

Department of Mechanical Engineering

II B.Tech I Semester Course Structure & Syllabus (ACE-R22 Regulations)



**ACE
Engineering College**
Ankushapur(V), Ghatkesar(M), Medchal Dist - 501 301
(An Autonomous Institution, Affiliated to JNTUH ,Hyderabad)

Department of Mechanical Engineering
B.Tech. in Mechanical Engineering
COURSE STRUCTURE & SYLLABUS (ACE-R22 Regulations)
Applicable from A.Y. 2022-23 Batch

II Year I Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1.	MA305BS	Probability, Statistics & Complex Variables	3	1	0	4
2.	ME302PC	Mechanics of Solids	3	0	0	3
3.	ME303PC	Metallurgy & Material Science	3	0	0	3
4.	ME304PC	Production Technology	3	0	0	3
5.	ME305PC	Thermodynamics	3	1	0	4
6.	ME306PC	Production Technology Laboratory	0	0	2	1
7.	ME307PC	Material Science & Mechanics of Solids Laboratory	0	0	2	1
8.	ME308PC	Computer Aided Machine Drawing	0	0	2	1
9.	*MC309	Constitution of India	3	0	0	0
		Total	18	2	6	20

MA305BS PROBABILITY, STATISTICS & COMPLEX VARIABLES**B.Tech. II Year I Semester****L T P C****3 1 0 4**

Pre-requisites: Mathematics courses of first year of study.

Course Objectives: To learn

- The ideas of probability and random variables and various discrete and continuous probability distributions and their properties.
- The basic ideas of statistics including measures of central tendency, correlation and regression.
- The statistical methods of studying data samples
- Differentiation and integration of complex valued functions.
- Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem and expansion of complex functions using Taylor's and Laurent's series.

Course Outcomes: After learning the contents of this paper, the student must be able to

- **CO1:** Formulate and solve problems involving random variables.
- **CO2:** Formulate and apply statistical methods for analyzing experimental data.
- **CO3:** Apply concept of estimation and testing of hypothesis to case studies.
- **CO4:** Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems.
- **CO5:** Analyze the complex function with reference to their integration using Cauchy's integral and residue theorems. Taylor's and Laurent's series expansions of complex function.

UNIT-I: Basic Probability**8 L**

Probability spaces, conditional probability, independent events, and Baye's theorem. Random variables: Discrete and continuous random variables, Expectation of Random Variables, Variance of random variables

UNIT - II: Probability distributions**10 L**

Binomial, Poisson, evaluation of statistical parameters for these distributions, Poisson approximation to the binomial distribution, Continuous random variables and their properties, distribution functions and density functions, Normal and exponential, evaluation of statistical parameters for these distributions

UNIT - III: Estimation & Tests of Hypotheses**10 L**

Introduction, Statistical Inference, Classical Methods of Estimation.: Estimating the Mean, Standard Error of a Point Estimate, Prediction Intervals, Estimating a Proportion for single sample, Difference between Two Means, difference between two proportions for two Samples.

Statistical Hypotheses: General Concepts, Testing a Statistical Hypothesis, Tests Concerning a Single Mean, Tests on Two Means, Test on a Single Proportion, Two Samples: Tests on Two Proportions.**UNIT - IV: Complex Differentiation****10 L**

Limit, Continuity and Differentiation of Complex functions, Analyticity, Cauchy-Riemann equations (without proof), finding harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithm) and their properties, Conformal mappings, Mobius transformations

UNIT-V: Complex Integration**10L**

Line integral, Cauchy's theorem, Cauchy's Integral formula, Zeros of analytic functions, Singularities, Taylor's series, Laurent's series, Residues, Cauchy Residue theorem (All theorems without Proof)

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, keying Ye, Probability and statistics for engineers and scientists, 9th Edition, Pearson Publications

REFERENCE BOOKS:

1. Fundamentals of Mathematical Statistics, Khanna Publications, S. C. Gupta and V. K. Kapoor.
2. Miller and Freund's, Probability and Statistics for Engineers, 8th Edition, Pearson Educations.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
4. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Edition, Mc-Graw Hill, 2004.

