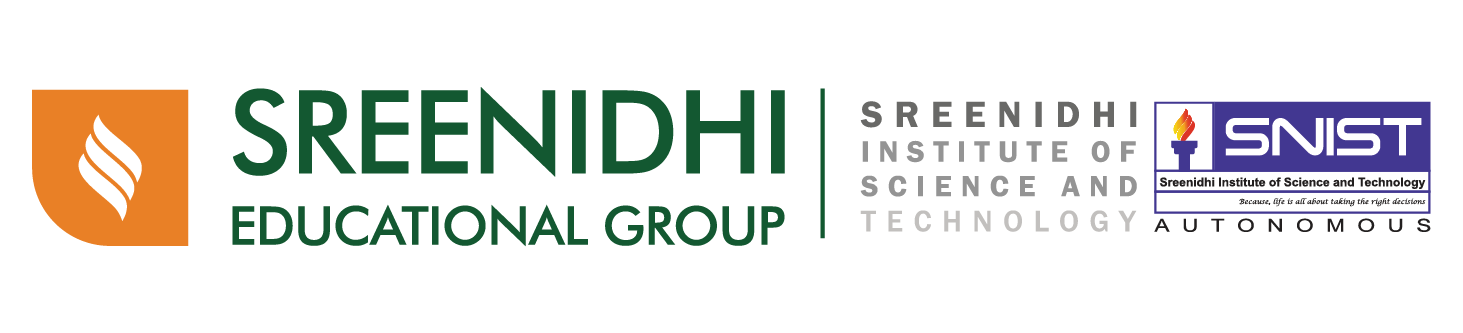
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**COURSE STRUTURE**

**AND**

**DETAILED SYLLABUS**

For

B.Tech. Four Years Degree Course

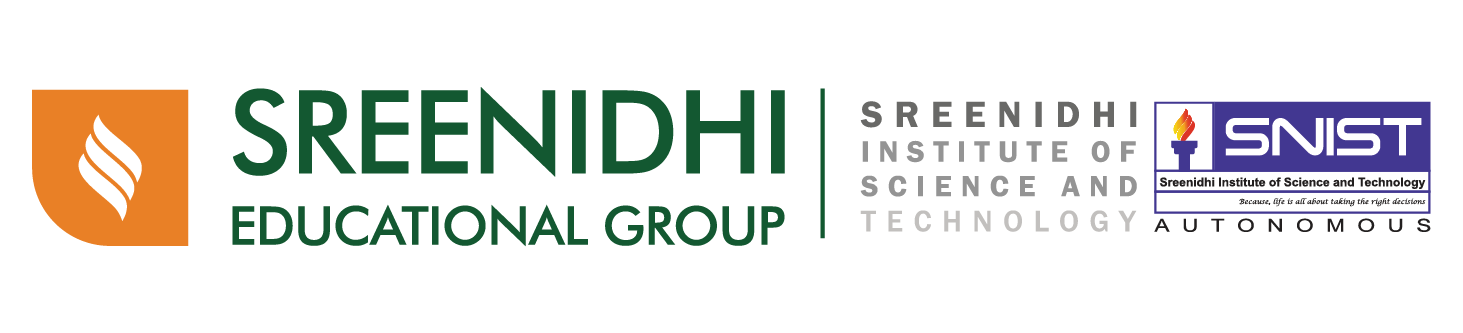
In

**MECHANICAL ENGINEERING**

**(ME)**

(A22 – I & II Year)

(Applicable for the batches admitted from AY 2022-23)



|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **A22-Course Structure for B. Tech(Mechanical)-I Year – I semester (1st Semester)** | | | | | | | |
| **Sl.No** | **AICTE Categery** | **Dept Course** | **Course code** | **Name of the Course** | **L** | **T** | **P/D** | **C** | **Max. Marks** | |
|  |  |  |  |  |  |  |  |  | **CIE** | **SEE** |
| 1 | BS - 1 | S&H | 9HC06 | Applied Physics | 2 | 1 | 0 | 3 | 30 | 70 |
| 2 | BS - 2 | S&H | 9HC11 | Matrix Algebra and Calculus | 2 | 1 | 0 | 3 | 30 | 70 |
| 3 | ES - 1 | ME | 9BC01 | Engineering Graphics | 1 | 0 | 4 | 3 | 30 | 70 |
| 4 | ES - 2 | IT | 9FC01 | Problem Solving using C | 3 | 0 | 0 | 3 | 30 | 70 |
| 5 | HS&MS - 1 | S&H | 9HC01 | Engilsh -I | 2 | 0 | 0 | 2 | 30 | 70 |
| 6 | HS&MS -Lab | S&H | 9HC61 | Oral communications Lab – I | 0 | 0 | 2 | 1 | 30 | 70 |
| 7 | BS - Lab | S&H | 9HC65 | Applied Physics Lab | 0 | 0 | 3 | 1.5 | 30 | 70 |
| 8 | ES - Lab | IT | 9FC61 | Problem Solving using C Lab | 0 | 0 | 3 | 1.5 | 30 | 70 |
| 9 | Ind.prog | S&H |  | Induction Course (Grade Evaluation) | 1 | 0 | 0 | 0 | -- | -- |
|  |  |  |  | **Total** | **11** | **2** | **12** | **18** | **240** | **560** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **A22-Course Structure for B. Tech.(Mech.)-I Year – II semester (2nd Semester)** | | | | | | | |
| **Sl.No** | **AICTE Categery** | **Dept Course** | **Course code** | **Name of the Course** | **L** | **T** | **P/D** | **C** | **Max. Marks** | |
|  |  |  |  |  |  |  |  |  | **CIE** | **SEE** |
| 1 | BS - 3 | S&H | 9HC04 | Engineering Chemistry | 2 | 1 | 0 | 3 | 30 | 70 |
| 2 | BS - 4 | S&H | 9HC12 | Advanced Calculus | 2 | 1 | 0 | 3 | 30 | 70 |
| 3 | ES - 3 | CSE | 9EC01 | Data Structure | 3 | 0 | 0 | 3 | 30 | 70 |
| 4 | HS&MS - 2 | S&H | 9HC62 | Oral communications Lab – II | 0 | 0 | 3 | 1.5 | 30 | 70 |
| 5 | ES - 4 | ME | 9BC02 | Engineering Mechanics | 2 | 1 | 0 | 3 | 30 | 70 |
| 6 | ES - Lab | ME | 9BC61 | \*Workshop/ Manufacturing processes Lab | 1 | 0 | 3 | 2.5 | 30 | 70 |
| 7 | BS - Lab | S&H | 9HC64 | Engineering Chemistry Lab | 0 | 0 | 3 | 1.5 | 30 | 70 |
| 8 | ES - Lab | CSE | 9EC61 | Data Structure using C Lab | 0 | 0 | 3 | 1.5 | 30 | 70 |
|  |  |  |  | **Total** | **10** | **3** | **12** | **19** | **240** | **560** |
| * **No External Theory Exam** | | | | | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **A22- Course Structure for B. Tech.(Mech)-II Year – I semester (3rd Semester)** | | | | | | | |
| **Sl.No** | **AICTE Category** | **Dept Course** | **Course code** | **Name of the Course** | **L** | **T** | **P/D** | **C** | **Max. Marks** | |
|  |  |  |  |  |  |  |  |  | **CIE** | **SEE** |
| 1 | HS&MS - 3 | MBA | 9ZC01 | Business Management and Accountancy | 3 | 0 | 0 | 3 | 30 | 70 |
| 2 | BS - 5 | S&H | 9HC13 | Complex Variable and Statistics | 2 | 1 | 0 | 3 | 30 | 70 |
| 3 | ES -1 | IT | 9EC41 | JAVA programming | 3 | 0 | 0 | 3 | 30 | 70 |
| 3 | PC -1 | ME | 9B303 | Thermodynamics | 2 | 1 | 0 | 3 | 30 | 70 |
| 4 | PC -2 | ME | 9B304 | Metallurgy and Material science | 2 | 0 | 0 | 2 | 30 | 70 |
| 5 | PC -3 | ME | 9B305 | Mechanics of Solids | 2 | 1 | 0 | 3 | 30 | 70 |
| 6 | HS&MS - 4 | S&H | 9HC63 | Soft skills | 1 | 0 | 2 | 2 | 30 | 70 |
| 7 | PC -LAB1 | ME | 9B362 | Metallurgy Lab | 0 | 0 | 3 | 1.5 | 30 | 70 |
| 8 | PC -LAB2 | ME | 9B363 | Mechanics of Solids Lab | 0 | 0 | 3 | 1.5 | 30 | 70 |
| 9 | PC -LAB3 | ME | 9B364 | Fuels and Lubricants Lab | 0 | 0 | 3 | 1.5 | 30 | 70 |
|  |  |  |  | **Total** | **15** | **3** | **11** | **23.5** | **300** | **700** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **A22- Course Structure for B. Tech.(Mech) -II Year – II Semester( 4th Semester)** | | | | | | | |
| **Sl.No** | **AICTE Category** | **Dept Course** | **Course code** | **Name of the Course** | **L** | **T** | **P/D** | **C** | **Max. Marks** | |
|  |  |  |  |  |  |  |  |  | **CIE** | **SEE** |
| 1 | MC - 1 | S&H | 9HC05 | Environmental Science (Grade Evaluation) | 3 | 0 | 0 | 0 | -- | -- |
| 2 | ES - 5 | EEE | 9AC48 | Basics Electrical & Electronics Engineering | 3 | 0 | 0 | 3 | 30 | 70 |
| 4 | PC -4 | ME | 9B406 | Manufacturing Processes | 3 | 0 | 0 | 3 | 30 | 70 |
| 5 | PC -5 | ME | 9B407 | Fluid Mechanics and Hydraulic Machinery | 2 | 1 | 0 | 3 | 30 | 70 |
| 6 | PC - 6 | ME | 9B408 | Applied Thermodynamics -I | 2 | 1 | 0 | 3 | 30 | 70 |
| 7 | BS - 6 | S&H | 9HC16 | Quantitative Aptitude and Logical Reasoning | 3 | 0 | 0 | 3 | 30 | 70 |
| 8 | ES LAB | EEE | 9AC95 | Basic Electrical & Electronics Engineering lab | 0 | 0 | 3 | 1.5 | 30 | 70 |
| 9 | PC -LAB 4 | ME | 9B465 | Manufacturing Processes Lab | 0 | 0 | 3 | 1.5 | 30 | 70 |
| 10 | PC-LAB5 | ME | 9B466 | Fluid Mechanics and Hydraulic Machinery Lab | 0 | 0 | 3 | 1.5 | 30 | 70 |
| 11 | TECH SEM | ME | 9B467 | Technical Seminar | 0 | 1 | 0 | 1 | 30 | 70 |
|  |  |  |  | Summer Industry Internship – I (Evaluation in III-I) | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  | **16** | **3** | **9** | **20.5** | **270** | **630** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **A22-Course Structure for B. Tech.(Mech.)-III Year – I Semester (5th Semester)** | | | | | | | |
| **Sl.No** | **AICTE Category** | **Dept Course** | **Course code** | **Name of the Course** | **L** | **T** | **P/D** | **C** | **Max. Marks** | |
|  |  |  |  |  |  |  |  |  | **CIE** | **SEE** |
| 1 | MC - 2 | ME |  | Cyber Security (Grade Award) | 3 | 0 | 0 | 0 | -- | -- |
| 2 | PC - 7 | ME |  |  | 2 | 1 | 0 | 3 | 30 | 70 |
| 3 | ES -1 | IT |  | Python programming | 3 | 0 | 0 | 3 | 30 | 70 |
| 5 | PC -8 | ME |  |  | 3 | 0 | 0 | 3 | 30 | 70 |
| 6 | PE-1 | ME |  | **Professional Elective-I** | 3 | 0 | 0 | 3 | 30 | 70 |
| 7 | PC -LAB6 | ME |  | Machine Drawing & PDP | 1 | 0 | 4 | 3 | 30 | 70 |
| 8 | PC-LAB7 | ME |  | Applied Thermodynamics Lab | 0 | 0 | 3 | 1.5 | 30 | 70 |
| 9 | PC -LAB8 | ME |  | Machine Tools Lab | 0 | 0 | 4 | 2 | 30 | 70 |
| 11 | Internship | ME |  | Summer Industry Internship-I | 0 | 0 | 0 | 1 | 30 | 70 |
|  |  |  |  | **Total** | **15** | **1** | **11** | **19.5** | **240** | **560** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **A22-Course Structure for B. Tech.(Mech.)-III Year – II Semester (6th Semester)** | | | | | | | |
| **Sl.No** | **AICTE Category** | **Dept Course** | **Course code** | **Name of the Course** | **L** | **T** | **P/D** | **C** | **Max. Marks** | |
|  |  |  |  |  |  |  |  |  | **CIE** | **SEE** |
| 1 | HS&MS - 5 | ME |  | Universal Human Values | 3 | 0 | 0 | 3 | 30 | 70 |
| 2 | PC - 9 | ME |  |  | 2 | 1 | 0 | 3 | 30 | 70 |
| 4 | PC-10 | ME |  |  | 2 | 1 | 0 | 3 | 30 | 70 |
| 3 | PC - 11 | ME |  |  | 2 | 1 | 0 | 3 | 30 | 70 |
| 4 | OE-1 | Others |  | **Open Elective-I** | 3 | 0 | 0 | 3 | 30 | 70 |
| 5 | PE-2 | ME |  | **Professional Elective-II** | 3 | 0 | 0 | 3 | 30 | 70 |
| 6 | PC -LAB10 | ME |  | Heat Transfer Lab | 0 | 0 | 4 | 2 | 30 | 70 |
| 7 | PC -LAB11 | ME |  | KOM & DOM Lab | 0 | 0 | 3 | 1.5 | 30 | 70 |
| 8 | CVV | ME |  | Comprehensive Viva-voce | - | - | - | 1 | 30 | 70 |
|  |  |  |  | Summer Industry Internship – II (Evaluation in IV-I) |  |  |  |  |  |  |
|  |  |  |  | **Total** | **15** | **3** | **7** | **22.5** | **270** | **630** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **A22-Course Structure for B. Tech.(Mech.) -IV Year – I Semester (7th Semester)** | | | | | | | |
| **Sl.No** | **AICTE Category** | **Dept Course** | **Course code** | **Name of the Course** | **L** | **T** | **P/D** | **C** | **Max. Marks** | |
|  |  |  |  |  |  |  |  |  | **CIE** | **SEE** |
| 1 | PC -12 | ME |  |  | 3 | 0 | 0 | 3 | 30 | 70 |
| 2 | PC -13 | ME |  |  | 3 | 0 | 0 | 3 | 30 | 70 |
| 3 | PC -14 | ME |  |  | 3 | 0 | 0 | 2 | 30 | 70 |
| 4 | OE-2 | ME |  | **Open Elective-II** | 3 | 0 | 0 | 3 | 30 | 70 |
| 5 | PE -3 | ME |  | **Professional Elective-III** | 3 | 0 | 0 | 3 | 30 | 70 |
| 6 | PE -4 | ME |  | **Professional Elective-IV** | 3 | 0 | 0 | 3 | 30 | 70 |
| 7 | PC-LAB12 | ME |  | M&I Lab | 0 | 0 | 3 | 1.5 | 30 | 70 |
| 8 | PC -LAB13 | ME |  | CAD/CAM Lab | 0 | 0 | 3 | 1.5 | 30 | 70 |
| 9 | interns | ME |  | Summer Industry Internship-II | --- | --- | --- | 1 | 30 | 70 |
|  |  |  |  | **Total** | **18** | **0** | **6** | **21** | **270** | **630** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **A22-Course Structure for B. Tech.(Mech.)-IV Year – II Semester (8th Semester)** | | | | | | | |
| **Sl.No** | **AICTE Category** | **Dept Course** | **Course code** | **Name of the Course** | **L** | **T** | **P/D** | **C** | **Max. Marks** | |
|  |  |  |  |  |  |  |  |  | **CIE** | **SEE** |
| 1 | **PE -5** | ME |  | **Professional Elective –V** | 3 | 0 | 0 | 3 | 30 | 70 |
| 2 | **OE-3** | **Others** |  | **Open Elective-III** | 3 | 0 | 0 | 3 | 30 | 70 |
| 3 | Proj,Sem, interns, viva | ME | 9B878 | Project | - | - | 20 | 10 | 30 | 70 |
|  |  |  |  | **Total :** | **6** | **0** | **20** | **16** | **90** | **210** |

**ME Department Vision:** To emerge as a renowned centre in Mechanical Engineering by following the best practices in teaching, learning and research.

