissner's effect, BCS theory & Josephson effect in superconductors(L2). |
| CO5 | Explain the concept of dielectric constant and polarization in dielectric materials (L2). Summarize various types of polarization of dielectrics (L2). Interpret Lorentz field and Claussius - Mosotti relation in dielectrics (L2). Classify the magnetic materials based on susceptibility (L2). |

Unit- I: Wave Optics (12hrs)

1. **Interference**- Principle of superposition – Interference of light – Conditions for sustained interference – Interference in thin films (Reflection Geometry) – Colors in thin films – Newton's Rings – Determination of wavelength and refractive index.
2. **Diffraction**- Introduction – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction due to single slit, double slit and N-slits (qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative).
3. **Polarization**- Introduction – Types of polarization – Polarization by reflection, refraction and double refraction - Nicol's Prism-Halfwave and Quarter wave plates.

Unit II: Crystallography and X-ray diffraction (8hrs)

1. **Crystallography**: Space lattice, Basis, Unit Cell and lattice parameters – Crystal systems Bravais Lattices — Coordination number - Packing fraction of SC, BCC & FCC - Miller indices – Separation between successive (h kl) planes.
2. **X-ray diffraction**: Bragg's law - X-ray Diffractometer–Crystal structure determination by Laue's method.

Unit- III: Quantum Mechanics and Free Electron Theory (9hrs)

1. **Quantum Mechanics**: Dual nature of matter – Heisenberg's Uncertainty Principle - Schrodinger's time independent and dependent wave equation – Significance and properties of wave function – Particle in a one-dimensional infinite potential well.
2. **Free Electron Theory**-Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – Equation for electrical conductivity based on quantum free electron theory – Fermi – Dirac distribution – Fermi energy – Failures of free electron theory.

Unit– IV: Semiconductors and Superconductors (8hrs)

1. **Semiconductors:** Formation of energy bands – classification of crystalline solids -Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers - Drift and diffusion currents – Einstein’s equation – Hall effect and its applications.
2. **Superconductors:** Introduction – Properties of superconductors – Meissner effect– Type I and Type II superconductors – AC and DC Josephson effects – BCS theory (qualitative treatment)–High T_c superconductors – Applications of superconductors.

Unit–V: Dielectric and Magnetic Materials (8hrs)

1. **Dielectric Materials-** Introduction – Dielectric polarization – Dielectric polarizability, Susceptibility and Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations - Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) -Lorentz field – Clausius – Mossotti equation – Dielectric loss.
2. **Magnetic Materials** – Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and Permeability – Atomic origin of magnetism – Classification of magnetic materials: Dia, Para, Ferro, Ferri & Anti ferro – Domain concept of Ferromagnetism (Qualitative) – Hysteresis –Soft and Hard magnetic materials.

Textbooks:

1. Engineering Physics by M.N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy S. Chand Publications, 11th Edition 2019.
2. Engineering Physics” by D. K. Bhattacharya and Poonam Tandon, Oxford press (2018).

Reference Books:

1. “Engineering Physics”-B. K. Pandey and S. Chaturvedi, Cengage Learning.
2. “Fundamentals of Physics”-Halliday ,Resnick and Walker ,John Wiley & Sons.
3. “Fundamentals of Physics with Applications”, Arthurs Amarjit Schaum Series.
4. “Engineering Physics”-Shatendra Sharma, Jyotsna Sharma, Pearson Education,2018.
5. “Engineering Physics”-Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.
6. “Semiconductor physics and devices: Basic principle”-A. Donald, Neamen ,Mc Graw Hill.
7. “Solid state physics”-A.J. Dekker, Pan Macmillan publishers
8. “Introduction to Solid State Physics”-Charles Kittel, Wiley

Mapping between Course Outcomes and Programme Outcomes

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | | 1 | | | | | | | | |
| CO2 | 3 | 3 | 2 | 1 | | | | | | | | |
| CO3 | 3 | 2 | | | | | | | | | | |
| CO4 | 3 | 3 | 3 | 2 | 1 | | | | | | | |
| CO5 | 3 | 3 | 2 | 2 | 1 | | | | | | | |



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B. Tech. – I Year I Semester
(Common to All branches of Engineering)

| Subject Code | Title of the Subject | L | T | P | C |
|--------------|---------------------------|---|---|---|---|
| 23A15101 | Linear Algebra & Calculus | 3 | 0 | 0 | 3 |

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: Develop and use of matrix algebra techniques that are needed by engineers for practical applications.

CO2: Utilize mean value theorems to real life problems.

CO3: Familiarize with functions of several variables which is useful in optimization.

CO4: Learn important tools of calculus in higher dimensions.

CO5: Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.

UNIT I: Matrices

Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of Non- singular matrices by Gauss-Jordan method, System of linear equations, consistency of linear system of equations Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

UNIT II: Eigen values, 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 similarity transformation, Lagrange's reduction and Orthogonal Transformation, types of complex matrices (Hermitian skew Hermitian & unitary)

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. Radius of curvature, centre of curvature and circle of curvature.