ME302PC MECHANICS OF SOLIDS**B.Tech. II Year I Sem.****L T P C****3 0 0 3****Course Pre-Requisites:** Engineering Mechanics**Course Objectives:** The objectives of this course are to:

- Understand the concepts of internal forces, moments, stress, strain, and deformation of solids with applications to bars, beams, and columns.
- Learn the fundamentals of applying equilibrium, compatibility, and force-deformation relationships to structural elements.
- Study twisting of circular bars and hollow shafts acted on by torsional moments.
- Define the state of stress at a point on a body and to develop stress transformations.
- Introduce the concept of theories of elastic failure and their significance in the design.

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

- **CO1:** Evaluate the internal forces, moments, stresses, strains, and deformations in structures made of various materials acted on by a variety of loads.
- **CO2:** Draw axial force, shear force and bending moment diagrams for beams and frames.
- **CO3:** Develop the Bending and Torsion formula and apply to the design of beams and shafts.
- **CO4:** Use the stress transformation equations to find the state of stress at a point for various rotated positions of the stress element and display the same in graphical form as Mohr's circle.
- **CO5:** Understand the different criteria for the safety of the component by applying the theories of elastic failure.

UNIT – I:

Simple Stresses & Strains: Elasticity and plasticity – Types of stresses & strains–Hooke's law–stress – strain diagram for mild steel – 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:

Shear Force and Bending Moment: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III:

Flexural 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 and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

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

UNIT – IV:

Principal Stresses and Strains: Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

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

UNIT – V:

Torsion of Circular Shafts: Theory of pure torsion – Derivation of Torsion equations: $T/J = q/r = N\theta/L$ Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure. **Columns and Struts:** Euler's Theory, Limitations of Euler's theory, Equivalent Length, Rankine's Formula, Secant Formula.

TEXT BOOKS:

1. Barry J. Goodno and James M. Gere, “Mechanics of Materials” Ninth Edition, Cengage Learning,2018.
2. S. S. Rattan, “Strength of Materials”, Second Edition Tata McGraw Hill Education Pvt. Ltd, New Delhi,2011

REFERENCE BOOKS:

1. U. C. Jindal, “Strength of Materials”, Pearson Education India,2012
2. Egor P. Popov, Toader A. Balan, “Engineering Mechanics of Solids”, PHI Learning, 2010
3. G. H. Ryder, “Strength of Materials”, Macmillan Long Man Publications, 1961
4. W. A. Nash and M. C. Potter, “Strength of Materials”, Fifth Edition, Schaum’s Outline Series, 2011
5. Dr.B.C. Punmia, “Mechanics of Materials” Laxmi Publications; Revised edition (1 January 2017).
6. Dr. Sadhu Singh “Strength of Materials” KHANNA Publishers, 2013.

ME303PC METALLURGY & MATERIAL SCIENCE**B.Tech. II Year I Sem.****L T P C****3 0 0 3****Course Objectives:** Students will be able to

- Learn the concepts of metallurgy and materials science in manufacturing processes.
- Interpret phase diagrams of different alloy systems.
- Describe the concept of heat treatment and other strengthening mechanisms.
- Materials engineering is an interdisciplinary field involving the properties of matter and its applications to various fields of science and engineering.
- Chemical metallurgy deals with chemical properties of metals including uniting of different metals with one another to form alloys.

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

- **CO1:** Memorize the types of Crystal structures and their defects.
- **CO2:** Learn the necessity of alloying and identify types of alloy phases.
- **CO3:** Demonstrate importance of critical understanding of heat treatment in achieving required properties.
- **CO4:** Apply the knowledge of heat treatment to enhance surface properties.
- **CO5:** Analyze the properties and microstructure of ferrous and non-ferrous alloys.

UNIT – I

Crystal Structure: Unit cells, Metallic and Ceramic crystal structures. Imperfection in solids: Point, line, surface and volume defects; dislocations, strengthening mechanisms, slip systems, critical resolved shear stress.