MISSION OF THE MECHANICAL ENGINEERING DEPARTMENT:

|  |  |
| --- | --- |
| M1 | To Provide good academic environment for pursuing high quality undergraduate, Post graduate and Doctoral programs in mechanical engineering to prepare our graduates for outstanding successful professional career. |
| M2 | To become a continuous learning centre by providing service to the practicing engineers from industry , academia and professional technical societies through the Industry -Institute interaction activities. |
| M3 | To ensure that our students be trained in interpersonal & communication skills, team work, professional ethics, IPR, practical industry training by providing campus training programs related to both placement and co-extra curricula activities. |
| M4 | To Conduct and proliferate high quality research work to the students for their lifelong learning in developing quality solutions to society problems. |

B.Tech.(Mechanical Engineering) Program Educational Objectives

|  |  |
| --- | --- |
| PEO1 | Preparation & Learning Environment: To prepare graduates with the strong fundamentals in basic science and engineering by providing an effective academic learning environment to excel in postgraduate programs and professional career. |
| PEO2 | Core Competence: To provide graduates with a solid foundation in the core mechanical engineering fundamentals that are required to solve engineering problems and also pursue higher studies or to succeed in the industry profession. |
| PEO3 | Breadth: To train graduates with multi-disciplinary engineering knowledge so as to comprehend, analyze, design, and create novel products and solutions for the real life problems. |
| PEO4 | Professionalism: To inculcate ethical attitude, communication skills, teamwork skills, life-long learning skills, and multidisciplinary approach in graduates to succeed in the professional career and society at large. |

B.Tech.(Mechanical Engineering) Program Outcomes

|  |  |
| --- | --- |
| PO1 | ENGINEERING KNOWLEDGE: Graduate can apply the knowledge of the fundamentals of mathematics, science and engineering for solutions of the problems. |
| PO2 | PROBLEM ANALYSIS: Graduate can identify, formulate and solve problems in the key areas of Design, Production and Thermal Engineering. |
| PO3 | DESIGN / DEVELOPMENT OF SOLUTIONS: Graduate can design, analyze and conduct experiments, and interpret the data in the areas of Mechanical Engineering. |
| PO4 | CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS: Graduate can conduct investigations and solve problems using research based knowledge and methods to arrive at logical conclusions. |
| PO5 | MODERN TOOLS USAGE: Graduate can use the skills of IT tools, software and modern engineering equipment for analyzing the problems in Mechanical Engineering. |
| PO6 | THE ENGINEER AND SOCIETY: Graduate can demonstrate the impact of engineering solutions on the society problems related to health, safety, legal, and social issues. |
| PO7 | ENVIRONMENT AND SUSTAINABILITY: Graduate can demonstrate the impact of professional engineering solutions in environmental context and respond effectively to the needs of sustainable development. |
| PO8 | PROFESSIONAL ETHICS: Graduate can implement the principles of ethics & human values in the professional responsibilities. |
| PO9 | INDIVIDUAL AND TEAM WORK: Graduate able to work effectively as an individual , a team member and a leader in multidisciplinary settings. |
| PO10 | COMMUNICATION: Graduate able to write critique samples (abstract, executive summary, project report), and make effective presentations among the engineering community and society at large. |
| PO11 | PROJECT MANAGEMENT AND FINANCE: Graduate can demonstrate the knowledge of project management & finance, and handle various projects in both own discipline and multidisciplinary environments. |
| PO12 | LIFE-LONG LEARNING: Graduate recognizes the need of self-learning skills and utilize them in lifelong learning. |

B.Tech.(Mechanical Engineering) Program Specific Outcomes

|  |  |
| --- | --- |
| **PSO1** | Graduate can apply the concepts of basic Mechanical Engineering courses for choosing professional career in Mechanical Engineering and allied disciplines. |
| **PSO2** | Graduate can design and analyze the technological problems and solutions specific to Thermal, Manufacturing and Product Design areas using conceptual, simulation and practical tools. |
| **PSO3** | Graduate can adapt emerging Mechanical and IT based Technologies to develop innovative solutions to varied problems, enabling graduate for lifelong learning that leads to successful career in industry / R&D / academics. |

**Syllabus for B. Tech. I Year I semester**

**Mechanical Engineering**

**B.TECH. I YEAR I SEM (Mechanical & Civil)**

**L T P C**

**Code: 9HC06 APPLIED PHYSICS (Theory) 2 1 0 3**

**Course Objectives**

* To understand basic fundamentals of crystallography, crystal structures and their properties.
* To understand the various defects of a crystal.
* To know the various types of vibrations, radius of gyration, moment of inertia and Ultrasonics and their importance.
* To make the students to widen the conceptual understanding of the fundamental principles of interference and diffraction.
* To understand the basic concepts of normal light, Laser and its applications and to know about the fundamentals of radioactivity and its applications.
* To discuss about the nano-technology, preparation techniques and characterization (XRD & TEM), CNTs.

**Unit:1**

**Fundamentals of Crystal structures and Miller Indices** (9 Periods)

Unit Cell, Space Lattice, Lattice Parameters, Crystal Systems, Bravais Lattices, Atomic Radius, Co-ordination Number and Atomic packing factor. Calculation of Atomic Packing Factor of SC, BCC, FCC and HCP structures. Crystal directions and Planes, Miller Indices and Inter Planar Spacing of Simple Cubic Crystal Systems.

**Unit:2**

**Crystal Imperfections** (6 Periods)

Point Defects: Vacancies, Interstitials and substitutional. Frenkel and Schottky Defects and Calculations of their concentrations. Qualitative treatment of line defects. Representation of Burger vector, burger circuit and it's significance.

**Unit:3**

**Vibrations and Ultrasonics** (6+3 Periods)

**Vibrations:**

Free vibrations and setting up of a differential equation and its solutions. Damped, forced vibrations and resonance (qualitative). Calculation of moment

of inertia of a circular disc. Applications: Compound Pendulum and Torsional Pendulum.

**Ultrasonics:**

Production of ultrasonics by Magnetostriction method and piezoelectric method, Applications of Ultrasonics.

**Unit:4**

**Wave optics** (6+2 Periods)

**Interference**: Superposition of waves, Young’s double slit experiment and calculation of resultant Intensity and wave pattern discussion. Interference in thin films due to reflection of light-Newton’s rings, Calculation of refractive Index of a liquid using Newton's rings.

**Diffraction:** Plane diffraction grating and resolving power of a grating. Calculation of wavelength of a spectral line by using diffraction grating.

**Unit:5**

**Lasers and Nuclear Energy** (6+3 Periods)

**Lasers:**

Characteristics of LASER, Spontaneous and Stimulated Emission of Radiation, Einstein’s Coefficients and their significance. Meta-stable State, Pumping, Population Inversion and optical resonator. Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers.

**Nuclear Energy:** Mass Defect, binding energy, Nuclear fission, Nuclear fusion.

Radioactive disintegration: , β, γ particles and their properties.

**Unit:6**

**Nano materials and their fabrication:** (7 Periods)

Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Quantum Confinement Effect, Bottom-up Fabrication: Sol-gel method, Chemical Vapor Deposition technique (CVD). Top-down Fabrication: Ball Milling, Characterization of Nano materials (XRD & TEM), Carbon Nano Tubes (CNTs), Applications of Nano Materials.

**Text Books:**

1. Engineering Physics by M.N. Avadhanulu, P.G. Kshirsagar and TVS Arun Murthy. S. Chand publications.

**Reference Books:**

1. Charles Kittel, Introduction to Solid State Physics.

2. Dekker - Solid State Physics

3. Halliday and Resnick, Physics

4. Engineering Mechanics by S.S. Bhavikatti & J.G. Rajasekharappa.

5. Theory of Vibrations with Applications – WT Thomson

6. S.O. Pillai, Solid State Physics

7. A. Ghatak – Optics

**Course Outcomes**

After completing the course the students are able to

* Get the knowledge to classify the crystal structures, their parameters and draw the various crystal planes using Miller indices.
* Understand and analyze the various crystal defects-its types.
* Understand about the vibrations, radius of gyration, moment of inertia and ultrasonic.
* Analyze the wave nature of light, superposition principle, differentiation between interference, diffraction and their applications
* Explain about the types of emissions, laser principle, working of different types of lasers and their applications. To understand the nuclear fission and fusion, radioactivity emission of alpha, beta and gamma rays.
* To understand the nano & bulk concepts, surface to volume ratio, quantum confinement, CNTs and preparation methods. Analysis techniques like XRD & TEM.

**Syllabus for B. Tech. I Year I semester**

**Mechanical Engineering**

**MATRIX ALGEBRA AND CALCULUS**

(Common to All Branches of Engineering)

#### L T P/D C

**Code:** 9HC11 **2 1 0 3**

**Pre Requisites**: Mathematics Knowledge at Pre-University Level

***Course Objectives:*** *To make the students to understand and expected to learn*

1. *Basic operation of matrices and about the linear system and some analytical methods for solution.*
2. *Concept of Eigen value and Eigen vector and their properties and applications.*
3. *Quadratic form and its properties.*
4. *Mean value theorems and their applications to the given functions, series expansions of a function.*
5. *Various analytical methods to solve first order first degree and also the equations not of first degree ordinary differential equations.*
6. *Methods to solve higher order ordinary differential equations.*

***UNIT-I: System of Linear Equations:*** Elementary row/column operations -Echelon form, Rank of a matrix, Inverse of a matrix by Gauss Jordan method. Non-Homogenous and Homogenous system of linear equations- consistency or inconsistency of a system, Gauss Elimination method, Rank method and problems. Symmetric, Skew-symmetric and Orthogonal matrices.

***UNIT-II: Eigen values and Eigen vectors:*** Definitions and Properties (without proofs). Evaluation ofEigen values and Eigenvectors for a given matrix. Cayley-Hamilton Theorem (without proof) and its applications in finding higher powers & inverse of a matrix, Diagonalization of a matrix. Hermitian, Skew-Hermitian and Unitary matrices.

***UNIT-III Quadratic forms:*** Quadratic forms, Nature, rank, index and signature of a quadratic form. Reduction of quadratic form to canonical form.

***UNIT-IV: Single Variable Calculus:***Rolle’s Theorem, Lagrange’s and Cauchy’s mean value theorems (without proof); Taylor’s and Maclaurin’s series (without proof) and their application for series expansions of standard functions.

***UNIT-V: First order ODE:***Exact differential equations, equations reduced to exact, Linear and Bernoulli’s equations, Newton’s law of cooling, Law of natural Growth/Decay.

***UNIT-VI: Higher order ODE:*** Higher order linear differential equations with constant coefficients- Complementary function, Particular Integral, Method of variation of parameters.

**Suggested Readings:**

1. R K Jain and S R K Iyengar Advanced Engineering Mathematics, Narosa Publications.
2. B.S. Grewal, Elementary Engineering Mathematics, Khanna Publishers
3. Alan Jeffery, Advanced Engineering Mathematics, Academic Press
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

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

* 1. *Check the consistency or inconsistency of a linear system and can solve the problems.*
  2. *Find the Eigen values and Eigen vectors and can solve the problems associated with these concepts.*
  3. *Find the nature, index and signature of the quadratic form.*
  4. *Verify the applicability of mean value theorems and also can express the givenstandard function in series form using Taylor’s and Maclaurin series.*
  5. *Find the solutions of first order first degree differential equations and solve the problems on Newton’s law of cooling, Natural growth and decay.*
  6. *Solve higher order ordinary differential equations with constant coefficients using some standard methods.*

**Syllabus for B. Tech. I Year I semester**

**Mechanical Engineering**

**ENGINEERING GRAPHICS**

**(COMMON TO ALL BRANCHES)**

**Code :9BC01**

**L T P/D C**

1 0 4 3

**Pre Requisites**: Nill

**Course objectives:**

1: To teach students the basic principles of Engineering graphics and instruments used and construct curves.

2: To introduce the concept of projections in drawing and its applications for simple drawing entities ie points and lines.

3: To impart the knowledge of various types of planes and solids and their projections in different position wrt principle planes

4: To teach the concept of sections of solids and their developments.

5: To develop a clear understanding of the basic principles involved in three dimensional Engineering drawings.

6: To teach conversion from three dimensional drawing to two dimensional drawing and introduce the concepts of CAD.

**Course outcomes**

After completing this course, the student will able to:

1. Get familiar to use the instruments to solve the engineering problem and draw various type of curves used in engineering
2. Understand Orthographic projections and draw projections of simple drawing entities such as points Lines.
3. Draw projections of different types of regular Planes, solids in various positions wrt principal planes of projection.
4. Draw Sections of various Solids including Cylinders, cones, prisms and pyramids and draw the developments of these solids and their sections.
5. Construct Isometric Scale, Isometric Projections and Views.
6. Convert Isometric to orthographic views and understand basic sketching using computer aided design (CAD) software.

**UNIT – I**

**Introduction to Engineering Drawing**: Drawing Instruments and their uses, types of lines, Lettering, Dimensioning-Terms & notations, placing of dimensions, general rules of dimensioning **Scales**(concepts).**:** RF,Reducing, Enlarging and Full Scales

**Curves**: Conic Sections including Rectangular Hyperbola - General method, Cycloid and Involutes of circle.

**UNIT – II**

**Orthographic Projection:** Principles of Projection – Methods of projection, First angle and third angle projections.

**Projections :** Projections of Points, Projections of straight lines –line inclined to one plane and line inclined to both reference planes.

**UNIT –III**

**Projections of regular Planes:** types of planes, plane inclined to one reference plane, Oblique planes

**Projections of regular Solids:** types of solids, Projections of: Prisms, Cylinders, Pyramids, Cones – simple position and axis inclined to one plane only

**UNIT –IV**

**Sections and sectional views of Solids:** Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid – Auxiliary views.

**Development of Surfaces:** Methods of development, Development of lateral Surfaces of Right Regular Solids – Prisms, Cylinders, Pyramids, Cones and their sections.

**UNIT – V**

**Isometric Projection:** Introduction, Isometric axes, lines and planes, Isometric Scale – Isometric drawing or View – Isometric drawing of planes and simple solids such as prisms, pyramids, cylinder, cone.

**UNIT –VI**

Conversion of isometric views to orthographic views of simple objects.

**Introduction to CAD :** Benefits of CAD, Graphic input and output devices - Function performed by CAD Software, AUTOCAD-Drawing Entities, Editing commands.

**TextBook:**

Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House (In First-angle Projection Method)

**Reference Books:**

1) Shah, M.B. &Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education

2) Agrawal B. &Agrawal C. M. (2012), Engineering Graphics, TMH Publication

3) AUTOCAD Software Theory and User Manuals

**Syllabus for B. Tech. I Year I semester**

**Mechanical Engineering**

**Problem Solving using C**

**Code :9FC01**

**L T P/D C**

3 0 0 3

**Course Objectives:**

**After completion of this course student will learn:**

* To acquire problem solving skills
* To be able to develop flowcharts
* To understand structured programming concepts
* To be able to write programs in C Language

**Course Outcomes:**

**After completion of this course student will learn**

1. To formulate simple algorithms for arithmetic, logical problems and to translate the algorithms to programs(in C language)
2. To test and execute the programs and correct syntax and logical errors, to implement conditional branching, iteration and recursion
3. To use arrays to formulate algorithms and programs and apply programming to solve matrix addition and multiplication problems and searching
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use pointers to formulate algorithms and programs.
6. To apply files to do various file manipulation functions.

**UNIT I**

**Problem solving Techniques –** Algorithms, pseudo code, flowcharts with examples

**Introduction to Computer Programming Languages** – Machine Languages, Symbolic Languages, High-Level Languages,

**Introduction to C language –** Characteristics of C language, Structure of a C Program.Syntax and semantics.

Data Types, Variables – declarations and initialization, formatting input and output.