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, Differentiation under the integral sign (Leibnitz's rule)

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:

- 1) Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
- 2) Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

Reference Books:

- 1) Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
- 2) Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
- 3) Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
- 4) Advanced Engineering Mathematics, Michael Greenberg, Pearson publishers, 9th edition
- 5) Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications, 2014, Third Edition (Reprint 2021).



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B. Tech. – I Year I Semester
(Common to Civil, Mechanical & Chemical Engineering)

| Subject Code | Title of the Subject | L | T | P | C |
|--------------|--------------------------------------------|---|---|---|---|
| 23A12401 | Basic Electrical & Electronics Engineering | 3 | 0 | 0 | 3 |

PART A: BASIC ELECTRICAL ENGINEERING

| |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Course Objectives: To expose to the field of electrical engineering, laws and principles of electrical engineering and to acquire fundamental knowledge in the relevant field. |
| Course Outcomes: |
| CO1: Remember the fundamental laws, operating principles of motors, generators, MC and MI instruments (L1) |
| CO2: Understand the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations (L2) |
| CO3: Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems (L3) |
| CO4: Analyse different electrical circuits, performance of machines and measuring instruments (L4) |
| CO5: Evaluate different circuit configurations, Machine performance and Power systems operation (L5) |

Syllabus:

UNIT I: DC & AC CIRCUITS

- DC Circuits:** Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple Numerical problems.
- AC Circuits:** A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Analysis of R-L, R-C, R-L-C Series circuits, 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.

2. **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

1. **Energy Resources:** Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.
2. **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.
3. **Equipment Safety Measures:** Working principle of Fuse and Miniature Circuit Breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

Learning Resources:

Textbooks:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Reference Books:

1. Basic Electrical Engineering, [D. P. Kothari](#) and [I. J. Nagrath](#), Mc Graw Hill, 2019, Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S. Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nag Sarkar and M. S. Sukhija, Oxford University Press, 2017
4. Basic Electrical and Electronics Engineering, S. K. Bhattacharya, Person Publications, 2018, Second Edition.

Web Resources:

1. <https://nptel.ac.in/courses/108105053>
2. <https://nptel.ac.in/courses/108108076>

PART B: BASIC ELECTRONICS ENGINEERING

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|---------------------------------------------------------------------------------------------------------------------------------------|
| Course Objectives: To teach the fundamentals of semiconductor devices and its applications, principles of digital electronics. |
| Course Objectives: At the end of the course, the student will be able to |
| CO1: Understand the principle of working of diodes, transistors and their characteristics. |
| CO2: Understand the fundamental concepts of various semiconductor devices in electronic circuits and instruments. |
| CO3: Apply the concepts of diodes in rectifiers and regulated power supplies |
| CO4: Explain the concepts of various number systems and the functionality of logic gates with Boolean functions. |
| CO5: Understand the simple combinational circuits and sequential circuits. |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 1 | 1 | | | 2 | 1 | 2 | | | | 2 |
| CO2 | 3 | 2 | 2 | 1 | | 3 | 2 | | | | 1 | 2 |
| CO3 | 2 | 1 | 2 | | | 2 | 1 | | | | | 2 |
| CO4 | 3 | 1 | 1 | | | 2 | 1 | 2 | | | | 2 |
| CO5 | 2 | 1 | 2 | | | 2 | 1 | | | | | 2 |

UNIT I: SEMICONDUCTOR DEVICES

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and V-I Characteristics, Elementary Treatment of Small Signal CE Amplifier.

UNIT II: BASIC ELECTRONIC CIRCUITS AND INSTRUMENTATION

1. **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.
2. **Amplifiers:** Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response.
3. **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:

1. Santi ram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata McGraw Hill, 2009

Reference Books:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.



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B. Tech. – I Year I Semester
(Common to Civil, Mechanical & Chemical Engineering)

| Subject Code | Title of the Subject | L | T | P | C |
|--------------|----------------------|---|---|---|---|
| 23A10301 | Engineering Graphics | 3 | 0 | 0 | 3 |

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 Development 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.
- CO2: Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.
- CO3: Understand and draw projection of solids in various positions in first quadrant.
- CO4: Explain principles behind development of surfaces.
- CO5: Prepare isometric and perspective sections of simple solids.

UNIT I:

1. **Introduction:** Lines, Lettering and Dimensioning, Geometrical Constructions and constructing regular polygons by general methods.
2. **Curves:** construction of ellipse, parabola and hyperbola by general, Cycloids, Involute, Normal and tangent to Curves.
3. **Scales:** Plain scales, diagonal scales and vernier scales.

UNIT II:

1. **Orthographic Projections:** Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.
2. **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.

3. **Projections of Planes:** regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both there refence planes

UNIT III:

Projections of Solids: Types of solids: Polyhedral 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 there reference planes ,Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT IV:

1. **Sections of Solids: Perpendicular** and inclined section planes, Sectional views and True shape of section, Sections of solids insimplepositiononly.
2. **Development of Surfaces:** Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNITV:

1. **Conversion of Views: conversion** of isometric views to orthographic views ; Conversion of orthographic views to isometric views.
2. **Computer graphics:** Creating 2D&3D drawings of objects including PCB and Transformations using AutoCAD (*Not for end examination*).

Textbook:

1.N.D. Bhatt, Engineering Drawing, Charotar Publishing House,2016.