UNIT – II

Hume – Rothery Rules: Alloys, substitutional and interstitial solid solutions- Phase diagrams: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, Eutectoid, peritectoid and monotectic reactions. Iron Iron-carbide phase diagram and microstructural aspects of ledeburite, austenite, pearlite, ferrite and cementite.

UNIT –III

Heat treatment of steels: Isothermal transformation diagrams for Fe-C alloys and microstructures development. Martensite, Bainite. Annealing. Normalising, Hardening, Tempering and Spheroidising.

UNIT – IV

Continuous cooling curves and interpretation of final microstructures and properties-Thermo mechanical treatments like austempering, martempering, surface hardening methods like case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum and plasma hardening.

UNIT – V

Alloy steels, properties and applications of stainless steels and tool steels, maraging steels- Types of cast irons (grey, white, malleable and spheroidal graphite cast irons), copper and its alloys (Brass and bronze)- Aluminium and its alloys (Al-Cu Alloys) - Titanium and its alloys & Magnesium and its alloys.

TEXT BOOKS:

1. V. Raghavan, "Material Science and Engineering", Prentice Hall of India Private Limited, Fifth Edition.
2. William. D. Callister, David G. Rethwisch, "Materials Science and Engineering: An Introduction", John Wiley & Sons, 2018.
3. SIDNEY H AVNER, Introduction to Physical Metallurgy, McGraw Hill, 2017

REFERENCE BOOKS:

1. Kenneth G. Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 9th Edition, Indian Reprint, 2009.
2. U. C. Jindal, "Engineering Materials and Metallurgy", Pearson, 2011.
3. Pakirappa, "Metallurgy and Material Science", 8ed Durga Publishing House, Publishing, 2019.
4. V.D. Kodgire & S.V. Kodgire, "Metallurgy and Material Science", 45th, Everest Publishing House, 2019.

ME304PC PRODUCTION TECHNOLOGY**B.Tech. II Year I Sem.****L T P C****3 0 0 3****Pre-requisites:** None**Course Objectives:**

- To expose the students to understand the concept of basic casting processes & furnaces.
- To provide a technical understanding of various joining processes used in the manufacturing industry.
- To impart the students to the concepts of solid-state welding processes.
- To teach the concepts of rolling and various press working operations.
- To provide a technical understanding of different metal forming processes like extrusion, forging and high energy rate forming processes.

Course Outcomes: Student will be able to:

- **CO1:** Elaborate the fundamentals of various moulding, casting techniques and furnaces.
- **CO2:** Identify the importance of permanent joining and principle behind different welding processes.
- **CO3:** Explain the concepts of solid-state welding processes
- **CO4:** Understand the concepts of rolling and sheet metal operations in metal working.
- **CO5:** Elaborates the uniqueness of extrusion, forging and high energy rate forming processes in metal working.

UNIT – I:

Casting: Steps involved in making a casting – Advantage of casting and its applications; Patterns - Pattern making, Types, Materials used for patterns, pattern allowances; Properties of moulding methods. Methods of Melting - Crucible melting and cupola operation – Defects in castings; Principles of Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riser and Riser design. Casting processes – Types – Sand moulding, Centrifugal casting, die-casting, Investment casting, shell moulding.

UNIT – II:

Welding: Classification – Types of welds and welded joints and their characteristics, Welding Positions - Gas welding - Types, oxy-fuel gas cutting – standard time and cost calculations. Arc welding, Shielded metal arc welding, submerged arc welding, Resistance welding, Thermit welding.

UNIT – III:

Inert Gas Welding _ TIG Welding, MIG welding, Friction welding, Friction Stir Welding, induction welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding. Welding defects – causes and remedies; destructive and non-destructive testing of welds.

UNIT – IV:

Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth. Sheet metal Operations: Stamping, Blanking and piercing, Coining, Strip layout, Hot and cold spinning – Bending and deep drawing. Rolling fundamentals – theory of rolling, types of Rolling mills and products. Forces in rolling and power requirements. Drawing and its types – wire drawing and Tube drawing – Types of presses and press tools. Forces and power requirement in the above operations.