**UNIT – II**

**C Tokens:** Identifiers, Keywords, Constants, variables and operators

**Expressions** – Arithmetic expressions, Precedence and Associativity, evaluating expressions,

**Decision control structures** – if, Two-way selection – if else, nested if, dangling else, Multi-way selection – else if ladder and switch.

**Repetitive control structures** – Pre-test and post-test loops – initialization and updation, while, do while and for loop and nested loops.

**Unconditional statements:** break, continue and goto statements with examples.

**UNIT III**

**Arrays** – Definition and declaration, initialization, accessing elements of in arrays, storing values in arrays,

1-D arrays, 2-D arrays, character arrays and multidimensional arrays.

**Function and arrays:** passing individual elements to arrays, passing 1-D array, 2-D array to function.

**Applications:** Linear search, matrix addition, subtraction, multiplication and transpose

**UNIT – IV**

**Functions** – User – defined functions - Function definition, arguments, return value, prototype, arguments and parameters, inter-function communication. Standard functions – Math functions. Scope – local, global.

**Parameter passing –** Call by value and call by reference.

**Recursive functions –** Definition, examples, advantages and disadvantages.

**Macros** – Definition, examples, comparison with functions.

**Storage Classes –** auto, extern, static and Register

**UNIT V**

**Introduction to Pointers** – pointer constants, pointer values, pointer variables, accessing variables through pointers, pointer declaration and definition, declaration versus redirection, initialization of pointer variables, Pointer for inter function communication, pointer to pointers, pointer to function.

**Arrays and pointers –** Pointer arithmetic and arrays, array of pointers

**Strings** – Declaration, Initialization, Input and Output functions, strings and pointer, string handling functions.

**UNIT VI**

**Files** – Concept of a file, streams, text and binary files, stream file processing, system created steams, Standard library I/O functions, file open and close, formatting I/O functions, character I/O functions, Binary I/O, command line arguments, file status functions ,positioning functions.

Applications: Basic operations on files.

**Text Books**

1. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
2. Let Us C by [Yashavant Kanetkar](https://www.amazon.in/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Yashavant+Kanetkar&search-alias=stripbooks)

**Reference Books**

1. Programming in C (2nd Edition) by Ashok N Kamthane
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language

Prentice Hall of India

**Syllabus for B. Tech. I Year I semester**

**Mechanical Engineering**

**ENGLISH – I**

**Essential English Language Skills (EELS)**

**Code :9HC01**

**L T P/D C**

2 0 0 2

**Course Objecives:**

**To enable students to:**

* Recognize and distinguish between different parts of speech
* Learn the correct usage of articles in sentences
* Write sentences using tenses
* Identify when each punctuation marks is needed and its correct usage
* Recognize the difference between direct and indirect speech and form statements in them

Understand the appropriate use of active and passive voice in certain context

**Course Learning Outcomes:**

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

* Demonstrate competence with suitable accuracy in vocabulary, and language fluency.
* State the definition of nouns, verbs, adjectives, and adverbs.
* Identify the differences of each tense and use the tenses accurately.
* Identify specialized reading strategies for specific types of texts

Produce written work that is substantive, organized, and grammatically accurate

UNIT I **Vocabulary-1**

1.1 Root words

1.2 Synonyms and Antonyms

1.3 Homonyms, Homophones and Homographs

1.4 One word substitutes

UNIT II  **Vocabulary-2**

2.1 Idioms and Phrases

2.2 Confusables

UNIT III **Grammar-1**

3.1 The Parts of Speech

3.2 Use of Articles

3.3 Omission of Articles

UNIT – IV **Grammar-2**

4.1 Tenses

4.2 Prepositions

4.3 Concord

UNIT – V **Reading & Writing**

5.1 Techniques of Reading, Reading Comprehension

5.2 Kinds of Sentences

5.3 Punctuation

UNIT – VI **Writing-2**

6.1 Voice – Active voice and Passive Voice

6.2 Speech-Direct & Reported Speech

6.3 Common errors in English

Suggested Reading & References:

1. Word Power Made Easy by Norman Lewis
2. English Grammar In Use: A Self Study Reference And Practice Book Intermediate Learners Book by Raymond Murphy

2. The Logic of English Words by Logophilia Education

3. English Vocabulary In Use Elementary Book With Ans And Cd-Rom by Felicity Odell (Second

Edition)

4. Effective Technical Communicatioin by M. Ashraf Rizvi

5. Intermediate grammar usage and composition; M.L.Tickoo, A.E.Subramanian,

P.R.Subramanyam; OBS

6. An Interactive Grammar to Modern English by Shivendra K. Verma and Hemalatha agarajan,

Frank Bros. & Co.

**Syllabus for B. Tech. I Year I semester**

**Mechanical Engineering**

**Oral Communication Lab -I**

**Code :9HC61**

**L T P/D C**

0 0 2 1

**Course Objectives:**

**To enable students to:**

* Comprehend the basic tactics to communicate effectively and set a road map to achieve their communication goals.
* Know the importance of pronunciation in effective communication and work on mitigating the MTI in their spoken English;
* Communicate in proper tense with conviction and also frame and pose questions aptly. Describe people, objects and situations, using appropriate vocabulary, phrases and sequencing of ideas.
* Use the right English language expressions in varying real life contexts. Develop skill of narration through listening and coordination of ideas.

**Course Learning Outcomes:**

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

* Describe people, objects and situations using simple sentences.
* Use appropriate tenses and expressions in different contexts of conversations.
* Identify major areas of concern in their oral communication and address them.

Create a SMART plan to enhance their communication skills in English

**Unit 1: Communication Skills**

Communication basics, essential elements of effective communication, barriers to Communication, setting SMART communication goals.

**Activities:**

* Ice-breaking activities
* Personal Communication SWOT Analysis

Communication Case Studies: The Terrible & The Terrific

**Unit 2: Pronunciation Matters**

Importance of pronunciation, neutralizing mother tongue interference (MTI).

**Activities:**

* Odd Word Out
* Minimal Pairs Masti Shadow reading

**Unit 3: Use apt expressions in diverse situations**

Self-introduction, Greetings, apologizing, complimenting, inviting, complaining etc.

**Activity:**

Role play in different contexts using the appropriate expressions

**Unit 4:Mind your Tenses**

Describing present and past habits, states, and events. Talking about actions in progress, elating past to the present, talking about the future. Framing questions. (confirmation/information uestions)

**Activities:**

* Speaking activity on daily routine, how students spent their recent vacation, speaking about their childhood, speaking about future plans.
* Dumb Charades (Present/Past continuous - Present/ Past perfect)

Guessing game (10/20 yes or no questions)

**Unit 5:**  **Hone your Describing skills**

Describing people, objects, and situations

**Activities:**

* Picture descriptions.
* Guessing games - listening to the descriptions.
* Narrating memorable incidents from life.
* Describe your ideal worldOnce upon a time……

**Unit 6: The Art of Storytelling**

Story telling for career success, the basics of story telling

**Activities:**

* Building stories - chain activity.
* Story prompts activity. Narrate the story. (all the hints are given except linking words and tenses)

Suggested Reading & References:

* An Interactive Grammar of Modern English” by Shivendra K Verma and Hemalatha Nagarajan, Frank Bros. & Co.
* “Skill Sutras” by Jayashree Mohanraj, Prism Books Pvt. Ltd.
* “Better English pronunciation” by J.D. Connor.
* “Effective Communication” John Adair, Pan Macmillan Ltd.
* “Body Language”, by Allan Pease, Sudha Publications.
* “Communicative English”, by Hariprasad M. and Prakasam V, Neel Kamal Publications.

**Syllabus for B. Tech. I Year I semester**

**Mechanical Engineering**

**Applied Physics Lab**

**Code :9HC65**

**L T P/D C**

0 0 3 1.5

**Course Objectives**

* Explain about the acceleration due to gravity and radius of gyration and periodic vibrations.
* To understand the rigidity modulus and periodic vibrations.
* Explaining about the electrical resonance by using the LCR circuit.
* To know the time constant of RC circuit.
* To understand the transverse laws of vibrations of stretched strings.
* To explain the electrically vibrating tuning fork by using Melde’s experiments.
* Explain the formation of Newton’s rings based on interference pattern.
* Discussion of diffraction pattern using the grating.
* To study the LED characteristics and its forward resistance.
* To understand the dispersive power of prism.
* To explain about magnetic induction, Biot-Savart Law.

**List of Experiments**

1. **Compound Pendulum:**

-Determination of acceleration due to gravity and radius of gyration

using compound pendulum.

1. **Torsional Pendulum:**

-Determination of rigidity modulus of a given material of wire using

Torsional pendulum.

1. **LCR Circuit:**

-Study of series and parallel resonance of a LCR circuit.

1. **RC Circuit:**

-Determination of time constant of a RC-circuit.

1. **Sonometer:**

Verification of laws of transverse vibrations of a stretched string.

1. **Melde’s Experiment:**

-Determination of frequency of an electrically vibrating tuning fork using

Melde’s experiment.

1. **Newton’s Rings:**

-Determination of wavelength of a monochromatic light source by using

Newton’s rings experiment.

1. **Diffraction Grating:**

-Determination of wavelength of a given laser source of light by using

diffraction grating in normal incidence method.

1. **Light Emitting Diode (LED):**

-Studying the characteristics and calculating the forward resistance of a

LED.

**10. Dispersive Power:**

-Calculation of dispersive power of a given material of prism by using

spectrometer.

**11. Stewart-Gee’s Experiment:**

-Determination of magnetic induction flux density along the axis of a

current carrying circular coil using Stewart and Gee’s experiment.

**NOTE**: Any **TEN** of the above experiments are to be conducted.

**Course Outcomes**

After completing the experiment, students are able to

* Analyze the concept and application parts of radius of gyration and periodic vibrations.
* Summarize the fundamentals of modulus-types, stress, strain, elasticity, plasticity and Hook’s law.
* Analyze the LCR circuit combination, parallel, series electrical resonance, inductance, reactance, capacitance and electrical and electronic fundamentals.
* Characterize the RC network, time constant, capacitor functioning and its application.
* Demonstrate the resonance phenomenon and verify the transverse laws of stretched strings by using Sonometer.
* Describe the types of waves like longitudinal, transverse, stationary and progressive waves. Electromagnetic induction and its applications.
* Understand the concepts of interference, conditions, formation of Newton’s rings-reason.
* Recognize the difference between the interference and diffraction, grating, laser characteristics.
* Analyze the difference between normal diode, LED, forward bias, reverse bias, I-V characteristics, direct and indirect band gap semiconductors.
* Know about the light properties-dispersion, prism, spectrometer and minimum deviation arrangement.
* Understand and search to apply the fundamentals of magnetic induction, Ampere’s law, Oersted’s law and the Biot-Savart law.

**Syllabus for B. Tech. I Year I semester**

**Mechanical Engineering**

**Problem solving Using C Lab**

**Code :9FC61**

**L T P/D C**

0 0 3 1.5

**Course Objectives:**

**After completion of this course student will learn**

* To be able to understand the fundamentals of programming in C Language
* To be able to write, compile and debug programs in C
* To be able to formulate problems and implement in C.
* To be able to effectively choose programming components.
* To solve computing problems in real-world.

**Course Outcomes:**

**After completion of this course student will learn**

1. To formulate the algorithms for simple problems
2. To translate given algorithms to a working and correct program
3. To be able to correct syntax errors as reported by the compilers
4. To be able to identify and correct logical errors encountered at run time
5. To be able to write iterative as well as recursive programs
6. To be able to represent data in arrays, string manipulation through a program
7. To be able to create, read and write to and from simple text files.

**[The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.]**

1. **Unit I (Cycle 1)**
2. Write an algorithm for converting a given Celsius temperature to its equivalent Fahrenheit temperature and draw a flowchart.
3. Write an algorithm to find the largest of three given numbers and draw a flowchart.
4. Write an algorithm and draw a flowchart for finding the roots and nature of roots of a quadratic equation, given its coefficients.
5. Write an algorithm and flowchart for finding the first n Fibonacci numbers, give n.
6. **Unit II (Cycle 2)**
7. Write an algorithm, flowchart, and C program for:
8. Finding the area and circumference of a circle of given radius.
9. Finding the volume of a sphere of given radius.
10. Finding the lateral surface area of a right circular cone of given base radius and height.
11. Finding selling price of an item, given its cost price and profit percent.
12. Finding the interest on a given principal for a given period of time at a given rate of per year.
13. Write a C program to display all the sizes of data types in C.
14. Write a C program to display a given decimal integer into an equivalent octal number and hexadecimal number using %o and %x in printf function.
15. **Unit II (Cycle 3)**
    1. Write a C program to find the roots and nature of the roots of a quadratic equation, given its coefficients.
    2. Write a C program for finding the largest of three given numbers.
    3. A salesman gets a commission of 5% on the sales he makes if his sales is below Rs.5000/- and a commission of 8% on the sales that exceeds Rs.5000/- together with Rs.250/-. Write an algorithm or a flowchart and develop C program for computing the commission of the salesman, given his sales.
    4. Write a C Program to demonstrate Marcos.
16. **Unit III (Cycle 4)**
17. Write three C programs to print a multiplication table for a given number using while, do-while, and for loops.
18. Write a C program to compute the sum of:
19. 1+x+x2+x3+………….+xn, given x and n.
20. 1! + 2! + 3! + . . . + n!, given n.
21. 1 – x2/2! + x4/4! – x6/6! + x8/8! – x10/10! + … to n terms where the nth term becomes less than 0.0001.
22. **Unit III (Cycle 5)**
    1. Write a C program in the menu driven style to perform the operations +, -, \*, /, % between two given integers.
    2. Write a C program to find the largest and the least of some numbers given by the user.
    3. Write a C program to find the sum of the digits of a positive integer.
23. **Unit IV (Cycle 8)**
    1. Write a program to store the numbers given by the user in an array, and then to find

the mean, deviations of the given values from the mean, and variance.

* 1. Write a C program to initially store user given numbers in an array, display them andthen to insert a given number at a given location and to delete a number at a given location.
  2. Write a program to store user given numbers in an array and find the locations of minimum and maximum values in the array and swap them and display the resulting array.

1. **Unit IV (Cycle 9)**
   1. Write a C program to implement the operations of matrices – addition, subtraction,

multiplication.

* 1. Write a program to find whether a given matrix is symmetric, lower triangular, upper triangular, diagonal, scalar, or unit matrix.

1. **Unit III (Cycle 6)**
   1. Write C functions for the following:
      1. A function that takes an integer n as argument and returns 1 if it is a prime number and 0 otherwise.
      2. A function that takes a real number x and a positive integer n as arguments and returns xn.
      3. A function that takes a positive integer n as an argument and returns the nth Fibonacci number.
   2. Using recursion write C functions for the following:
      1. Factorial of a non-negative integer n.
      2. Number of combinations of n things taken r at a time.
      3. Greatest Common Divisor of two integers.
      4. Least Common Multiple of two integers.
2. **Unit III (Cycle 7)**
   * 1. Write a menu driven style program to compute the above functions (cycle 6) on the choice of the function given by the user.
     2. Define macros for the following and use them to find sum of the squares of the minimum and maximum of two given numbers.
        1. Larger of two numbers.
        2. Smaller of two numbers.
        3. Sum of the squares of two numbers.
     3. Write a program to generate Pascal’s triangle.
     4. Write a program to count the number of letters, words, and lines in a given text.
3. **Unit V (Cycle 10)**
   1. Write a function to swap two numbers.
   2. Write a function to compute area and circumference of a circle, having area and

Circumference as pointer arguments and radius as an ordinary argument.

1. **Unit VI (Cycle 12)**
   1. Write a program to:

Create a file by the name given by the user or by command line argument and add the text given by the user to that file.

* + 1. Open the file created above and display the contents of the file.
    2. Copy a file into some other file, file names given by the user or by command line

arguments.

* + 1. Append a user mentioned file to another file.
    2. Reverse the first n characters of a file.