Reference Books:

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata Mc Graw Hill,2013.
2. Engineering Drawing, M. B. Shahand B.C. Rana, Pearson Education Inc,2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata Mc Graw Hill,2017.

Mapping between Course Outcomes and Programme Outcomes

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|--------------------------|--------------------------|-----|-----|--------------------------|--------------------------|-----|-----|-----|------|--------------------------|------|
| CO1 | <input type="checkbox"/> | | | | <input type="checkbox"/> | | | | | | <input type="checkbox"/> | |
| CO2 | | | | | | <input type="checkbox"/> | | | | | | |
| CO3 | | | | | | <input type="checkbox"/> | | | | | | |
| CO4 | | <input type="checkbox"/> | | | | | | | | | | |
| CO5 | | | | | | <input type="checkbox"/> | | | | | | |



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B. Tech. – I Year I Semester
(Common to All branches of Engineering)

| Subject Code | Title of the Subject | L | T | P | C |
|--------------|-----------------------------|---|---|---|---|
| 23A10501 | Introduction to Programming | 3 | 0 | 0 | 3 |

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, the concept of algorithm and algorithmic thinking.

CO2: Analyse a problem and develop an algorithm to solve it.

CO3: Implement various algorithms using the C programming language.

CO4: Understand more advanced features of C language.

CO5: Develop problem-solving skills and the ability to debug and optimize the code.

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O1 | PSO 2 | PSO 3 |
|-----|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| CO1 | 1 | 1 | 1 | | | | | | | | | 1 | 1 | 1 | |
| CO2 | 1 | 2 | 1 | | | | | | | | | | 1 | 1 | |
| CO3 | 2 | 2 | 1 | | | | | | | | | | 1 | 1 | |
| CO4 | 2 | 1 | 1 | | | | | | | | | | 1 | 1 | |
| CO5 | 2 | 2 | 1 | | | | | | | | | | 1 | 1 | |

UNITI: 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 DÍa 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.

UNITII: Control Structures

Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while)
Break and continue.

UNITIII: 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, Dynamic memory allocation, 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, Command line arguments,

Basics of File Handling: why files, file opening and closing a data file, reading and writing a data file, processing data files.

Note: The syllabus is designed with C Language as the fundamental language of implementation.

Textbooks:

1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 1988
2. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1996

Reference Books:

1. Computing fundamentals and C Programming, Balaguru samy, E., McGraw-Hill Education, 2008.
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
3. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition

[illegible]

PC Hardware & Software Installation:

Task1: 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 are 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 tool bars and pop-up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task3: 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 LaTeX and Microsoft (MS) office equivalent (FOSS) tool word: Importance of LaTeX 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 LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using LaTeX 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 LaTeX and Word.

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

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

EXCEL

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spread sheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of tool bars, 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/V LOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting.

POWERPOINT

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

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

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

AI TOOLS –Chat GPT

Task1: 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 adscription of a scene, and let the model generate the rest of the content. This can be a fun way to brains term 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 Dreamtech,2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dreamtech,2013,3rd edition.
3. Introduction to Information Technology ,ITL Education Solutions limited, Pearson Education, 2012, 2nd edition.
4. PC Hardware -A Handbook, Kate J. Chase, PHI(Microsoft)
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfinson and Ken Quamme. – CISCO Press, Pearson Education,3rdedition.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS) ANANTHAPURAMU– 515002 (A.P)
INDIA**

**B. Tech. – I Year I Semester
(Common to Civil, Mechanical & Chemical Engineering)**

| Subject Code | Title of the Subject | L | T | P | C |
|--------------|-------------------------|---|---|---|---|
| 23A15202 | Engineering Physics Lab | 0 | 0 | 2 | 1 |

| |
|---------------------------------------------------------------------------------------------------------|
| Course Objectives: |
| Understands the concepts of interference, diffraction and their applications. |
| Understand the role of optical fibre parameters in communication. |
| Recognize the importance of energy gap in the study of conductivity and Hall Effect in a semiconductor. |
| Illustrates the magnetic and dielectric materials applications. |
| Apply the principles of semiconductors in various electronic devices. |

(Any **TEN** of the following listed experiments)

(Out of which any **TWO** experiments may be conducted in virtual mode)

List of Engineering Physics 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. Determination of dispersive power of prism.
4. Verification of Brewster's law
5. Determination of the resistivity of semiconductor by four probe methods.
6. Determination of energy gap of a semiconductor using p-n junction diode.
7. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
8. Determination of dielectric constant using charging and discharging method.
9. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
10. Magnetic field along the axis of a current carrying circular coil by Stewart & Gee's Method.
11. Determination of wavelength of Laser light using diffraction grating.
12. Estimation of Planck's constant using photo electric effect.
13. Determination of temperature coefficients of thermistor.
14. 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.