UNIT – V:

Extrusion of Metals: Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion, Hydrostatic extrusion. Forces in extrusion

Forging Processes: Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers: Rotary forging – forging defects – cold forging, swaging, Forces in forging operations.

High Energy Rate Forming Processes: Principles of Explosive Forming, Electro-hydraulic Forming, Electro-magnetic forming and rubber pad Forming.

TEXT BOOKS:

1. Manufacturing Technology / P.N. Rao/ Vol.1 / Mc Graw Hill Education/ 5th Edition, 2018.
2. Manufacturing Engineering & Technology / Serope Kalpakjian / Steven R. Schmid / Pearson,7th Edition,2014

REFERENCE BOOKS:

1. Production Technology Vol.: 1, WILEY, sreeramulu M, 2018
2. A Text book of Production Technology (Manufacturing Processes) / Dr.P.C. Sharma / S. Chand Publications /1st Edition, 2006.
3. Manufacturing processes H. S. Shan, Second Edition, Cambridge University Press, 2017.
4. Production Technology: Manufacturing Processes, Technology and Automation / R. K. Jain Vol.1/Khanna Publishers /19th Edition, 2009.
5. Elements of Workshop Technology/ S.K. Hajra Choudhury, A.K. Hajra Choudhury, Nirjhar Roy/Vol.1/ Media Publishers & Promoters Pvt. Ltd./1st Edition,2008.

ME305PC THERMODYNAMICS**B.Tech. II Year I Sem.****L T P C****3 1 0 4****Pre-requisite:** Engineering Chemistry and Physics**Course Objective:**

- To understand the treatment of classical Thermodynamics and to apply the First and Second laws of Thermodynamics to engineering applications.
- To present a comprehensive and rigorous treatment of classical thermodynamics while retaining an engineering perspective.
- To lay the groundwork for subsequent studies in such fields as fluid mechanics, heat transfer and to prepare the students to effectively use thermodynamics in the practice of engineering.
- To develop an intuitive understanding of thermodynamics by emphasizing the physics and physical arguments.
- To present a wealth of real world engineering examples to give students a feel for how thermodynamics is applied in engineering practice.

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

- **CO1:** Understand the basics of Thermodynamics
- **CO2:** Apply first and second laws of thermodynamics to different systems
- **CO3:** Determine the feasibility of a process w.r.to entropy changes
- **CO4:** Apply concepts of thermodynamic property relations to ideal gas and real gases
- **CO5:** Evaluate performance of power cycles and refrigeration cycles

Tables/Codes: Steam Tables and Mollier Chart, Refrigeration**Tables****UNIT – I:**

Introduction: Basic Concepts: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale

UNIT – II:

PMM I - Joule's Experiments – First law of Thermodynamics – Corollaries – First law applied to a Process – applied to a flow system – Steady Flow Energy Equation.
 Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics.

UNIT – III:

Pure Substances, p-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.

Perfect Gas Laws – Equation of State, specific and Universal Gas constants – various Non-flow processes, properties, end states, Heat and Work Transfer, changes in Internal Energy – Throttling and Free Expansion Processes – Flow processes

UNIT – IV:

Deviations from perfect Gas Model – Vander Waals Equation of State – Compressibility charts – variable

specific Heats – Gas Tables Mixtures of perfect Gases – Mole Fraction, Mass fraction Gravimetric and volumetric Analysis – Dalton’s Law of partial pressure, Avogadro’s Laws of additive volumes – Mole fraction, Volume fraction and partial pressure, Equivalent Gas const. And Molecular Internal Energy, Enthalpy, sp. Heats and Entropy of Mixture of perfect Gases and Vapour, Atmospheric air - Psychrometric

Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation, Carrier’s Equation – Psychrometric chart.

UNIT – V:

Power Cycles: Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle – Description and representation on P-V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles, Brayton and Rankine cycles – Performance Evaluation.