**12. Cycle 13:**

Case study on Electricity Billing, Restaurant Billing System

**Syllabus for B. Tech. I Year II semester**

**Mechanical Engineering**

## ENGINEERING CHEMISTRY

**(Common to all branches)**

I B. Tech I Sem (for CSE, CSD, CSM, CSI, CSO, IT and ECM)

I B. Tech II Sem (for EEE, ME, ECE and CE)

**Code :9HC04**

**L T P/D C**

2 1 3 3

**Course Objectives:**

1. To understand microscopic chemistry in terms of atomic and molecular orbitals
2. To learn the preparation and applications of commercial polymers and lubricant materials
3. To learn the industrial problems caused by water and municipal water treatment
4. To acquire knowledge about different types of batteries and their working mechanism
5. To develop the concepts and types of corrosion, control methods and protective coatings
6. To learn the chemical reactions that are used in the synthesis of drug molecules

## UNIT - I

**Atomic and molecular structure (6L)**

Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics (F2, Cl2 CO, NO). Pi- molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

## UNIT - II

**Plastics and Lubricants (8L)**

**Plastics: Polymerization-**Addition and Condensation polymerization, Plastics – Thermosetting and Thermoplastics, preparation, properties and **engineering applications of plastics:** PVC, Teflon, Bakelite. Fibers: Nylon 6,6 and Dacron.

Rubbers – natural and artificial rubber, vulcanization of natural rubber, Buna-S, Buna-N and their **engineering applications.** Fabricated Reinforcing Polymers**- engineering applications Lubricants:** Definition, classification and function of lubricants, Types of lubrication and mechanisms – Thick Film or Hydrodynamic Lubrication, Thin Film or Boundary Lubrication, Extreme Pressure Lubrication. Classification and properties of lubricants – Viscosity, flash and fire point, cloud and pour point and acid value. **Engineering applications.**

## UNIT - III

**Water Technology (8L)**

1. **Introduction: -** Hardness of water – types of hardness (temporary and permanent), calculation of hardness- Numerical problems. Estimation of hardness of water by EDTA Method.
2. **Water for Industrial purpose:** Food, sugar, textile, paper and pharma industries, water for steam making characteristics of boiler feed water, boiler troubles- scale and sludge & Carry over (priming &foaming), boiler corrosion, caustic embrittlement.
3. **Water Treatment:** Internal conditioning- phosphate, carbonate & calgon conditioning. External Treatment: Ion-exchange process. Desalination-reverse osmosis. Municipal water treatment-sedimentation, coagulation, filtration, disinfection-chlorination, ozonization. **Engineering applications: Methodology and working of mineral water plant for drinking purpose.**

## UNIT - IV

**Electrochemistry (8L)**

Conductance – conductors (metallic and electrolytic), types of conductance – specific, equivalent and molar conductance – effect of dilution on conductance.

Free energy and emf, cell potentials, electrode potential (oxidation and reduction). Types of electrodes - redox electrode (quinhydrode electrode), metal – metal insoluble salt electrode and Ion selective electrode. Cell notation and cell reaction –Nernst equation and applications. **Engineering Applications.**

**Batteries** : Types of batteries

1. Primary batteries – Lechalanche cell (dry cell), Lithium cell
2. Secondary batteries(Accumulators) – Lead acid battery, Lithium-ion battery
3. Fuel cells- H2 – O2 fuel cell and MeOH-O2 fuel cell-advantages and applications.

## Engineering applications – future water powered car, Hydrogen production and storage.

**UNIT - V**

## Corrosion and Surface treatment (8L)

Corrosion – basic concepts –types of corrosion, chemical, electrochemical corrosion (absorption of O2 and evolution of H2) -factors affecting the rate of corrosion.

**Cathodic protection** – sacrificial anodic protection and impressed current cathodic protection method.Surface treatment

Mechanical surface treatment and coatings, casehardening and surface coating, thermal spraying, vapour deposition, Ion implantation, Diffusion coating.

Methods of metallic coatings-hot dipping (tinning and galvanizing), metal cladding (Al cladding), electroplating (copper plating) and electroless plating (nickel plating), electroforming, ceramic, organic and diamond coating

## UNIT-VI

**Organic reactions and drug molecules (5L)**

Introduction: reactions involving substitution (SN1, SN2) addition to double bond(C=C), elimination (E1 and E2), oxidation (using KMnO4, CrO3), reduction (Hydrogenation by Ni/H2, Pd/C)

**Drugs:** Definition, classification structure and applications of commonly used drug molecules- paracetamol, aspirin, ibuprofen and diphenhydramine (Benadryl)

Principles of spectroscopy and selection rules: Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules- **Applications**.

## TEXT BOOKS:

* 1. Engineering Chemistry: PK Jain & MK Jain, Dhanapathrai Publications (2018)
  2. Engineering Chemistry: by Thirumala Chary Laxminarayana & Shashikala, Pearson Publications (2020)

## REFERENCE BOOKS:

1. Textbook of Engineering Chemistry: Jaya Shree Anireddy, Wiley Publications (2019)
2. Engineering Chemistry: by & B.Rama Devi, Prsanta Rath & Ch. Venkata Ramana Reddy, Cengage Publications (2018)
3. Engineering Chemistry: Shashi Chawla, Dhanapathrai Publications (2019)
4. Textbook of Engineering Chemistry: SS Dara, SS Umare S. Chand Publications (2004)

## Course Outcomes

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

1. Understand and analyse microscopic chemistry in terms of atomic orbitals, molecular orbitals and intermolecular forces.
2. Identify and differentiate polymers, thermoplastic, thermosetting plastics and various lubricants.
3. Recognize and select the domestic and industrial problems caused by hard water and also learn about the municipal water treatment using various methods.
4. Understand and interpret the important fundamental concepts of electrochemistry and solve the problems related to batteries.
5. Differentiate the types of corrosion and methods used to prevent the corrosion, surface coating techniques
6. Learn and implement synthesis of drug molecules and learn fundamentals of analytical techniques like electronic, vibrational and rotational spectroscopy**.**

**Syllabus for B. Tech. I Year II semester**

**Mechanical Engineering**

**ADVANCED CALCULUS**

(Common to All Branches of Engineering)

#### L T P/D C

**Code:** 9HC12 **2 1 0 3**

**Pre Requisites**: Mathematics Knowledge at Pre-University Level

***Course Objectives:*** *To make the students to understand and expected to learn*

1. *Basic concepts of multivariable differential calculus.*
2. *Evaluation of double and triple integrals.*
3. *Solutions of first order linear and non-linear partial differential equations.*
4. *Series expansion of a given function in terms of sine and cosine terms.*
5. *Basic Concepts of vector differential calculus.*
6. *Concepts of vector integral calculus,*

***UNIT-I: Functions of several variables:*** Limits, Continuity and partial derivative, total derivative, Jacobian, Maxima and minima of two variable functions (without constraints).

***UNIT-II: Multiple Integrals:*** Double integrals, change of order of integration, change of variables (Cartesian to polar), Triple integrals (Cartesian form).

***UNIT-III: Partial Differential Equations:*** Formation of partial differential equations, solutions to first order linear and non-linear partial differential equations - standard Forms,

***UNIT-IV: Fourier series:*** Dirichlet conditions, Fourier series of functions over the intervals of length 2l& 2π. Half range sine and cosine series, Problems on Parseval’s theorem (without proof).

***UNIT-V: Vector Differentiation:*** Vector and scalar point functions, gradient, directional derivatives; divergence and curl of a vector point function and problems.

***UNIT-VI: Vector Integration:*** Line integrals, surface integrals, volume integrals, Green, Gauss divergence and Stokes theorems (without proofs) and problems.

**Suggested Readings:**

1. R K Jain and S R K Iyengar Advanced Engineering Mathematics, Narosa Publications.
2. B.S. Grewal, Elementary Engineering Mathematics, Khanna Publishers
3. Alan Jeffery, Advanced Engineering Mathematics, Academic Press
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

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

* 1. *Find the limits and test for the continuity and differentiability of a function.*
  2. *Solve the problems on multiple integrals.*
  3. *Solve linear and nonlinear first order partial differential equations.*
  4. *Find Series expansion a function defined over the intervals.*
  5. *Find directional derivative, gradient, divergence and curl of a function.*
  6. *Solve problems of line, surface and volume integrals.*

**Syllabus for B. Tech. I Year II semester**

**Mechanical Engineering**

**DATA STRUCTURES**

**(Common to all Branches)**

|  |  |  |  |
| --- | --- | --- | --- |
| **L** | **T** | **P** | **C** |
| **3** | **0** | **0** | **3** |

**Prerequisites: Problem Solving using C**

**Course Code: 9EC01**

**Course Objectives:**

1. To provide the knowledge of structures, unions, enum and typedef.
2. To understand and learn the applications of Abstract data Type, linear data structures such as stacks, queues and linked list.
3. To comprehend different nonlinear data structures.
4. To understand and analyze the concepts of various searching and sorting techniques.

**Course Outcomes:**

After completion of this course student will be able to:

1. Design the programs using structures, unions and enum.
2. Demonstrate the concepts of Abstract data type and also applications of stacks and queues.
3. Implement basic operations on single, double and circular linked list.
4. Solve problems involving Binary Search trees and AVL trees.
5. Articulate the concepts of graphs, heaps and hashing.
6. Develop algorithms for various searching and sorting techniques and analyze their performance.

**UNIT I:**

**Structures:** Introduction, types, initialization and accessing,

Array of Structures, Nested Structures, Self-referential structures.

Unions, enum, typedef, Dynamic Memory allocation.

**UNIT II:**

**Introduction to data structures:** Abstract data type (ADT), Stacks, Queues and Circular queues and their implementation with arrays.

Applications of Stack: infix to post fix conversion, postfix expression evaluation. Applications of Queues.

**UNIT III:**

**Linked list:** introduction, advantages of Linked list over Arrays.

**Single linked list:** creation, insertion, deletion and display operations

**Double linked list:** creation, insertion, deletion and display operations

**Circular linked list:** creation, insertion, deletion and display operations,

Implementation of Stacks and Queues with singly linked list.

**UNIT IV:**

**Trees:** Terminology, Binary Tree: types, representation and traversals (in-order, pre-order, post-order).

**Binary Search Tree:** introduction, operations (insertion, deletion, display)

**AVL Trees**: Definition, examples, and operations (insertion, deletion and searching).

**UNIT V:**

**Graphs:** terminology, representation, traversals (DFS and BFS).

**Heaps:** Introduction, Min Heap, Max Heap, Operations on Heaps, Heap Sort.

**Hashing:** Hash Table, Hash functions.

**Collision resolution techniques**: separate chaining, open addressing-linear probing, quadratic probing, double hashing.

**UNIT VI:**

**Searching:** linear and binary search methods.

**Sorting:** Bubble Sort, Insertion Sort, Selection Sort, Quick sort, Merge sort

Performance analysis of Searching and Sorting Algorithms.

**TEXT BOOKS:**

1. Data Structures Using C second edition by [Reema Thareja](https://www.amazon.in/Reema-Thareja/e/B00357V8ME/ref=dp_byline_cont_book_1) Oxford university press

2. Data Structure through C by Yashavant Kanetkar.

**REFERENCES:**

1. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft. Data Structures and

Algorithms. Addison Wesley,1983 .

1. Data Structures using c Aaron M.Tenenbaum , YedidyahLangsam,MosheJAugenstein.
2. Introduction to Data Structures in C ByKamtane
3. Data Structures, A pseudocode Approach with C by Richard F. Gilberg and Behrouz A. Forouzan.

**Syllabus for B. Tech. I Year II semester**

**Mechanical Engineering**

**Oral Communication Lab - II**

**(2022-2023) (A-22 Regulations)**

(Common for all Branches)

Lab Code: 9HC62

**L – T –P/D - C**

0 0 3 1.5

*Maximum Marks: 100 (Internal – 30 / External – 70)*

**Course Objectives:**

To enable students to:

* Strike a conversation and engage in effective small talk.
* Lose stage fear and confidently interact with others in different roles and tap their creative side.
* Speak for a minute, fluently and cohesively.
* Make official presentations with effective use of PPTs.
* Engage in group discussions in a confident and professional manner.
* Shed fear of questions from the audience and the interviewers.

|  |  |  |
| --- | --- | --- |
| **Unit** | **OC Lab (2 hrs. per week)** | **No. of periods (32 hrs.)** |
| Unit 1 | **Small talk and conversational techniques**  Tips on enhancing conversation skills.  Conversation starters, small talk questions, how to talk to stranger**s** andpractice activities on initiating informal conversations.   * Talk about your favourite things. * Interview each other. | 6 |
| Unit 2 | **Role Play/skit/one act play**   * Role play assuming fictional characters and non-fictional characters. * One Act plays * Ad’ Venture: Advertisement creation and enacting. | 4 |
| Unit 3 | **Just a minute (JAM)**  One-minute speaking activity on topics of students’ choice and Extempore. | 6 |
| Unit 4 | **Presentation skills**  Introduction to structural talk.Techniques of making effective presentations.   * Five minute PowerPoint presentations. | 6 |
| Unit 5 | **Group Discussions**  Tips on Dos and Don'ts of Group Discussion (GD).Discussion on evaluation pattern during GD.   * Practice sessions: GDs on different topics. | 4 |
| Unit 6 | **Facing questions: Mock Interviews**  Strategies of handling Question and Answer sessions after Presentations/seminars.   * Question Toss: Practice on asking and answering questions. | 6 |

**Suggested Reading:**

* “Effective Technical Communication” by M. Ashraf Rizvi, McGraw Hill.
* “Skill Sutras” by Jayashree Mohanraj, Prism Books Pvt. Ltd.
* “Technical Communication: Principles and Practice” by Meenakshi Raman, OUP.
* “Effective Communication” John Adair, Pan Macmillan Ltd.
* “Body Language”, by Allan Pease, Sudha Publications.
* “Business Communication: From Principles to Practice” MM Monippally, TataMcGraw Hill.

**Course Learning Outcomes:**

* Understand the nuances of striking a great conversation in formal and informal situations.
* Gain experience of facing an audience and speaking in public.
* Design a winning presentation and present it with ease.

**Syllabus for B. Tech. I Year II semester**

**Mechanical Engineering**

**ENGINEERING MECHANICS**

**(COMMON TO MECHANICAL AND CIVIL)**

**Code :** **9BC02**

**L T P/D C**

2 1 0 3

**Pre Requisites**: Nill

**Course Objectives:**

Understand the Concepts o1f Resultant and Equilibrium of System of Forces, Properties of surfaces and volumes and Dynamics of Particle and Rigid Bodies.

**Course Outcomes:**After completing the subject, students will be able:

1. to analyse the system of forces, free body diagrams to solve problems dealing with forces in a plane.
2. to analyse plane frame and solving using different methods like method of joints and method of sections friction concept and applications like wedge friction.
3. to understand the properties of surfaces and volumes and roll played by centroid and centre of gravity in different applications.
4. to understand second moment of area and mass moment of inertia and its application strength of materials in evaluating strength.
5. to understand analysis of rigid body rotation and kinematics and kinetics of particle & rigid body.
6. To analyse Application of work energy method and impulse momentum method to rigid bodies

**UNIT-I**

**Introductory Concepts**: Fundamental Concepts & Axioms, System of Forces.

**Resultant of Force System:** Parallelogram law, Resolution of forces, Resultant of Coplanar ConcurrentForces, Component Forces in Space, Moment of Force, Principle of Moments, Moment of Couple, Resultant of Coplanar Non-concurrent Forces.

**Equilibrium of Systems of Forces:**Free Body Diagrams, Equations of Equilibrium of Coplanar systems, Spatial System, Spatial systems for Concurrent and Non-concurrent forces, Lami’s Theorem, Equilibrium of Coplanar systems.

**UNIT-II**

**Analysis of Perfect Frames:** Construction of Trusses, Assumptions, Methods of Analysis – Method of Joints and Method of Sections.

**Friction***:*  Theory of friction, Laws of Friction, Types of Friction, Limiting Friction, Sliding, Rolling and Pivot friction, Static and Dynamic friction, Motion of Bodies, Wedge friction.