16. Sonometer: Verification of laws of stretched string.
17. Determination of young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.

| |
|--------------------------------------------------------------------------------------------------------|
| Course Outcomes: The students will be able to |
| Operate optical instruments like microscope and spectrometer (L2) |
| Estimate the wavelength of different colours using diffraction grating and resolving power (L2) |
| Plot the intensity of the magnetic field of circular coil carrying current with distance (L3) |
| Determine the resistivity of the given semiconductor using four probe methods (L3) |
| Identify the type of semiconductor i.e., n-type or p-type using hall effect (L3) |
| Calculate the band gap of a given semiconductor (L3) |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | | | 2 | | | | | | | | |
| CO2 | 3 | 2 | | 2 | | | | | | | | |
| CO3 | 3 | 1 | | 2 | | | | | | | | |
| CO4 | 3 | 3 | | 3 | 2 | | | | | | | |
| CO5 | 3 | | | | | | | | | | | |

References: 1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.

- **URL:** www.vlab.co.in



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INDIA**

**B. Tech. – I Year I Semester
(Common to Civil, Mechanical & Chemical Engineering)**

| Subject Code | Title of the Subject | L | T | P | C |
|--------------|--------------------------------------------------|---|---|---|-----|
| 23A12402 | Electrical and Electronics Engineering Work Shop | 0 | 0 | 3 | 1.5 |

PART A: ELECTRICAL ENGINEERING LAB

| |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Course Objectives: |
| To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations. |
| Course Outcomes: |
| CO1: Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer (L2) |
| CO2: Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor (L3) |
| CO3: Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor (L3) |
| CO4: Analyse various characteristics of electrical circuits, electrical machines and measuring instruments (L4) |
| CO5: Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring (L5) |

List of Experiments:

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises

Learning Resources:**Reference books:**

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

PART B: ELECTRONICS ENGINEERING LAB

Course Objectives:

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

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

CO1: Identify and testing of various electronic components.

CO2: Understand the usage of electronic measuring instruments.

CO3: Plot and discuss the characteristics of various electron devices.

CO4: Explain the operation of a digital circuit.

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 2 | 3 | 2 | 1 | 2 | 1 | | | | | 1 | |
| CO2 | 2 | | 2 | 2 | 1 | | | | 1 | | 2 | |
| CO3 | 2 | 2 | | 3 | 1 | | | | | | 1 | |
| CO4 | | 2 | 1 | 2 | 2 | 1 | | | | | | |

List of Experiments:

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

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

References:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata McGraw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

Note: a. Minimum Six Experiments to be performed.

b. All the experiments shall be implemented using both Hardware and Software.



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INDIA
B. Tech. – I Year I Semester
(Common to All Branches)

| Subject Code | Title of the Subject | L | T | P | C |
|--------------|--------------------------|---|---|---|-----|
| 23A10502 | Computer Programming Lab | 0 | 0 | 3 | 1.5 |

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.

CO2: Select the right control structure for solving the problem.

CO3: Develop C programs which utilize memory efficiently using programming constructs like pointers.

CO4: Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

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

UNITI:

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

- Basic Linux environment and its editors like Vi, Vim & Emacs etc.
- Exposure to Turbo C, gcc

iii) Writing simple programs using printf (), scanf ()

WEEK 2

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

Suggested Experiments /Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts.

Lab 2: 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:

WEEK9:

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.

WEEK14:

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:

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw Hill

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE



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INDIA**

**B. Tech. – I Year I Semester
(Common to Civil, Mechanical & Chemical Engineering)**

| Subject Code | Title of the Subject | L | T | P | C |
|--------------|---------------------------------------------|---|---|---|-----|
| 23A15902 | NSS/NCC/Scouts & Guides / Community Service | 0 | 0 | 1 | 0.5 |

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.

CO2: Solve some societal issues by applying acquired knowledge, facts, and techniques

CO3: Explore human relationships by analysing social problems

CO4: Determine to extend their help for the fellow beings and down trodden people

CO5: Develop leadership skills and civic responsibilities.

SYLLABUS

UNIT I Orientation

General Orientation on NSS/NCC/Scouts & Guides /Community Service activities, Career guidance.

Activities:

- Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
- Conducting orientation programs for the students–future plans-activities-releasing road map etc.
- Displaying success stories – motivational biopics -award winning movies on societal issues etc.
- Conducting talents how in singing patriotic songs – paintings -any other contribution.

UNIT II Nature & Care Activities:

- Best out of waste competition.
- Poster and signs making competition to spread environmental awareness.
- Recycling and environmental pollution article writing competition.
- Organizing 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 Campaign 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:

1. Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme* Vol;I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. *Red Book - National Cadet Corps* – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., *Introduction to Environmental Engineering*, McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. *Introduction to Environmental Engineering and Science*, Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. *Social Problems in India*, Rawat Publications, New Delhi.

General Guidelines:

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

Evaluation Guidelines:

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



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INDIA**

**I B. TECH (R23) – II SEMESTER
(Common to CIVIL, MECH & CHEM)**

| Subject Code | Title of the Subject | L | T | P | C |
|--------------|--------------------------|---|---|---|---|
| 23A25501 | COMMUNICATIVE ENGLISH | 2 | 0 | 0 | 2 |

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.
- CO2:** Apply grammatical structures to formulate sentences and correct word forms.
- CO3:** Analyze discourse markers to speak clearly on a specific topic in informal discussions.
- CO4:** Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
- CO5:** Create a coherent paragraph, essay, and resume.