Refrigeration Cycles: Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

TEXT BOOKS:

1. Engineering Thermodynamics / PK Nag / Mc Graw Hill
2. Thermodynamics – An Engineering Approach by Yunus A. Cengel & Michael A. Boles, TMH
3. Fundamentals of Classical Thermodynamics by G. Van Wylan & R.E. Sonntag, John Wiley Pub

REFERENCE BOOKS:

1. Engineering Thermodynamics by Jones & Dugan, PHI, 2007.
2. Thermodynamics by M. Achutan, PHI, 2nd Edition, 2013.
3. Thermodynamics & Heat Engines by R. Yadav, Central Book Depot, Allahabad.
4. Thermodynamics by S.C. Gupta, Pearson Publications.

ME306PC PRODUCTION TECHNOLOGY LABORATORY**B.Tech. II Year I Sem.****L T P C****0 0 2 1****Pre-requisites:** Production Technology**Course Objectives:**

- Know about the basic Physical, Chemical Properties of materials.
- Learn the basic operation of various manufacturing processes.
- Design and fabricate a simple product.
- Understand how process conditions are set for optimization of production.
- Arc welding, gas welding and resistance welding equipment for the fabrication of welded joints

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

- **CO1:** Analyze the given problem and conducts investigation on the experimental setup.
- **CO2:** Operate different types of welding machines
- **CO3:** Perform operations on mechanical press.
- **CO4:** Get familiarity with processing of Plastics.
- **CO5:** Effectively communicate and explain the experimental analysis.

Minimum of 12 Exercises need to be performed**I. Metal Casting Lab:**

1. Pattern Design and making - for one casting drawing.
2. Sand properties testing - Exercise -for strengths, and permeability – 1
3. Moulding Melting and Casting - 1 Exercise

II. Welding Lab:

1. ARC Welding Lap & Butt Joint - 2 Exercises
2. Spot Welding - 1 Exercise
3. TIG Welding - 1 Exercise
4. Plasma welding and Brazing - 2 Exercises (Water Plasma Device)

III. Mechanical Press Working:

1. Blanking & Piercing operation and study of simple, compound and progressive press tool.
2. Hydraulic Press: Deep drawing and extrusion operation.
3. Bending and other operations

IV. Processing of Plastics

1. Injection Moulding
2. Blow Moulding

REFERENCE BOOK:

1. Dictionary of Mechanical Engineering – G.H.F. Nayler, Jaico Publishing House.

**ME307PC MATERIAL SCIENCE & MECHANICS OF SOLIDS
LABORATORY**

B.Tech. II Year I Sem.

L T P C

0 0 2 1

Pre-Requisites: Material Science and Metallurgy

Course Objective:

- The Objective is to make the students to learn the concepts of Metallurgy and Material Science in manufacturing processes, which convert raw materials into useful products.
- Students will be able to understand basic structure and crystal arrangements of materials and classify and distinguish different microstructures of steels, cast irons and non-ferrous alloys.
- To impart the required material for products based on micro structure.
- To know the properties of materials at higher elevated temperatures.
- To know the properties of materials at higher elevated temperatures.

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

- **CO1:** Design different crystal structures and their models.
- **CO2:** Infer the microstructures developed for different ferrous and non-ferrous metals.
- **CO3:** Correlate the microstructures, properties, performance and processing of alloys.
- **CO4:** Ability to relate properties to microstructure.
- **CO5:** Ability to select metals and alloys for industrial applications.

List of Experiments:

1. Preparation and study of crystal models for simple cubic, body centred cubic, face centred cubic and hexagonal close packed structures.
2. Preparation and study of the Microstructure of pure metals like Iron, Cu and Al.
3. Preparation and study of the Microstructure of Mild steels, low carbon steels, high Carbonsteels.
4. Study of the Microstructures of Various Cast Irons.
5. Study of the Microstructures of Non-Ferrous alloys. (Al, Cu, Mg)
6. Hardenability of steels by Jominy End Quench Test.

MECHANICS OF SOLIDS LAB:

Course Objectives: The objective is to learn the fundamental concepts of stress, strain, and deformation of solids with applications to bars, beams, and columns. Detailed study of engineering properties of materials is also of interest. Fundamentals of applying equilibrium, compatibility, and force-deformation relationships to structural elements are emphasized. The students are introduced to advanced concepts of flexibility and stiffness method of structural analysis. The course builds on the fundamental concepts of engineering mechanics course.