**UNIT-III**

**Centroid & Centre of Gravity:** Centroid of areas and lines, Centroids determined by Integration, Centroids of composite areas and lines, Theorem of Pappus, Centre of gravity of flat plate, Centre of gravity of simple bodies from basic principles, centre of gravity of composite bodies.

# UNIT-IV

**Area Moment of Inertia:** Definition, Polar moment of inertia, Radius of gyration, Transfer Formula for Moment of Inertia, Moment of Inertia by integration, Moment of Inertia for Composite Areas, Product of Inertia, Transfer Formula for Product of Inertia.

**Mass Moment of Inertia:** Radius of Gyration, Mass moment of Inertia by integration, Transfer Formula for Mass Moment of Inertia, Mass Moment of Inertia of composite bodies.

# UNIT-V

**Kinematics of Particle**: Rectilinear and Curvilinear translation, Rectangular components of curvilinear translation, Normal & Tangential components of acceleration.

**Kinematics of Rigid Bodies**: Types of rigid bodies motions, Angular motion–Fixed Axis Rotation, Centroidal Rotation and Non–centroidal Rotation.

**Kinetics:** Analysis as Particle and Rigid Body in translation Fixed Axis Rotation.

**UNIT - VI**

**Work - Energy Method**: Work – Energy Equation for translation, Work -Energy applied to particle motion, work-Energy applied to connected systems, Work -Energy applied is fixed axis rotation.

**Impulse – Momentum Method**: Linear Impulse Momentum, Conservation of linear momentum, Elastic Impact and types of Impacts, Coefficient of Restitution.

**TEXT BOOKS:**

1. K. Vijay Kumar Reddy and J. Suresh Kumar, Singer’s Engineering Mechanics, BS Publications, Hyderabad, 2011
2. Engineering Mechanics by S.S.Bhavikatti J.G.Rajasekharappa.

**REFERENCE BOOKS:**

1. Engineering Mechanics by Timoshenko & Young
2. Irving H.Shames , Engineering Mechanics.
3. Kurmi R.S. Engineering Mechanics S.Chand & Co.
4. Engineering Mechanics by Meriam and Kraize
5. Engineering Mechanics by K.L.Kumar / Tata McGraw Hill.

**Syllabus for B. Tech. I Year II semester**

**Mechanical Engineering**

**WORKSHOP/MANUFACTURING PROCESSES LAB**

**((COMMON TO ALL BRANCHES)**

**Code :9BC61**

**L T P/D C**

1 0 3 2.5

**COURSE OBJECTIVES:**

1. To know the different popular manufacturing process
2. To gain a good basic working knowledge required for the production of various engineering products
3. To provide hands on experience about use of different engineering materials, tools, equipment’s and processes those are common in the engineering field
4. To identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances

**COURSE OUTCOMES:** After completion of the course, the student will be able to:

CO-1: Use various types of conventional manufacturing Processes

CO-2: Manufacture components from wood, MS flat, GI Sheet etc. – hands on experience

CO-3: manufacturing of components by machining like shafts, holes & threaded holes, surface finishing of components etc.

CO-4: Produce small devices / products /appliances by assembling different components

**LIST OF EXPERIMENTS**

|  |  |  |
| --- | --- | --- |
| **S.No** | **Trades** | **Experiment name** |
| 1 | Fitting Shop | **1**. Preparation of T-Shape Work piece  **2.** Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding. |
| 2 | Carpentry | 3. Cross Half Lap joint  4. Half Lap Dovetail joint |
| 3 | Electrical & Electronics | 5. One lamp one switch  6. Stair case wiring |
| 4 | Welding | 7. Practice of Lap and Butt joint by Arc welding |
| 5 | Casting | 8. Preparation of mould cavity using solid pattern  9. Preparation of mould cavity using split pattern |
| 6 | Tin Smithy | 10. Preparation of Rectangular Tray  11. Preparation of Square box |
| 7 | Plastic molding & Glass Cutting | 12 Injection Moulding  13 Glass Cutting with hand tools |
| 8 | Machine Shop  (Demonstration only) | Demonstration of Turning, Drilling and grinding operations on Lathe, Drilling and grinding machines |

**Syllabus for B. Tech. I Year II semester**

**Mechanical Engineering**

## ENGINEERING CHEMISTRY LABORATORY

I B. Tech I Sem (for CSE, CSD, CSM, CSI, CSO, IT and ECM)

I B. Tech II Sem (for EEE, ME, ECE and CE)

**Code :9HC64**

**L T P/D C**

0 0 3 1.5

## Course Objectives:

The student will be able to learn:

1. To reparation of Inorganic compounds
2. To determine surface tension of a liquid
3. To determine viscosity of lubricant
4. To determine acid value of an oil
5. To estimate hardness of water
6. To analyze the amount of chloride content
7. To determine cell constant and conductance of solutions
8. To determine redox potential and emf of solutions
9. To determine the rate constant of acid
10. To synthesize a polymer (Thiakol rubber / Urea-Farmaldehyde resin)
11. To synthesize a drug- Aspirin
12. To estimate of Mn+7 by Colorimetry method

## List of Experiments

1. Preparation of coordination complex NiDMG Complex
2. Determination of surface tension
3. Determination of viscosity
4. Saponification/acid value of an oil
5. Ion exchange column for removal of hardness of water / Estimation of Hardness of water by EDTA Method
6. Determination of chloride content of water
7. Determination of cell constant and conductance of solutions (HCl Vs NaOH / Mixture of acid Vs Strong base)
8. Potentiometry - determination of redox potential and emf (FeSO4 Vs KMNO4 / HCl Vs NaOH)
9. Determination of the rate constant of acid catalyzed hydrolysis of methylacetete
10. Synthesis of a polymer- Thiakol rubber / Urea-Farmaldehyde resin
11. Synthesis of a drug- Aspirin
12. Estimation of Mn+7 by Colorimetry method

## Course Outcomes

After completion of the course, the student will be able to learn:

1. Preparation of Inorganic compounds
2. Determination surface tension of a liquid
3. Determination viscosity of lubricant
4. Determination acid value of an oil
5. Estimation hardness of water
6. Analysis the amount of chloride content
7. Determination of cell constant and conductance of solutions
8. Determination of redox potential and emf of solutions
9. Determination of the rate constant of acid
10. Synthesis of a polymer (Thiakol rubber / Urea-Farmaldehyde resin)
11. Synthesis of a drug- Aspirin
12. Estimation of Mn+7 by Colorimetry method

**Syllabus for B. Tech. I Year II semester**

**Mechanical Engineering**

#### DATA STRUCTURES Using C Lab

**(Common to all Branches)**

|  |  |  |  |
| --- | --- | --- | --- |
| **L** | **T** | **P/D** | **C** |
| **0** | **0** | **3** | **1.5** |

Course Code: 9EC61

**Prerequisites: Problem Solving using C Lab**

**Course objectives:**

1. Create programs on structures and unions
2. Develop the programs on Linear and Non-Linear data structures
3. Write programs on various searching and sorting algorithms.

#### Course Outcomes:

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

1. Write programs on structures and unions.
2. Implement Stacks, Queues and circular queues using arrays.
3. Write programs to implement basic operations on various types of linked list.
4. Implement insertion and traversal operations on binary search tree
5. Develop programs on various searching, sorting algorithms.

Note: Lab Projects will be allocated to the students at the beginning of the semester.

**Cycle 1:**

1. Define a structure for complex number. Write functions on complex numbers (addition, subtraction, absolute value, multiplication, division, complex conjugate) and implement them in a menu driven style.
2. Define a structure student having members roll no., name, class, section, marks.

Create an array of 10 students give the data and find the average marks, section-wise.

**Cycle 2:**

1. Write a C program that implement stack and its operations using arrays
2. Write a C program that implement Queue and its operations using arrays.
3. Write a C program that implement Circular Queue and its operations using arrays.

**Cycle 3:**

1. Write a C program that uses Stack operations to perform the following:
2. Converting infix expression into postfix expression
3. Evaluating the postfix expression

**Cycle 4:**

1. Write a C program that uses functions to perform the following operations on

singly linked list:

1. Creation ii) Insertion iii) Deletion iv) Traversal

**Cycle 5:**

1. Write a C program that uses functions to perform the following operations on

doubly linked list:

1. Creation ii) Insertion iii) Deletion iv) Traversal in both ways

**Cycle 6:**

1. Write a C program using functions to perform the following operations on

circular singly linked list:

1. Creation ii) Insertion iii) Deletion iv) Traversal

**Cycle 7:**

1. Write a C program to implement operations on the following Data Structures

Using Singly linked list:

i) Stack ii) Queue

**Cycle 8:**

1. Write a C program that uses functions to perform the following:
2. Creating a Binary Search Tree.
3. Traversing the above binary tree in pre-order, in-order and post-order.

**Cycle 9:**

1. Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:
2. Linear Search ii) Binary Search

**Cycle 10:**

1. Write C programs that implement the following sorting methods to sort a given

list of integers in ascending order:

1. Bubble Sort ii) Insertion Sort iii) Selection Sort

**Cycle 11:**

1. Write C programs that implement the following sorting methods to sort a given list of integers in ascending order:
2. Quick sort ii) Merge sort iii) Heap Sort

**Cycle 12:**

15 Lab Projects- Design and Develop Case Studies such as ,Graph Traversal Techniques,

Collision Resolution Techniques

**Syllabus for B. Tech. II Year I semester**

**Mechanical Engineering**

**BUSINESS MANAGEMENT AND ACCOUNTANCY**

**Code : 9ZC01**

**L T P/D C**

3 0 0 3

**Course Objectives:**

* To understand the basics of Managerial Economics at Micro level, Demand analysis and production analysis in particular.
* To understand cost concept, Revenues and Market structure
* To understand and identify various basic concepts of Accounting, Double entry system and Book keeping.
* To understand the concepts of Capital expenditure, Revenue expenditure and Final accounts.
* To make student understand the basics of Management, its principles and various functions performed in organization.
* To make student learn about various personality traits, perception, attitudes of individuals working in organization.

**UNIT-1**

**INTRODUCTION TO MANAGERIAL ECONOMICS:**

Definition, Nature and scope of Managerial Economics, consumer’s Equilibrium. Theory of Demand, Demand function, Determinants, exceptions - Price Elasticity of Demand and Demand forecasting. Theory of supply, Production function and Economies of scale.

**UNIT- 2**

**INTRODUCTION TO COST, REVENUE AND MARKET STRUCTURE:**

Cost Analysis, types of costs, Revenue Analysis, Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems). Market structures: Types of competition, Features of Perfect competition, Monopoly, Monopolistic Competition and oligopolistic competition.

**UNIT-3**

**INTRODUCTION TO MANAGEMENT:**

Management- Definitions, Fayol’s principles of Management, Levels of Management, functions of management. Planning: types of planning, planning process; Organizing: Organizational Design and structure, staffing; Directing;, Controlling: Basic control process.

**UNIT-4**

**INTRODUCTION TO ORGANIZATIONAL BEHAVIOR:** Definition, Nature and Scope, Perception – Perceptual selectivity and organization, Personality and Attitudes, Determinants of personality Formation of Attitudes-**,** Perceptual Distortions Attribution analysis Attribution theories, Johari Window and Transactional Analysis.

**UNIT-5**

**INTRODUCTIONT O FINANCIAL ACCOUNTING:**

Meaning and Definition of Accounting, principles of Accounting, Double-Entry system of Accounting, Book Keeping, introduction to Journal, Ledger and its types, Introduction to Trial balance, problems and solutions of trial balance.

**UNIT-6**

**INTRODUCTION TO FINAL ACCOUNTS:**

Introduction to Final Accounts, Concepts of classifications of Revenue and Capital expenditures, Final accounts: Trading account, Profit and Loss Account, Balance sheet, Problems and solutions of Final accounts with adjustments.

**Essential Readings:**

1. A R Aryasri: Managerial Economics, Tata Mc Graw Hill
2. A R Aryasri: Management Science, Tata Mc Graw Hill

**Suggested Readings:**

1. S A Siddiqui & A S Siddiqui, Managerial Economics & Financial Analysis, New Age
2. Accountancy – I Tulasian Tata Mcgraw Hill Co
3. Koontz & Weihrich: Essentials of Management, 6/e, TMH, 2005

**Syllabus for B. Tech. II Year I semester**

**Mechanical Engineering**

**COMPLEX VARIBLE AND STATISTICS**

(Common to CE & ME)

**Code :9HC13**

**L T P/D C**

2 1 0 3

**Pre Requisites**: Mathematics Knowledge at Pre-University Level.

***Course Objectives:*** *To make the students to understand and expected to learn*

1. *Basic concepts of differential calculus of a complexvariable function.*
2. *Complex integration and its application to evaluate definite integrals.*
3. *Concept of random variables and probability distributions.*
4. *Sampling distributions and their properties and the concepts on estimation.*
5. *Concepts on testing the hypothesis concerning to large samples.*
6. *Test of hypothesis concerned to small size samples and goodness of fit and independence of attributes using chi-square distribution.*

***UNIT-I: Complex Variable-Differentiation:*** Differentiation, analytic functions, Cauchy- Riemann equations, harmonic functions, finding harmonic conjugate and analytic functions.

***UNIT-II: Complex Variable–Integration:*** Cauchy - Integral theorem and Integral formula (without proofs), singularities, zeros of analytic functions, Residues, Cauchy residue theorem (without proof), Evaluation of definite integral involving sine and cosine functions.

***UNIT-III: Random Variables and Probability Distributions:*** Discrete and continuous random variables, probability mass and density functions, expectation and variance. Binomial, Poisson and Normal distributions.

***UNIT-IV: Sampling Distributions and Estimation:***Sampling distribution of the mean ( - known and unknown), sums and differences, central limit theorem. Point estimation and Interval estimation concerning to mean for Large Samples.

***UNIT-V:Test of hypothesis for large samples****:*Type–I and Type-II Errors, Hypothesis testing concerning to one mean and two means, one Proportion and difference of proportions.

***UNIT-VI: Test of hypothesis for small samples****:*Student t-test, Hypothesis testing concerning one mean and two Means, F-test and 2 test-Goodness of fit, Independence of Attributes.

**Suggested Readings:**

1. B.S. Grewal, Elementary Engineering Mathematics, Khanna Publishers
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. Probability and Statistics for Engineers: Miller and John E. Freund, PHI Publishers, 9th Edition
4. SCHAUM’S outlines: Probability and Statistics, Murray R. Spiegel, John Schiller, R. Alu Srinivasan, Mc Graw Hill publishers.

***Course Outcomes:****Students will able to*

* 1. *Solve the problems on differential calculus of complex variable.*
  2. *Solve the problems on contour integration.*
  3. *Solve problems on discrete and continuous probability distributions.*
  4. *Solve problems on sampling and estimation.*
  5. *Solve problems on testing the hypothesis concerning to large size*
  6. *Solve problems on small size samples also goodness of fit and independence of attributes using chi-square distribution.*

**Syllabus for B. Tech. II Year I semester**

**Mechanical Engineering**

**JAVA Programming**

**Code : 9EC41**

**L T P/D C**

3 0 0 3

**Course Objective:**

Understand the concepts of Object oriented programming principles of Java. Write the programs and execute using OOP principles such as garbage collection, overloading methods, constructors, recursion, string handling, StringTokenizer, inheritance and its types, packages, multithreading and threads.

**Course Outcomes :**

1. Understand the concept of OOP with the need of constructing objects, and classes. Write programs using classes, objects, members of a class and the relationships among them needed for a speciﬁc problem.
2. Identify the purpose and usage of principles of inheritance and polymorphism. Implement concepts of polymorphism, encapsulation and methodoverloading
3. Create Java application programs using sound OOP practices (e.g., interfaces and APIs) and proper program structuring (e.g., by using access control identiﬁers, automatic documentation through comments)
4. Students understand and implement error exception handling andmulti-threading.
5. Students learn to create GUI for the specificapplications.
6. Write programs for event-handling using various user interface components on applets.

UNIT-I

History of Java, Java buzzwords, datatypes, variables, simple java program,scope and life time of variables,operators, expressions, control statements, type conversion and costing, arrays,, classes and objects – concepts of classes, objects, constructors, methods, access control, this keyword, overloading methods and constructors, string handling, StringTokenizer.