SYLLABUS

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 structured 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)

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; **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:** Academic Writing (Letter Writing, Letter writing, creative writing, critical thinking)
- 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:

1. Dubey, Sham Ji & Co. *English for Engineers*, Vikas Publishers, 2020
2. Bailey, Stephen. *Academic writing: A Handbook for International Students*. Routledge, 2014.
3. Murphy, Raymond. *English Grammar in Use*, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. *Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary*. Anchor, 2014.

Web Resources:

GRAMMAR:

1. www.bbc.co.uk/learningenglish
2. <https://dictionary.cambridge.org/grammar/british-grammar/>
3. www.eslpod.com/index.html
4. <https://www.learngrammar.net/>
5. <https://english4today.com/english-grammar-online-with-quizzes/>
6. <https://www.talkenglish.com/grammar/grammar.aspx>

VOCABULARY

1. <https://www.youtube.com/c/DailyVideoVocabulary/videos>
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA



(Common to CIVIL, MECH & CHEM)

Course Objectives:

- ## COURSE OUTCOMES

Mapping between Course Outcomes and Programme Outcomes

[illegible]

UNIT I Water Technology (8 hrs)

Soft and hard water, 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 electro dialysis.

Learning outcomes:

The student will be able to

- **list** the differences between temporary and permanent hardness of water (L1)
- **Explain** the principles of reverse osmosis and electro dialysis. (L2)
- **Compare** quality of drinking water with BIS and WHO standards. (L2)
- **Illustrate** problems associated with hard water - scale and sludge. (L2)
- **explain** the working principles of different Industrial water treatment processes (L2)

UNIT II Electrochemistry and Applications (10 hrs)

Electrodes –electrochemical cell, Nernst equation, cell potential calculations.

Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (NiCad), and lithium-ion batteries-principle, working 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 Bed worth ratios and uses, Factors affecting the corrosion, cathodic and anodic protection, electroplating and electro less plating (Nickel and Copper).

Learning Outcomes:

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

- **apply** Nernst equation for calculating electrode and cell potentials (L3)
- **apply** Pilling Bed worth rule for corrosion and corrosion prevention (L3)
- **demonstrate** the corrosion prevention methods and factors affecting corrosion (L2)
- **compare** different batteries, Fuel Cells and their applications (L2)

UNIT III Polymers and Fuel Chemistry (10 hrs)

Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth polymerization, Poly dispersity index (PDI)- significance

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.

Learning Outcomes:

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

- **explain** different types of polymers and their applications (L2)
- **Solve** the numerical problems based on Calorific value(L3)
- **Discuss** the different types of Fuels and their applications (L2)
- **explain** calorific values, octane number, refining of petroleum(L2)

UNIT IV Modern Engineering Materials (10 hrs)

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.

Learning Outcomes:

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

- **explain** the constituents of Composites and its classification (L2)
- **identify** the factors affecting the refractory material(L3)
- **illustrate** the functions and properties of lubricants (L2)
- **demonstrate** the phases and reactivity of concrete formation (L2)
- **identify** the constituents of Portland cement (L3)
- **enumerate** the reactions at setting and hardening of the cement (L3)

UNIT V Surface Chemistry and Nanomaterials (10 hrs)

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 nanomaterial's by stabilizing agents, adsorption isotherm (Freundlich and Langmuir), BET equation (no derivation) applications of colloids and nano material's – catalysis, medicine, sensors, etc.

Learning Outcomes:

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

- **summarize** the concepts of colloids, micelle and nanomaterials (L2)
- **explain** the synthesis of colloids with examples (L2)
- **outline** the preparation of nanomaterials and metal oxides (L2)
- **identify** the application of colloids and nanomaterials in medicine, sensors and catalysis (L2)

Textbooks:

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:

1. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
2. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth- Heineman, 1992.
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

Learning Outcomes:

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

- **demonstrate** the differences between temporary and permanent hardness of water (L2)
- **explain** the preparation, properties, and applications of thermoplastics & thermos setting, elastomers & conducting polymers. (L2)
- **explain** calorific values, octane number, refining of petroleum and cracking of oils (L2)
- **explain** the setting and hardening of cement and concrete phase (L2)
- **summarize** the concepts of colloids, micelle and nanomaterials (L2).



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I B. TECH (R23) – II SEMESTER

(23A25101) DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common to All Branches of Engineering)

| Subject Code | Title of the Subject | L | T | P | C |
|--------------|-----------------------------------------------|---|---|---|---|
| 23A25101 | DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS | 3 | 0 | 0 | 3 |

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.

CO2: Identify solution methods for partial differential equations that model physical processes.

CO3: Interpret the physical meaning of different operators such as gradient, curl and divergence.

CO4: Estimate the work done against a field, circulation and flux using vector calculus.

UNIT I Differential equations of first order and first degree

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay orthogonal Trajectories, Electrical circuits.

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, Equations reducible to Linear Differential equations with constant coefficients (Cauchy's equation, Lagendre's equation) Applications to L-C-R Circuit problems and Simple Harmonic motion.

UNIT III Partial Differential Equations

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients, Non-linear partial differential equations (Standard forms)

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, physical interpretation, examples and 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) physical interpretation and related problems.