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

- Analyze the behavior of the solid bodies subjected to various types of loading.
- Apply knowledge of materials and structural elements to the analysis of simple structures.
- Undertake problem identification, formulation and solution using a range of analytical methods
- Analyze and interpret laboratory data relating to behavior of structures and the materials they are made of and undertake associated laboratory work individually and in teams.
- Expectation and capacity to undertake lifelong learning.

List of Experiments:

1. Direct tension test (Tensile Test, Comparison Test).
2. Bending test on Simple supported beam.
3. Bending test on Cantilever beam.
4. Torsion test.
5. Brinell hardness test/ Rockwell hardness test.
6. Test on springs.
7. Izod Impact test/ Charpy Impact test.

Reference Books:

1. Dictionary of Mechanical Engineering – G.H.F. Naylor, Jaico Publishing House.

ME308PC COMPUTER AIDED MACHINE DRAWING**B.Tech. II Year I Sem.****L T P C****0 0 2 1****Pre-requisites:** Engineering Graphics**Course objectives:**

- To familiarize with the standard conventions for different materials and machine parts in working drawings.
- To gain knowledge of conventional representation of various machining and mechanical details as per IS.
- To make part drawings including sectional views for various machine elements. To prepare assembly drawings given the details of part drawings.
- To gain knowledge of threads, bolts, nuts, stud bolts, tap bolts, set screws, Keys, cottered joints and knuckle joint.
- To prepare assembly drawings given the details of part drawings

Course Outcomes:

- **CO1:** Preparation of engineering and working drawings with dimensions and bill of material during design and development. Developing assembly drawings using part drawings of machine components.
- **CO2:** Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
- **CO3:** Types of sections – selection of section planes and drawing of sections and auxiliary sectionalviews. Parts not usually sectioned.
- **CO4:** Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
- **CO5:** Types of Drawings – working drawings for machine parts.

Drawing of Machine Elements and simple parts

Selection of Views, additional views for the following machine elements and parts with every drawing proportion.

1. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
2. Keys, cottered joints and knuckle joint.
3. Rivetted joints
4. Shaft coupling, spigot and socket pipe joint.
5. Journal, pivot and collar and footstep bearings.

Drawing of Machine Elements: Using Computer aided drafting in addition to manual drawing**Assembly Drawings:**

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

1. Steam engine parts – stuffing box, cross head, Eccentric.
2. Machine tool parts: Tail stock, Tool Post, Machine Vices.
3. Other machine parts - Screw jack, Connecting rod, Plumber block, Fuel Injector.
4. Valves - Steam stop valve, spring loaded safety valve, feed check valve and air cock.

Assembly Drawings: Using Computer aided drafting in addition to manual drawing

- NOTE:**
1. First angle projection to be adopted.
 2. All the drawing components/Assembly to be drawn using any Computer aided drafting package.

TEXT BOOKS:

1. Machine Drawing / N.D. Bhatt / Charotar.
2. Machine Drawing with Auto CAD / Goutham Pohit, Goutam Ghosh / Pearson.

REFERENCE BOOKS:

1. Machine Drawing by / Bhattacharyya / Oxford
2. Machine Drawing / Ajeet Singh / Mc Graw Hill
3. Machine Drawing by / K.C. Jhon.

Note: - External examination is conducted in conventional mode and internal evaluation to be done by both conventional as well as using computer aided drafting.

MC309 CONSTITUTION OF INDIA*B.Tech. II Year I Sem.**

L	T	P	C
3	0	0	0

Course Objectives: Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes: Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
- Discuss the passage of the Hindu Code Bill of 1956.

Unit - 1 History of Making of the Indian Constitution- History of Drafting Committee.**Unit - 2** Philosophy of the Indian Constitution- Preamble Salient Features**Unit - 3** Contours of Constitutional Rights & Duties - Fundamental Rights

- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

Unit - 4 Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions**Unit - 5** Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO Zila Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy**Unit - 6** Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.**Suggested Reading:**

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.