UNIT-II

Inheritance –Definition, single inheritance, benefits of inheritance, Member access rules, super class, polymorphism- method overriding, Dynamic method dispatch, using final with inheritance, abstract class, Base classobject.

UNIT-III

Interfaces: definition, variables and methods in interfaces, differences between classes and interfaces, usage of implements and extends keyword, uses of interfaces.

Packages: Definition, types of packages, Creating and importing a user defined package.

Applications using interface UNIT-IV

Exception handling -exception definition, benefits of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating user defined exceptions.ulti-Threading: Thread definition, types of multitasking, uses of multitasking, thread life cycle, creating threads using Thread class and Runnable interface, synchronizing threads, daemon thread.

Applications of multithreading.

UNIT-V

Advantages of GUI over CUI ,The AWT class hierarchy, Component, Frame, user interface components- labels, button, scrollbars, text components, check box, check box groups, choices, lists panels – scroll pane, menu bar, graphics, layout, managers – boarder, grid, flow and card layouts.

Applications: developing calculator, developing feedback form, developing biodata.

UNIT-VI

Event handling: Delegation event model, closing a Frame, mouse and keyboard events, Adapter classes.

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters toapplets.

Applications: Developing of simple advertisements.

**TEXT BOOKS**

1. Java; the complete reference, 6th editon, Herbert schildt,TMH.
2. Introduction to Java programming 6th edition, Y. Daniel Liang, pearsoneducation.

**Syllabus for B. Tech. II Year I semester**

**Mechanical Engineering**

**THERMODYNAMICS**

**Code :9B303**

**L T P/D C**

3 0 0 3

**Course Objective:**

* To learn about work and heat interactions, and balance of energy between system and its surroundings
* To learn about application of I law to various energy conversion devices
* To evaluate the changes in properties of substances in various processes
* To understand the difference between high grade and low grade energies and II law limitations on energy conversion
* To Learn the application of steam tables and Mollier charts for pure substances(steam)
* To understand the processes and efficiencies of basic power cycles

**Course Outcomes: After completing this course**

* The students will be able to apply energy balance to systems and control volumes, in situations involving heat and work interactions
* Students can evaluate changes in thermodynamic properties of substances
* The students will be able to evaluate the performance of energy conversion devices
* The students will be able to differentiate between high grade and low grade energies.
* The students will be able to use property table and Mollier charts to evaluate properties of steam at different states.
* The students will be able to analyze and evaluate the performance of basic thermodynamics cycles

**Unit I: INTRODUCTION AND ZEROTH LAW**

Contents: Fundamentals - System & Control volume; Property, State & Process; Exact & Inexact differentials; Work-Thermodynamic definition of work; examples; Displacement work; Path dependence of displacement work and illustrations for simple processes; electrical, magnetic, gravitational, spring and shaft work.

Temperature, Definition of thermal equilibrium and Zeroth law; Temperature scales; thermometric properties of various thermometers

**Applications:** These concepts will be useful in analyzing thermodynamics systems and construction of thermometers

**Unit II: GAS LAWS & FIRST LAW FOR NON FLOW PROCESS**

Definition of heat, specific heat, examples of heat/work interaction in systems- control mass-First Law for Cyclic & Non-cyclic processes; Concept of total energy E ; Demonstration that E is a property; Various modes of energy, Internal energy.

Fundamentals- Working Fluid & behaviour: Perfect gas laws – Ideal gas-Equation of state, specific and universal gas constants-specific heat relations.

Application of First law for ideal gas undergoing during different processes; calculation of displacement Work; heat transfer; internal energy

**Applications:** These concepts will be applied in analysis of closed systems- piston cylinder cases.

**Unit III: FIRST LAW FOR FLOW PROCESS & SECOND LAW**

First Law for Flow Processes - Derivation of general energy equation for a control volume; definition of Enthalpy; Steady state steady flow processes including throttling; Examples of steady flow devices; Application of I law applications for steady flow devices.

Second law - Definitions of direct and reverse heat engines; Definitions of thermal efficiency and COP; Kelvin-Planck and Clausius statements; Definition of reversible process; Internal and external irreversibility; Carnot cycle; Absolute temperature scale.

Applications: Theses concepts will be employed in different applications like turbines, compressors, nozzles etc.

**Unit IV: ENTROPY, AVAILABILTY, IRRIVERSIBILY**

Clausius inequality; Definition of entropy S ; Demonstration that entropy S is a property; Evaluation of entropy for solids, liquids, ideal gases undergoing various processes; Principle of increase of entropy.(4)

Calculation of change in entropy during mixing process; Ideal Gas Mixtures- governing laws: evaluation of equivalent properties.

Irreversibility and Availability, Availability function for systems and Control volumes undergoing different processes, Lost work. Second law analysis for a control volume

Applications: (i) The above concepts are employed in calculating the efficiency and losses of different processes.

**Unit V: PROPERTIES OF PURE SUBSTANCES**

Pure substances-definition, Properties of two phase systems - Const. temperature and Const. pressure heating of water; Definitions of saturated states; P-v-T surface; Use of steam tables; Saturation tables; Superheated tables; Identification of states & determination of properties, Mollier’s chart.

Determination of entropy from steam tables; Definition of Isentropic efficiency for compressors, turbines and nozzles

**Applications:** The above concepts are employed in the steam power plants.

**Unit VI: BASIC THERMODYNAMIC CYCLES**

Thermodynamic cycles - Basic Rankine cycle; Basic Brayton cycle; Basic vapor compression cycle and comparison with Carnot cycle.

**Applications:** The basics of these cycles will be useful for the actual design of external combustion engines

Text Books:

1. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, Fundamentals of Thermodynamics, John Wiley and Sons.

2. Jones, J. B. and Duggan, R. E., 1996, Engineering Thermodynamics, Prentice-Hall of India

3. Moran, M. J. and Shapiro, H. N., 1999, Fundamentals of Engineering Thermodynamics, John Wiley and Sons.

4. Nag, P.K, 1995, Engineering Thermodynamics, Tata McGraw-Hill Publishing Co. Ltd.

**Syllabus for B. Tech. II Year I semester**

**Mechanical Engineering**

**METALLURGY AND MATERIALS SCIENCE**

**Code :9B304**

**L T P/D C**

2 0 0 2

**COURSE OBJECTIVES:**

* To offer a comprehensive in-depth knowledge in key core course ‘Materials Engineering’ with a broad range of topics including crystal structures, plastic deformation, failure analysis, alloy formation principles and rules, interpretation of equilibrium phase diagrams of ferrous and non-ferrous alloys, heat treatments, case-hardening, composite materials, nanomaterials, smart materials, plain carbon steels, special steels, superalloys, mechanical properties and NDT.
* To equip the mechanical engineer with knowledge and skills required to work in manufacturing industries, materials testing, quality control, and R& D labs.

**COUSE OUTCOMES:**

**After studying this course, the students will be able to**:

* identify crystal structures for various materials including metals and alloys and understand the impact of defects in such structures at atomic scale.
* understand fracture modes in failure of the industrial components during their service and failure under fatigue conditions.
* acquire the knowledge of finding number and amounts of phases, by using Lever Rule, draw and analyze the phase diagram for different binary alloys; concept of nucleation, growth of crystals and application of some cast and wrought non-ferrous metals/alloys used in industry.
* acquire the knowledge of industrially important Fe-Fe3C phase diagram, various cast irons, steels and their applications in industry
* acquire the knowledge of different industrial heat treatment processes for steels; Surface hardening processes, how mechanical properties could be altered by implementing various heat treatment processes.

**UNIT-I**

Mechanical Behavior and Properties of Metals:

Crystal Structure: Unit cell, Crystal structures of metals and ceramics, Imperfections in solids: Point, line, interfacial and volume defects; dislocation strengthening mechanisms and slip systems, critically resolved shear stress. Mechanical Properties: Tensile, and torsion tests; Young’s modulus, relations between true and engineering stress-strain curves, generalized Hooke’s law, yielding, yield strength, 0.2% Proof stress, ductility, resilience, toughness and elastic recovery; Definition of Creep, creep curve and mechanism of creep; NDT: Introduction to non-destructive testing.

**UNIT II**

Failure: Fracture: Types of fracture: Brittle and Ductile fractures in tension, compression and pure torsion; Fracture mechanics: Introduction to Stress intensity factor approach and Griffith criterion; Fatigue failure: High and low cycle fatigues, S-N curve, types of fatigue loading; endurance and Fatigue limits, effect of mean stress on fatigue; Fracture surfaces of fatigue and creep.

**UNIT III**

Alloys: Substitutional solid solution, Hume-Rothery’s rules for solid solution, interstitial solid solutions; Equilibrium Phase diagrams: Interpretation of binary phase diagrams, lever rule, and microstructure development; Phase transformations: eutectic, peritectic, peritectoid and monotectic reactions. Binary phase diagrams: Ni-Cu, Cu-Zn, Cu-Sn, Al-Cu, and Al-Si.

**UNIT IV**

Fe-Fe3C Phase diagram: Iron-Iron-carbide phase diagram, description of microstructural aspects of phases: Ferrite, Austenite, Cementite, Pearlite, and ledeburite; Hypo and hyper eutectoid steels; Hypo and hyper eutectic cast irons; Steels: Effect of alloying elements in steels; Composition, microstructure, tensile properties and applications of: (i) Plain carbon steels: low carbon, medium carbon, and high carbon; (ii) austenitic stainless steel, (iii) Hadfield steel, (iv) high speed steel, and Maraging steel ; Cast irons: Types of cast irons: Composition, microstructure and applications: (i) Gray cast iron, (ii) White cast iron, (iii) Spheroidal graphite cast iron, (iv) Malleable cast iron.

UNIT V

Heat treatment of Steels: Annealing, normalizing and spheroidising, hardening, tempering, quenching medium; Time Temperature Transformation (TTT) isothermal diagrams for eutectoid steel and its microstructure development; Continuous Cooling Transformation curves and interpretation of final microstructures and properties: Austempering, martempering; Case hardening: carburizing, Nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum plasma nitriding.

**UNIT VI**

Non-ferrous Alloys: Composition, microstructure, tensile properties and applications of copper and copper alloys: Brass, Bronze and cupro-nickel; Aluminium and Al-Cu–Mg alloy, NIMONIC 105 alloy, and Titanium alloys.; Advanced Materials: Composites: Description, examples and applications of Metal matrix composite (MMC), CMC, PMC, C-C composite.; SMART Materials: Principle and applications of (i) Shape memory alloys and (ii) Piezoelectric ceramics; Nanomaterials: Top-down and bottom-up approaches, applications of nanomaterials.

Text Books:

1. W. D. Callister, 2006, “Materials Science and Engineering-An Introduction”, 6th Edition, WileyIndia.

2. Introduction to Physical Metallurgy / Sidney H. Avener.- Design Data book

3. Material Science and Metallurgy/Kodgire.

4. V. Raghavan, “Material Science and Engineering’, Prentice Hall of India Private Limited, 1999.

References:

1. Physical Metallurgy principles by Reed-Hill

2 Material Science - Vanclak

3. Engineering Materials-2, An Introduction to Microstructure, Processing and Design – Michael F Ashby & David R H Jones

4. Mechanical Metallurgy / G.E. Dieter

5. Essential of Materials science and engineering/ Donald R.Askeland/Thomson

6. Kenneth G. Budinski and Michael K. Budinski, “Engineering Materials”, Prentice Hall of India, Private Limited, 4th Indian Reprint, 2002.

7. U. C. Jindal, “Engineering Materials and Metallurgy”, Pearson, 2011.

**Syllabus for B. Tech. II Year I semester**

**Mechanical Engineering**

**MECHANICS OF SOLIDS**

**Code: 9B305**

**L T P/D C**

**2** 1 0 3

**Course Objective:**

The objective is to learn the fundamental concepts of stresses, strains, and deformation of solids with applications to beams and columns. Fundamentals of applying equilibrium, compatibility, and force-deformation relationships to structural elements in order to evaluate the strength of materials.

**Course Outcomes:**

After studying this course, the students will be able:

1. To Understand simple stresses and strains of uniform bars, cross- section varying bars, compound bars and statically in-determinate bars
2. To Understand principle stresses, strains and torsion of circular shafts
3. To Understand Shear Force Diagrams (SFD) and Bending Moment Diagrams(BMD) for various types of beams
4. To Understand bending stresses and shear stresses of different types of beams
5. To understand how to determine deflections of various beams and buckling load of slender columns.
6. To Understand how to find out various stresses that are developed in thin and thick cylinders

**UNIT – I (Simple Stresses & Strains)**

**Simple Stresses & Strains: Mechanical Properties:** Elasticity, plasticity, Hooke’s law, stress-strain diagram for Mild steel, Young’s modulus, yielding and yield strength, ductility, toughness and elastic recovery, Tensile and compression tests; **Hardness:** Rockwell, Brinell and Vickers and their relation to strength. Types of stresses- uniaxial, biaxial & triaxial and strains–Working stress, Factor of safety, Lateral strain, Poisson’s ratio, volumetric strain, Elastic moduli & the relationship between them – Bars of varying section – composite bars – Temperature stresses, Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

**UNIT – II (Mohr’s circle and Torsion)**

**Principal stresses:** Normal stress, Shear stress. Principal stresses, Mohr’s stress circle and its application. **Torsion of shafts**: Stresses and deformation in circular and hollow shafts, stepped shafts.

**UNIT – III (SF & BM Diagrams)**

**Shear Force and Bending Moment Diagrams:** Definition of beam, Types of beams, Concept of SF and BM, SF and BM diagrams for cantilever, simply supported and overhanging beams subjected to point loads, UDL, UVL and combination of these loads, Point of Contra flexure – Relation between SF, BM and rate of loading at a section of a beam.

**UNIT – IV (Flexural Stresses)**

**Bending Stresses:** Theory of simple bending, Assumptions, Derivation of bending equation: M/I = f/y = E/R, Neutral axis, Determination bending stresses, section modulus of rectangular, circular (Solid and Hollow) and I sections.

**Shear Stresses**:Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular and I sections.

**UNIT – V (Deflections)**

**Deflection of Beams:** Bending of Beam into a circular arc – slope, deflection and radius of curvature –Differential equation for the elastic line of a beam – Double integration and Macaulay’s method.

**UNIT – VI (Thin & Thick cylinders)**

**Thin Cylinders:** Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in diameter and volume of thin cylinders – Riveted boiler shells – Thin spherical shells.