Textbooks:

- 1) Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
- 2) Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

Reference Books:

- 1) Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
- 2) Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
- 3) Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
- 4) Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint)



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I B. TECH (R23) – II SEMESTER

(23A21301) BASIC CIVIL AND MECHANICAL ENGINEERING
(Common to CIVIL, MECH & CHEM)

| Subject Code | Title of the Subject | L | T | P | C |
|--------------|----------------------------------------|---|---|---|---|
| 23A21301 | BASIC CIVIL AND MECHANICAL ENGINEERING | 3 | 0 | 0 | 3 |

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: Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.
- CO2: Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying.
- CO3: Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation.
- CO4: Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated.
- CO5: Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.

PART A: BASIC CIVIL ENGINEERING

UNIT I

Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement - Aggregate - Bricks- Cement concrete- Steel. Introduction to Prefabricated construction Techniques.

UNIT II

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

UNIT III

Transportation Engineering Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

Textbooks:

1. Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.

Reference Books:

1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

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: Understand the different manufacturing processes.

CO2: Explain the basics of thermal engineering and its applications.

CO3: Describe the working of different mechanical power transmission systems.

CO4: Describe the working of different power plants.

CO5: Describe the basics of robotics and its applications.

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.
2. A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications,(India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengagelearning India Pvt. Ltd.

Reference Books:

1. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I
2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak MPandey, Springer publications
3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt.Ltd.

4. G. Shanmugam and M.S. Palanisamy, Basic Civil and the Mechanical Engineering,
TataMcGraw Hill publications (India) Pvt. Ltd.

Mapping between Course Outcomes and Programme Outcomes

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|--------------------------|-----|-----|-----|--------------------------|--------------------------|--------------------------|-----|-----|------|--------------------------|------|
| CO1 | <input type="checkbox"/> | | | | <input type="checkbox"/> | | | | | | <input type="checkbox"/> | |
| CO2 | <input type="checkbox"/> | | | | | | <input type="checkbox"/> | | | | <input type="checkbox"/> | |
| CO3 | <input type="checkbox"/> | | | | | | <input type="checkbox"/> | | | | <input type="checkbox"/> | |
| CO4 | <input type="checkbox"/> | | | | | <input type="checkbox"/> | | | | | <input type="checkbox"/> | |
| CO5 | <input type="checkbox"/> | | | | | | | | | | <input type="checkbox"/> | |



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I B. TECH (R23) – II SEMESTER

(23A20801) INTRODUCTION TO CHEMICAL ENGINEERING

| Subject Code | Title of the Subject | L | T | P | C |
|--------------|--------------------------------------|---|---|---|---|
| 23A20801 | INTRODUCTION TO CHEMICAL ENGINEERING | 3 | 0 | 0 | 3 |

Course Objectives:

1. To teach the importance of Chemical Engineering in industries and everyday life
2. To learn the role of various Unit Operations and Unit Processes in Chemical industries.

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

CO1: Understand the role of Chemical Engineers in everyday life and the importance of Chemical Engineering subject.

CO2: Learn about material & energy balance calculations and fluid flow. CO3:

Understand the concept of heat transfer & thermodynamics.

CO4: Understand the principles of mass transfer

CO5: Learn the importance of mechanical operations and chemical reaction engineering

Course Articulation Matrix

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| CO 1 | 3 | 1 | 1 | - | - | 2 | 3 | 3 | - | 1 | - | 3 | 1 | 2 | 2 |
| CO 2 | 3 | 2 | 1 | - | - | - | - | - | - | 1 | - | 3 | 1 | 2 | 2 |
| CO 3 | 3 | 2 | 1 | - | - | - | - | - | - | 1 | - | 3 | 1 | 2 | 2 |
| CO 4 | 3 | 1 | 1 | - | - | - | - | - | - | 1 | - | 3 | 1 | 2 | 2 |
| CO 5 | 3 | 2 | 1 | - | - | 2 | 3 | 3 | - | 1 | - | 3 | 1 | 2 | 2 |

Unit-I

Chemical Engineering Concepts: Chemical Engineering in everyday life, scaling up or down, Understanding the difference between Chemist & Chemical Engineer, versatility of a Chemical Engineer, Applications of Chemical Engineering.

Processes and Process Variables: Unit operations, Unit processes, Batch process, Continuous process, Mass and volume, flow rate, pressure, temperature, chemical composition. case studies (manufacture of Ammonia, Sulphuric acid & Pencilin)

Unit-II

Introduction to Engineering Calculations: Units and Dimensions, Conversion of units, System of units, force and weight, Numerical calculations and estimation, Dimensional homogeneity and dimensionless quantities, process data representation and analysis.

Fluid Flow: Fluid, nature & types of fluid, Newtonian & Non-Newtonian, Compressible & incompressible fluids, viscosity, different flow regimes, Flow meters, fluid handling machinery (pumps, fans, blowers)

Unit-III

Introduction to Process Heat Transfer: Historical background and application areas of

heat transfer, physical origin and rate equations for conduction, convection and radiation, concept of thermal resistance, simultaneous heat transfer mechanisms.

Relationship of heat transfer to thermodynamics: Relation to first and second laws of thermodynamics, units and dimensions, analysis of heat transfer problems, relevance of heat transfer in chemical engineering

Unit-IV

Mass transfer: classification of mass transfer operations, molecular diffusion, choice of separation processes, basic principles & applications of absorption, distillation, adsorption, extraction.

Unit-V:

Mechanical operations: principles of Size reduction, types of crushers & grinders, filtration, agitation and mixing.

Overview of Reaction Engineering: Classification of reactions, variables affecting the rate of reaction, concentration & temperature dependency of reaction rate, Kinetics of homogeneous reactions, Types of reactors, and catalysis.

TEXT BOOK:

1. Introduction to Chemical Engineering by S. Pushpavanam, PHI, 2012.
2. Introduction to Chemical Engineering by S. K. Ghosal, S. K. Sanyal and S. Dutta, TMH Publications, 1993.

REFERENCES:

1. Unit operations in Chemical Engineering by W.L. McCabe and J.C. Smith and Peter Harriott, McGraw Hill 7th Ed. 2005
2. Incropera's Principles of Heat and Mass Transfer by Incropera, Dewitt, Bergman and Lavine, Global Edition, Wiley India Edition
3. Elementary Principles of Chemical Processes Richard M. Felder and Ronald W. Rousseau, Third Edition, John Wiley & Sons, INC.



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I B. TECH (R23) – II SEMESTER

(23A25502) COMMUNICATIVE ENGLISH LAB
(Common to CIVIL, MECH & CHEM)

| Subject Code | Title of the Subject | L | T | P | C |
|--------------|---------------------------|---|---|---|---|
| 23A25502 | COMMUNICATIVE ENGLISH LAB | 0 | 0 | 2 | 1 |

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 the basic communication skills and also make them ready to face job interviews.

Course Outcomes:

CO1: Understand the different aspects of the English language proficiency with emphasis on LSRW skills.

CO2: Apply communication skills through various language learning activities.

CO3: Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.

CO4: Evaluate and exhibit professionalism in participating in debates and group discussions. **CO5:** Create effective resume and prepare themselves to face interviews in future.

List of Topics:

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

Suggested Software:

- Walden Infotech
- Young India Films
- K-Van Solutions

Reference Books:

1. Raman Meenakshi, Sangeeta-Sharma. *Technical Communication*. Oxford Press. 2018.
2. Taylor Grant : *English Conversation Practice*, Tata McGraw-Hill Education India, 2016
3. Hewing's, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
4. J.Sethi & P.V.Dhamija. *A Course in Phonetics and Spoken English*, (2nd Ed) Kindle, 2013

Web Resources:**Spoken English:**

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. <https://www.britishcouncil.in/english/online>
5. <http://www.letstalkpodcast.com/>
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. <https://www.youtube.com/c/ArnelsEverydayEnglish/featured>
8. <https://www.youtube.com/c/engvidAdam/featured>
9. <https://www.youtube.com/c/EnglishClass101/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>
2. <https://www.youtube.com/c/EngLanguageClub/featured>
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA



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I B. TECH (R23) – II SEMESTER

(23A25302) ENGINEERING CHEMISTRY LAB
(Common to CIVIL, MECH & CHEM)

| Subject Code | Title of the Subject | L | T | P | C |
|--------------|---------------------------|---|---|---|---|
| 23A25302 | ENGINEERING CHEMISTRY LAB | 0 | 0 | 2 | 1 |

Course Objectives:

- To verify the fundamental concepts with experiments

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

CO1: Determine the cell constant and conductance of solutions.

CO2: Prepare advanced polymer materials.

CO3: Determine the physical properties like surface tension, adsorption and viscosity.

CO4: Estimate the Iron and Calcium in cement.

CO5: Calculate the hardness of water.

Mapping between Course Outcomes and Programme Outcomes

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | | | | | | | | | | | | |
| CO2 | | | | | | | | | | | | |
| CO3 | | | | | | | | | | | | |
| CO4 | | | | | | | | | | | | |
| CO5 | | | | | | | | | | | | |

List of Experiments:

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

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

- **determine** the Strength of solutions, Dissolved oxygen (L3)
- **prepare** advanced polymer materials (L2)
- **determine** the physical properties like surface tension, adsorption and viscosity (L3)

- **estimate** the Iron and Calcium in cement (L3)
- **calculate** the hardness of water (L4)

Reference:

"Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C. Denney, J.D. Barnes and B. Sivasankar



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS) ANANTHAPURAMU –515 002 (A.P) INDIA

I B. TECH (R23) – II SEMESTER

(23A20301) ENGINEERING WORKSHOP
(Common to CIVIL, MECH & CHEM)

| Subject Code | Title of the Subject | L | T | P | C |
|--------------|----------------------|---|---|---|-----|
| 23A20301 | ENGINEERING WORKSHOP | 0 | 0 | 3 | 1.5 |

Course Objectives:

To familiarize students with wood working, sheet metal operations, fitting and electrical housewiring skills

Course Outcomes

CO1: Identify workshop tools and their operational capabilities.

CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.

CO3: Apply fitting operations in various applications.

CO4: Apply basic electrical engineering knowledge for House Wiring Practice.