**Thick cylinders:** Lame’s equation – cylinders subjected to inside & outside pressures – compound cylinders

**TEXT BOOKS:**

1. Strength of materials by S.Ramamrutham
2. Strength of Materials by SS Rattan

**REFERENCE BOOKS:**

1. Mechanics of Materials By Hibbeler Pearson Publications
2. Strength of Materials -By Jindal, Umesh Publications.
3. Strength of Materials by S.Timshenko & Young
4. Strength of Materials by Andrew Pytel and Ferdinond L. Singer Longman.
5. Solid Mechanics, by Popov

**Syllabus for B. Tech. II Year I semester**

**Mechanical Engineering**

**Soft Skills**

**Code: 9HC63**

**L T P/D C**

**1** 0 2 2

**Course objectives:**

To enable students to:

* make self-assessment.
* know the importance of certain soft skills like time management and goal setting.
* enhance their team skills and design thinking capabilities for effective critical thinking and creativity.
* know their emotional quotient which guides their thinking, behaviour and helps them manage stress efficiently.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Units** | **Tutorial (1 per week)** | **No. of Periods** | **Lab (2 per week)** | **No. of Periods** |
| **Unit-1** | * 1. Introduction to soft skills   2. SWOT / SWOC Analysis   3. SWOT / SWOC Grid   4. Johari window | **1**  **1**  **1** | * Activities based on Soft skills * Self-Analysis * Questionnaire, * SWOT Practice | **4** |
| **Unit-2** | * 1. Emotional intelligence   2. Time management   3. Goal Setting | **1**  **1**  **1** | Activities :   * big picture challenge * Goal setting charts | **4** |
| **Unit-3** | 3.1 Attitude  3.2 Professional etiquette & Grooming | **1**  **1** | Practice activities on   * Attitude * Professional etiquette & Grooming | **6** |
| **Unit-4** | 4.1 Styles of Communication  4.2 **Inter-personal Skills**  4.3 Team work, Team building  4.4 Leadership Skills | **1**  **1**  **1**  **1** | * Activities on social skills * Role Plays * Team building activities | **6** |
| **Unit-5** | 5.1 Problem Solving & Decision making  5.2 Critical & Creative thinking | **1**  **1** | Practice activities on   * Problem solving situations * Games and puzzles * Case Studies and Group Discussions on decision making and problem solving, creativity and innovation. | **8** |
| **Unit-6** | 6.1 Values : Personal, Social & Cultural | **2** | Practice activities   * Role Plays | **4** |

**Text Book:** SOFT SKILLS – Dr. K. Alex, S. Chand publications  
**Suggested Readings: \*** SOFT SKILLS – Meenakshi Raman ; \* Step Ahead with Soft Skills - Oxford University Press ; \* Skill Sutras- Jayashree Mohanraj \* The Power of Soft Skills – Robert A. Johnson ; \* Soft Skills for Everyone – Jeff Butterfield

**Course Learning Outcomes:**

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

## Determine the significance of soft skills in the working environment

## Understand how to demonstrate empathy in a wide range of situations.

## Effectively communicate through verbal/oral communication and improve the listening

## Become more effective individual through goal/target setting, self motivation and practicing creative thinking.

## Develop a positive and responsible *attitude* to their own well-being

## Identify stress factors and handle stress effectively.

**Syllabus for B. Tech. II Year I semester**

**Mechanical Engineering**

**METALLURGY LAB**

**Code :9B362**

**L T P/D C**

0 0 3 1.5

**Course objective:**

To learn the sample preparation technique, etch and observe optical microstructures of ferrous and nonferrous metals/alloys.

**Course Outcomes:**

After studying this course, the students will be able to:

* acquire the knowledge of preparation of samples for metallurgical study.
* acquire the knowledge of preparation of sample for metallurgical study of a plain carbon steel, cast iron, alloy steel, heat treated steel and their interpretation.
* acquire the knowledge of preparation of sample for metallurgical study of nonferrous metal/alloy and interpretation

**List of Experiments:**

|  |  |
| --- | --- |
| 1. | Specimen preparation for metallographic examination and Study of Metallurgical Microscope. |
| 2. | Study of microstructure of plain carbon steel (Low/ medium carbon steel) |
| 3. | Study of microstructures of heat-treated plain carbon steel (Low/medium carbon steel). |
| 4. | Study of microstructures of Alloy steel (Tool steel) |
| 5. | Study of microstructures of cast iron (Gray cast iron) |
| 6. | Study of microstructure of Non-ferrous alloy (Al-Si alloy) |
| 7 | Study of microstructure of eutectoid steel. |
| 8 | Study of microstructure of stainless steel (Austenitic stainless steel) |
| 9 | Study of microstructure of welded joint |
| 10 | Study of microstructure of composite material |

**Syllabus for B. Tech. II Year I semester**

**Mechanical Engineering**

**MECHANICS OF SOLIDS LAB**

**Code :9B363**

**L T P/D C**

0 0 3 1.5

**Course Objective:**

The objective is to learn the fundamental concepts of stresses, strains, and deformation of solids with applications structural elements.

**Course Outcomes:**

After studying this course, the students will be able to:

* know how to measure the hardness and impact strength of given materials
* measure the modulus of rigidity of given spring, and shaft.
* find the deflection of beams theoretically and paracticaly.

**List of Equipments**

* 1. Rockwell hardness testing machine
* 2. Brinell hardness testing machine
* 3.Izod impact testing machine
* 4. Simple supported beam
* 5. Cantilever Beam
* 6. Spring Testing Machine
* 7.Torsion Testing Machine
* 8. Tensile Testing Machine
* 9. Universal Testing Machine
* 10. Charpy impact testing machine

**List of Experiments**

* 1. To determine the Rockwell hardness of given test specimen.
* 2. To determine the Brinell harness of a given test specimen.
* 3. To perform the Izod impact test on metals.
* 4. To perform the deflection test on simple supported beam.
* 5. To perform the deflection test on Cantilever beam
* 6. To determine the stiffness and modulus of rigidity o the given spring.
* 7. To conduct Torsion test on mild steel specimen to determine the modulus of rigidity and angle of twist.
* 8. To conduct Tensile test on mild steel specimen to determine the mechanical properties.
* 9. To conduct compression test on U.T.M to determine t he compressive strength of the material.
* 10. To perform the Charpy impact test on the metals.

**Syllabus for B. Tech. II Year I semester**

**Mechanical Engineering**

**FUELS AND LUBRICANTS LAB**

**Code :9B364**

**L T P/D C**

**0 0 3 1.5**

**Course Objectives:** To understand the properties of fuels and lubricants.

**Course Outcomes:**

* To determine the flash and fire point using Abels Apparatus
* To determine the flash and fire point using Pensky Martens Apparatus
* To determine the Viscosity using Saybolt Viscometer
* To determine the Calorific value using Bomb Calorimeter

**List of Experiments:**

1. Determination of Flash and Fire points of Liquid fuels/Lubricants using: Abels Apparatus.

2. Determination of Flash and Fire points of Liquid fuels/Lubricants using: Pensky Martens apparatus.

3. Determination of Viscosity of Liquid lubricants and Fuels using: Redwood Viscometer-I.

4. Determination of Viscosity of Liquid lubricants and Fuels using: Redwood Viscometer-II.

5. Determination of Viscosity of Liquid lubricants and Fuels using: Saybolt Viscometer.

6. Determination of Calorific value: Solid/Liquid/ fuels using: Bomb Calorimeter.

7. Determination of Viscosity of Liquid lubricants and Fuels using: Engler Viscometer.

8. Determination of Calorific value: of Gaseous fuels using: Junkers Gas Calorimeter.

9. Determine the percentage of carbon resedue of the given oil using carbon resedue test aparators.

10.Conduct the greace penetrate test for finding the quality of greace.

11. Determine the destilation characteristics of petroleum products.

12. Determine the cloud point and pour point of the given lubricant.

**Syllabus for B. Tech. II Year II semester**

**Mechanical Engineering**

**ENVIRONMENTAL SCIENCE**

II B. Tech I Sem (for CSE, CSD, CSM, CSI, CSO, IT and ECM)

II B. Tech II Sem (for EEE, ME, ECE and CE)

**Code :9HC05**

**L T P/D C**

**2 0 0 0**

## Course Objectives:

1. To understand structure and function of ecosystem
2. To learn classification and uses of natural resources
3. To learn about Understanding the impacts of developmental activities and mitigation measures.
4. To know the source, causes and preventive methods of pollution
5. To understand the importance of ecological balance for sustainable development.
6. To understand the environmental policies and regulations

**UNIT-I Ecosystems**: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity.

**UNIT-II Natural Resources**: Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land Energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy source.

**UNIT-III Biodiversity and Biotic Resources**: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation.

**UNIT-IV Environmental Pollution and Control Technologies**: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants. Acid rain-Threshold limit values of chemicals present in environment, Global warming, Ozone layer depletion, Water pollution: Sources and types of pollution. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid

waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Sewage water Treatment, Kyoto protocol, and Montréal Protocol.

**UNIT-V Sustainable development and Green Technology**: Concept of sustainable development, threats to sustainability population and its explosion, Crazy consumerism, over- exploitation of resources, strategies for achieving sustainable development environmental education, conservation of resources, urban sprawl sustainable cities and sustainable communities, human health , role of IT in Environment, Environmental Ethics, Environmental Economic – Concept of Green Building, Clean Development Mechanism ( CDM ).

**UNIT-VI Environmental Policy, Legislation & Environment Impact Assessment**: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).

## Course Outcomes

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

* 1. Understand about ecosystem and energy flow among the organisms.
  2. Know the resources available, use of them and overexploitation of the resources in the nature.
  3. Learn the value, use and value of biodiversity.
  4. Understand the causes and effect of pollution and implement measures in control of pollution.
  5. Understand the sustainable development and implement green technology for sustainable development.
  6. Learn and implement policy to protect the environment.

## TEXT BOOKS:

1. Perspectives in Environmental Studies: Kaushik A. and Kaushik, C.P. New Age International (P) Ltd. (2008)

## REFERENCE BOOKS:

1. Environmental Studies by Erach Bharucha, 2005 University Press.
2. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
3. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
4. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
5. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
6. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

**Syllabus for B. Tech. II Year II semester**

**Mechanical Engineering**

**ELEMENTS OF ELECTRICAL & ELECTRONICS ENGINEERING**

**Code : 9AC48**

**L T P/D C**

**3 0 0 3**

CO’s: after studying this course, the student will be able to

1. Understand the fundamentals of electrical engineering and DC machines.
2. Understand the principles of AC circuits.
3. Understand the principle and operation of three phase induction motor and measuring instruments.
4. Understand the principle and operation of diode.
5. Understand the principle and operation of transistor.
6. Understand the principles of digital electronics.

**Unit – I: Fundamentals of Electrical Engineering and DC Machines:**

Ohm’s Law, Kirchhoff’s Laws, types of sources, passive elements. Series parallel circuits, mesh and nodal analysis. Superposition, Reciprocity theorem.

**DC Machines**: Principle of operation of D.C generators, types, E.M.F equation. Principle of operation of D.C motors, Types motors, Torque equation, Losses and efficiency, simple problems on D.C Generators and motors.

**Unit – II: Fundamentals of AC circuits:**

AC voltage wave form and basic definitions: Peak Value, R.M.S. value, Average values, Form factor and Peak factor, ’j’ operator, Analysis of single phase AC circuits series and parallel (Simple circuits). Three phase circuits – Star - delta connection, Relation between line and phase voltages / currents in a 3-phase Star-Delta balanced system.

**Unit – III: Induction Motors and Instruments:**

Concept of Faraday’s laws, 3- phase induction motor working principle, operation and construction details.

**Instruments**: Introduction, classification of instruments, operating principles, essential features of measuring instruments, permanent magnet moving coil (PMMC) instruments, moving iron (MI) instruments.

**UNIT IV-DIODE:** Overview of Semiconductors, PN junction diode and Zener diode –Diode circuits: rectifiers (bridge type only), filters, clippers and clampers.

**UNIT V- TRANSISTOR**: BJT construction, operation, characteristics (CB, CE and CC configurations) and uses – JFET and MOSFET construction, operation, characteristics (CS configuration) and uses.

**UNIT VI-DIGITAL ELECTRONICS**: Number systems – binary codes –binary arithmetic - Boolean algebra, laws & theorems - simplification of Boolean expression using K maps - logic gates - implementation of Boolean expressions is using logic gates - standard forms of Boolean expression.

**Text Books:**

1. Basic Electrical Engineering –T.K. Nagesarkar and M.S. Sukhja, Oxford University Press.2nd edition.
2. Basic electrical Engineering – M.S. Naidu and S. Kamakshiah – TataMcGraw-Hill, 2005 edition.
3. Principles of Electronics - V.K.Mehta, S.Chand Publications, 2nd edition.

**References:**

1. Theory and problems of Basic electrical Engineering- D.P.Kotahari & I.J.Nagrath PHI.
2. Electronic Devices and Circuits, Millman & Halkias, TMH publications.

**Syllabus for B. Tech. II Year II semester**

**Mechanical Engineering**

**MANUFACTURING PROCESSES**

**Code: 9B406**

**L T P/D C**

3 0 0 3

**Course Objectives:**

1. To understand the basic casting process and calculate the pattern allowances and design the riser system needed for defect free casting and understand various types of castings and their applications
2. To understand the importance of metal forming processes and study the Rolling process
3. To gain knowledge in the working principle of Extrusion and Forging operations and learn the various ways of performing theses operations.
4. To be acquainted with the fundamentals of sheet metal operations and distinguish between various types of operations and learn about plastic processing techniques.
5. To understand the various welding processes and learn about the various types of welding operations and their applications.
6. To gain understanding of powder based manufacturing technique and manufacturing methods of plastic based products

**Course Outcomes:**

1. Select moulding material, pattern and calculate pattern allowances used in casting and design the gating system and Design a suitable riser for the casting and decide specific casting type for a defect free product
2. Distinguish between different forming processes and Analyze the forces and power consumed in rolling operation
3. Decide the specific forging/ extrusion process for making a part and identify the specific defects if any in the process
4. Suggest the sheet metal process for making a part and decide the processing technology for a particular type of plastic.
5. Propose the type of welding joint and specific welding process for an application and estimate the effect of process variables on arc welding
6. Choose appropriate technique for making discrete parts and opt the specific plastic processing method based on type of plastic.

**UNIT – I**

**Metal Casting :** Advantages and applications of casting processes, Casting terms, Patterns - Pattern allowances and Numerical Problems in pattern calculation, Types of patterns, Pattern Materials, Moulding materials, Elements of Gating system, Gating ratio, Solidification of pure metal and alloys, Cooling curves, Risers - Function, Riser design – Chvorinov’s rule, Caine’s method- Numerical Problems, Cores-uses, Special casting processes- Centrifugal casting, Die casting, and Investment casting, Casting defects

**UNIT – II**

**Metal Forming:** Advantages of forming operations,Nature of plastic deformation, hot working and cold working processes-Advantages, Disadvantages, Types of stresses applied in metal working, Bulk metal forming processes: **Rolling:** Principle, Rolled Products, mechanics of Rolling, Types of Rolling mills, Forces in rolling and power requirements - Numerical Problems

**UNIT – III**

**Forging:** basicforging operations,Forging types: Smith, Drop, Press & Machine Forging, Forging defects, Swaging

**Extrusion: E**xtrusion principle Hot extrusion and cold extrusion - Forward extrusion and backward extrusion, Impact extrusion, Hydrostatic extrusion

**UNIT – IV**

**Sheet-Metal Operations:** Classification, Springback in metals, shearing action, Press operations: Blanking, Piercing and other operations,Clearance and Shear in press operations, Forces and power requirement in press operations- Numerical Problems, Bending: Nomenclature, Bend allowance, bend length calculation, Types of bending dies, Numerical Problems. Spinning, Stretch forming, Embossing and Coining.

**UNIT- V**

**Welding :** Classification of welding processes, Welding terms, Gas welding: Fuel gases, Oxy-Acetylene welding, Flame types, Electric Arc welding: Electrodes, AC & DC, V-I Characteristics-Numerical Problems, Resistance Spot welding, Thermit-welding, Inert Gas welding: Shielding gases, TIG & MIG welding, Submerged arc welding, Friction welding, & Friction stir welding, Explosive welding, Welding defects – causes and remedies. Principles and Applications of Soldering, Brazing and Adhesive bonding

**UNIT – VI**

**Powder Metallurgy- P**rinciple, steps in PM processing, production of metallic powder, mixing and blending, compacting, sintering, Advantages & limitations of PM

**Plastics processing:** WorkingPrinciple and Applications of: Injection moulding, Blow moulding, Compression moulding, and Transfer moulding

**TEXT BOOKS:**

1. Manufacturing Technology (Foundry, Forming and Welding )Vol 1 / P.N. Rao/TMH

2. A Text book of Production Technology (Manufacturing Processes) /Dr. P C Sharma /S.Chand Publishers

**REFERENCES:**

1. Manufacturing Engineering and Technology/Kalpakjian S/ Pearson Education

2. Welding Engineering and Technology / RS Parmar / Khanna Publishers

**Syllabus for B. Tech. II Year II semester**

**Mechanical Engineering**

**Fluid Mechanics and Hydraulic Machinery**

**Code: 9B407**

**L T P/D C**

2 1 0 3

**Course Objectives:**

To understand the basic principles of fluid mechanics and types of flows. To understand boundary layer concepts and flow through pipes. Evaluate the performance of hydraulic turbines and characteristic curves of pumps.