CO5: Demonstration and Practice of plumbing and welding.

SYLLABUS

Demonstration: Safety practices and precautions to be observed in workshop.

- Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.
 - Half – Lap joint
 - Mortise and Tenon joint
 - Corner Dovetail joint or Bridle joint
 - Demonstration of Power tools
- Sheet Metal Working:** Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
 - Tapered tray
 - Conical funnel
 - Elbow pipe
 - Brazing
- Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
 - V-fit
 - Dovetail fit
 - Semi-circular fit
 - Bicycle tire puncture and change of two-wheeler tyre
- Electrical Wiring:** Familiarity with different types of basic electrical circuits and make the following connections.
 - Parallel and series
 - Two-way switch
 - Godown lighting
 - Tube light
 - Three phase motor
 - Soldering of wires
- Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.
- Welding Shop:** Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
- Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameter

Textbooks:

- Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published, 2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
- A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

Reference Books:

- 1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
- 2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
- 3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.

Mapping between Course Outcomes and Programme Outcomes

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | | | | | ✓ | ✓ | ✓ | | ✓ | | | |
| CO2 | | | | | ✓ | | | | | | ✓ | ✓ |
| CO3 | | | | | | ✓ | | | | | ✓ | ✓ |
| CO4 | | | | | | ✓ | | | ✓ | | ✓ | ✓ |
| CO5 | | | | | | ✓ | | | ✓ | | ✓ | ✓ |



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I B. TECH (R23) – II SEMESTER

(23A20802) ELEMENTS OF CHEMICAL ENGINEERING LAB

| Subject Code | Title of the Subject | L | T | P | C |
|--------------|--------------------------------------|---|---|---|-----|
| 23A20802 | ELEMENTS OF CHEMICAL ENGINEERING LAB | 0 | 0 | 3 | 1.5 |

Course Objectives: To get primary understanding on chemical process equipment and instrumentation for the measurement of various process parameters

Course Outcomes:

CO1: To learn about water analysis

CO2: To understand flow regimes and know about flow meters

CO3: Understand modes of heat transfer and measurement of temperature
CO4: Learn size reduction principles

CO5: Learn mass transfer and reaction engineering principles

Course Articulation Matrix

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O1 | PS O2 | PS O3 |
|-----|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| CO1 | 3 | 3 | 2 | - | 2 | 3 | 3 | 1 | 3 | 2 | - | 3 | 1 | 3 | 2 |
| CO2 | 3 | 3 | 1 | - | 2 | - | 2 | 1 | 3 | 2 | - | 3 | 1 | 3 | 2 |
| CO3 | 3 | 3 | 1 | - | 2 | 1 | - | 1 | 3 | 2 | - | 3 | 1 | 3 | 2 |
| CO4 | 3 | 3 | 1 | - | 2 | 1 | - | 1 | 3 | 2 | - | 3 | 1 | 3 | 2 |
| CO5 | 3 | 3 | 1 | - | 2 | 1 | - | 1 | 3 | 2 | - | 3 | 1 | 3 | 2 |

LIST OF EXPERIMENTS

1. Determination of pH, conductivity & TDS of water sample
2. Preparation of Soap
3. Preparation of solutions with different concentrations
4. Study of flow regimes using Reynold's apparatus
5. Determination of viscosity of an oil
6. Studies on flow measurement using Rotameter
7. Understanding different modes of heat transfer
8. Determination of average particle diameter using standard screens
9. Diffusion of acetone in air
10. Determination of activation energy of a reaction using batch reactor
11. Measurement of temperature using thermometer/thermocouple
12. Determination of humidity of air using wet & dry bulb thermometer.



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I B. TECH (R23) – II SEMESTER

(23A25901) HEALTH AND WELLNESS YOGA AND SPORTS
(Common to CIVIL, MECH & CHEM)

| Subject Code | Title of the Subject | L | T | P | C |
|--------------|-------------------------------------|---|---|---|-----|
| 23A25901 | HEALTH AND WELLNESS YOGA AND SPORTS | 0 | 0 | 1 | 0.5 |

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 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

CO2: Demonstrate an understanding of health-related fitness components

CO3: Compare and contrast various activities that help enhance their health

CO4: Assess current personal fitness levels.

CO5: Develop Positive Personality

SYLLABUS

UNIT I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship

between diet and fitness, Globalization and its impact on health, Body Mass Index(BMI) of all age groups.

Activities:

- i) Organizing health awareness programmes in community
- ii) Preparation of health profile
- iii) Preparation of chart for balanced 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

1. Gordon Edlin, Eric Golanty. *Health and Wellness*, 14th Edn. Jones & Bartlett Learning, 2022
2. T.K.V.Desikachar. *The Heart of Yoga: Developing a Personal Practice*
3. Archie J.Bahm. *Yoga Sutras of Patanjali*, Jain Publishing Company, 1993
4. Wiseman, John Lofty, *SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere* Third Edition, William Morrow Paperbacks, 2014
5. *The Sports Rules Book/ Human Kinetics* with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014

General Guidelines:

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

Evaluation Guidelines:

1. Evaluated for a total of 100 marks.
2. 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.
3. A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.