**Course Outcomes:**

After studying this course, the students will be able to:

1. understand the fluid properties and measurement of pressure with monometers.
2. Understand the classification of fluid, Bernoulli’s equation, momentum equation and their applications
3. understand Reynolds’s experiment, major losses, minor losses
4. understand velocity triangle, work done calculations, elements of Hydroelectric power plant, pump storage plant.
5. Understand the classifications of turbines working principles of turbines, draft tube theory, performance of turbine.
6. Understand various types of pumps working principle of reciprocating pump, centrifugal pump, performance characteristics of centrifugal pump.

**UNIT I**

**Fluid statics :** Dimensions and units: physical properties of fluids- specific gravity, viscosity surface tension- vapor pressure and their influence on fluid motion- atmospheric gauge and vacuum pressure – measurement of pressure- Piezometer, U-tube and differential manometers. Applications: Foundation of basic concepts and pressure measurement devices.

**UNIT II**

**Fluid kinematics** : Stream line, path line and streak lines and stream tube, classification of flows-steady & unsteady, uniform, non uniform, laminar, turbulent, rotational, and irrotational flows-equation of continuity for one dimensional flow and three dimensional flow.

**Fluid dynamics** : Surface and body forces –Euler’s and Bernoulli’s equations for flow along a stream line, momentum equation and its application on force on pipe bend.

Applications: The fluid dynamics concepts are employed in analyzing fluid flow problems and design of hydraulic devices.

**UNIT III**

Exact flow solutions in channels and ducts, Couette and Poisuielle flow, laminar flow through circular conduits and circular annuli- concept of boundary layer – measures of boundary layer thickness – Darcy Weisbach equation, friction factor,

Applications: Analysis of fluid flow through pipes and design of hydraulic pipe.

**UNIT IV**

Need for dimensional analysis–methods of dimension analysis–Similitude–types of similitude Dimensionless parameters–application of dimensionless parameters–Model analysis.

**UNIT V**

Euler’s equation – theory of Rotodynamic machines – various efficiencies – velocity components at entry and exit of the rotor, velocity triangles – Centrifugal pumps, working principle, work done by the impeller, performance curves – Cavitation in pumps- Reciprocating pump–working principle.

Applications: Lifting of water in steam power plant, irrigation, and other power plants.

**UNIT VI**

Classification of water turbines, heads and efficiencies, velocity triangles- Axial, radial and mixed flow turbines Pelton wheel, Francis turbine and Kaplan turbines, working principles – draft tube- Specific speed, unit quantities, performance curves for turbines – governing of turbines.

Applications: Turbines used in hydro-powerplants under different head conditions.

**TEXT BOOKS :**

1. Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH.

2. Fluid Mechanics and Hydraulic Machines by Rajput.

**REFERENCES :**

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.

2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International.

3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.

4..Hydraulic Machines Including Fluidics PB by Jagdish Lal Metropolitan Book Co. Pvt. Ltd. , 1994.

**Syllabus for B. Tech. II Year II semester**

**Mechanical Engineering**

**APPLIED THERMODYNAMICS-I**

**Code: 9B408**

**L T P/D C**

**2 1 --- 3**

**Pre-requisite:** Thermodynamics

**Course Objective:**

To understand the working principles of 2-stroke and 4-stroke cycles, combustion processes of S.I and C.I Engines, working principles of compressors.

**Course Outcomes:**

After studying this course, the students will be able to:

1. Compare the air standard, actual and the fuel-air cycles of Internal Combustion Engines.
2. Classify IC Engines, understand the working principles of 2-stroke and 4-stroke cycles, draw valve and port timing diagrams and explain different engine subsystems.
3. Understand the combustion process in S.I and C.I Engines, the phenomenon of knocking, factors affecting knocking, and different types of combustion chambers for S.I and C.I Engines,
4. Understand the performance parameters, methods of measurement of brake and friction power and Draw the heat balance diagram.
5. Understand the working principles of Roots blower, vaned blower, reciprocating compressor-single stage and multi-stage compression with inter cooling.
6. Understand the working principles of centrifugal and axial compressors and draw the velocity diagram and calculate the Compressor Power input and efficiency.

**UNIT – I**

**Ideal cycles and Actual Cycles and their Analysis:** Introduction, Air Standard cycles -otto cycle, diesel cycle and dual cycle , problems on ideal cycles.and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blow down - Loss due to Gas exchange process, Volumetric Efficiency, Loss due to Rubbing Friction, Actual and Fuel-Air Cycles of CI Engines. Applications: These concepts will be useful in achieving overall knowledge about I.C. engines.

**UNIT-II**

**I.C. Engines :**Classification - Working principles, Valve and Port Timing Diagrams, Air Standard, Air-fuel and Actual cycles - Engine systems – Fuel Carburetor, Fuel Injection System, Multipoint fuel Injection, Ignition, Cooling and Lubrication. Applications: These topics will give broader view of working of IC engines.

**UNIT – III**

**Combustion in S.I. Engines :**Normal Combustion and Abnormal combustion – Importance of flame speed and effect of engine variables – Type of Abnormal combustion, pre-ignition and knocking (explanation of ) – Fuel requirements and fuel rating, anti knock additives – combustion chamber – requirements, types. Applications: These concepts are useful for achieving deeper knowledge about normal and abnormal combustion in SI and CI engines.

**Combustion in C.I. Engines :**Four stages of combustion – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence – open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

**UNIT – IV**

**Testing and Performance :**Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart. Applications: These topics will tell in greater detail about the performance evaluation of IC engines.

**UNIT – V**

**Compressors** – Classification –positive displacement and roto-dynamic machinery – power absorbing machines, fan such as blower and compressor – reciprocating and rotary types.

**Reciprocating:** Principles of operation, work required, Isothermal efficiency, volumetric efficiency and effect of clearance, stage compression, under cooling, saving of work, minimum work condition for stage compression. Applications: These topics will discuss on the design and applications of reciprocating air compressors.

**UNIT VI**

**Centrifugal Compressors:**  Mechanical details and principle of operation – velocity and pressure variation. Energy transfer-impeller blade shape- losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams – power input calculations.

**Axial Flow Compressors:** Mechanical details and principle of operation – velocity triangles and energy transfer per stage, degree of reaction, work done factor - isentropic efficiency- pressure rise calculations – Polytropic efficiency. Applications: This unit will bring in differences between reciprocating and rotary compressors. Theses compressors are employed in land based power plants and aircraft engines.

**TEXT BOOKS:**

1. I.C. Engines / V. GANESAN- TMH

2. Thermal Engineering / Rajput / Lakshmi Publications.

**REFERENCES:**

1. IC Engines – Mathur & Sharma – Dhanpath Rai & Sons.

2. Thermodynamics & Heat Engines / B. Yadav/ Central Book Depot.,Allahabad

3. I.C. Engines / Heywood /McGraw Hill.

4. IC Engines/ Ramalingam/ Scitech publishers

5. “A Treatise on Turbo Machines”,G.Gopalakrishnan, &D.Prithviraj, Scitech

Publications (India) Pvt. Limited (2002.)

**Syllabus for B. Tech. II Year II semester**

**Mechanical Engineering**

**QUANTITATIVE APTITUDE & LOGICAL REASONING I**

(Common to All Branches)

**Code: 9HC16**

**L T P/D C**

**3 0 0 3**

**Pre Requisites**: Nil

**Course objectives:** *To answer general problems in his everyday life within in short time and to improves the certain skills of a student such as numerical and logical ability, mental capacity and also in sharpening minds.*

**Unit I:**Number System: Test for Divisibility, Test of prime number, Division and Remainders – HCF and LCM of Numbers–Fractions and Decimals -Average-Problems on Ages- Problems on Numbers- Ratio and Proportion.

**Unit II:**Percentage – Profit, Loss and Discount – Partnership and Share-Simple Interest - Compound Interest. Time and Work- Pipes and Cisterns-Time and Distance- Problems on Trains- Boats and Streams.

**Unit III:** Allegation or Mixtures, Clocks & Calendar. Mensuration: Area of Plane Figures, Volume and Surface Area of Solid Figures. Data Interpretation: Tabulation, Bar Graphs, Pie Charts, Line Graphs.

**Unit–IV:**Series Completion: Number Series, Alphabet Series, Alpha – Numeric Series.

Analogy: Completing the Analogous Pair, Simple Analogy, Choosing the Analogous pair, Double Analogy, Word Analogy, and Number Analogy.

Classification: Word Classification, Number Classification and Letter Classification.

Coding & Decoding: Letter Coding, Number Coding, Matrix Coding, Substitution, Deciphering Message Word Codes, Jumbled Coding. Crypt arithmetic-Inequalities-Input Output Tracing

**Unit–V:** Blood Relations– Direction sense test- Number, Ranking & Time Sequence Test –Mathematical Operations-Arithmetical Reasoning. Puzzle Test: Classification Type Questions, Seating Arrangements, Comparison Type Questions, Sequential Order of Things, Selection Based on Given Conditions, Family Based Puzzles, Jumbled Problems.

**Unit –VI:** Logical Venn Diagrams –Cubes and Dice – Analytical Reasoning-Assertions and Reason–Logical Deductions-Syllogism -Statement and Arguments-Statement and Conclusions- -Data Sufficiency.

**Text Books:**

1. Quantitative Aptitude by R.S.Agarwal
2. Verbal and Non Verbal Reasoning by R.S.Agarwal.

**Course outcomes:** *By learning Quantitative Aptitude and Logical Reasoning, a student can answer*

* 1. *Problems on Number system, HCF and LCM, Averages, Ages and ratio and proportion.*
  2. *The questions on topics of aptitude.*
  3. *The questions on mensuration and data interpretation topics.*
  4. The questions on series completion, analogy, classification and coding and decoding topics.
  5. The questions on various topics of logical reasoning.
  6. The questions on Venn-diagrams, cubes and dice and also on clocks and calendar problems.

**Syllabus for B. Tech. II Year II semester**

**Mechanical Engineering**

**BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB**

**Code: 9AC95**

**L T P/D C**

**0 0 3 1.5**

|  |
| --- |
| Understand the fundamentals of electrical engineering and DC machines. |
| Understand the principles of AC circuits. |
| Understand the principle and operation of three phase induction motor and measuring instruments. |
| Understand the principle and operation of diode. |
| Understand the principle and operation of transistor. |
| Understand the principles of digital electronics |

***Mapping of Course Outcomes with Program Outcomes:***

**Electrical Experiments**

1. Brake test on 3-phase induction motor (performance characteristics).
2. Speed control of DC shunt motor by
   1. a) Armature Voltage Control .
   2. b) Field flux control method.
3. Brake test on DC shunt motor.
4. Swinburne’s test on DC shunt machine.
5. OCC characteristics of DC shunt generator.
6. Verification of superposition and Reciprocity Theorems.

**Electronics Experiments**

1. PN Junction diode characteristics A. Forward bias B. Reverse bias.
2. Zener diode characteristics
3. Half wave Rectifier with and without filters.
4. Full wave Rectifier (Centre tapped and Bridge)with and without filters
5. Transistor CE characteristics (Input and Output)
6. Verification of Logic gates

**Syllabus for B. Tech. II Year II semester**

**Mechanical Engineering**

**MANUFACTURING PROCESSES LAB**

**Code: 9B465**

**L T P/D C**

**0 0 3 1.5**

**Course Objective:**

Understand the entire procedure for preparing a component through the sand casting route

Perform sand testing to produce defect free product

Understand the procedure for doing arc, gas, and resistance welding processes.

Understand the procedure for press working operations

Understand the plastic processing techniques.

**COURSE OUTCOMES:**

After studying this course, the students will be able to:

1. Make a pattern preparation of sand mould and cast the part
2. Perform welding operation under different conditions and test the quality of the weld
3. Make use of plasma technique for accurately cutting metals and also perform brazing operation
4. Identify the various press working operations and various parts of hydraulic press and perform operations
5. Choose the appropriate plastic moulding method to manufacture a plastic product

**I. Metal Casting Lab:**

1. Pattern Design and making – 1 Exercise (CO-1)

2 .Core Making-1 Exercise (CO-1)

3. Sand properties testing - -for strengths, and permeability – 2 Exercises (CO-1)

4. Melting and Pouring - 1 Exercise (CO-1)

**II Welding Lab:**

1. Arc welding (AC & DC)- To study the effect of polarity on weld strength and heat effected zone in Arc welding.2 Exercises (CO-2)

2. Spot Welding - 1 Exercise (CO-2)

3. TIG & MG Welding - 2 Exercises (CO-2)

4. Plasma Cutting - 2 Exercises (CO-3)

**III Mechanical Press Working:** (CO-4)

1. Study of simple, compound and progressive press tool.

2. Blanking & Piercing operation- 1 Exercise

3. Bending and other operations-1 Exercise

**IV Processing Of Plastics:** (CO-5)

1. Injection Moulding

2. Blow Moulding

**V Demonstration of Electrical Discharge Machine & Submerged Arc Welding**

**Syllabus for B. Tech. II Year II semester**

**Mechanical Engineering**

**FLUID MECHANICS AND HYDRAULIC MACHINERY LAB**

**Code:9B466**

**L T P/D C**

**0 0 3 1.5**

**Course Objectives:**

To understand the basic principles of fluid mechanics and types of flows. To understand boundary layer concepts and flow through pipes. Evaluate the performance of hydraulic turbines and characteristic curves of pumps.

**Course Outcomes:**

After studying this course, the students will be able to:

1. compute the performance of pelton wheel under working conditions
2. compute the performance of francis turbine under working conditions
3. compute performance of reciprocating pump under working conditions
4. compute the Performance of major and minor losses under working conditions
5. compute the Performance of multistage pump under working conditions
6. compute the coefficient of discharge of venturimeter of orifice meter under working conditions

**List of Experiments:**

**Verification of Bernoulli’s Theorem**

1. Determination of friction factor for a given pipe line
2. Determination of minor losses in a pipeline
3. Calibration of Notches
4. Determination of Co-efficient of discharge for mouth piece (cd)
5. Calibration of Flow Nozzle
6. Calibration of Rotameter
7. Calibration of Orifice meter
8. Calibration of Venturimeter
9. Performance Test on Reciprocating Pump.
10. Performance Test on Francis Turbine.
11. Performance Test on Pelton Wheel.
12. Performance Test on Kaplan Turbine
13. Performance Test on Multi Stage Centrifugal Pump

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**List of Equipments:**

1. Major and minor losses in pipes
2. Calibration of Notches
3. Calibration of Mouth piece
4. Calibration of flow nozzle and rotameter
5. Calibration of Orificemeter and venturi meter
6. Reciprocating pump test Rig
7. Francis turbine test Rig
8. Pelton turbine test Rig
9. Kaplan Turbine test rig
10. Multi stage centrifugal pump test Rig

**Syllabus for B. Tech. II Year II semester**

**Mechanical Engineering**

**TECHNICAL SEMINAR**

**Code:9B467**

**L T P/D C**

**0 1 0 1**

**Course objective**

Develop an ability to understand and present the latest technological developments in computer science. Identify one of them, understand its impact on the event/method/society as a whole and present the seminar on the same which enhances oratory and interview facing skills.

**Course Outcome :**

|  |  |
| --- | --- |
| 1 | Deliver lecture on emerging technologies. |
| 2 | Explain domain knowledge to resolve real time technical issues |
| 3 | Demonstrate ability to lead and explain concepts and innovative ideas. |
| 4 | Demonstrate team leading qualities. |
| 5 | Demonstrate public speaking and lifelong learning skills for higher studies and to pursue professional practice. |
| 6 | Exchange new information that would not have been available otherwise. Develop debating and interview skills |

**Technical Seminar evaluation:** There shall be a technical seminar evaluated for 100 marks each from year I Semester to II year II Semester. The evaluation is purely internal and will be as follows:

|  |  |  |
| --- | --- | --- |
| **S** | **Description** | **Marks** |
| 1 | Literature survey, topic and content | 10 |
| 2 | Presentation including PPT | 10 |
| 3 | Seminar Notes | 05 |
| 4 | Interaction with audience after presentation | 05 |
| 5 | Final Report 3 copies | 10 |
| 6 | Class room participation | 05 |
| 7 | Punctuality in giving seminar as per Scheduled time and date | 10 |
| 8 | Mid Semester Viva (on the seminar topics completed up to the end of 9th week | 15 |
| 9 | End Semester Viva | 30 |
|  | **Total** | **100** |