COURSE STRUCTURE & DETAILED SYLLABUS

MECHANICAL ENGINEERING

B. TECH SECOND YEAR FIRST SEMESTER

(Applicable for the batches admitted from 2020-2021)

ACE

Engineering College

Ankushapur(V), Ghatkesar(M), Medchal Malkajgiri (Dist.), Telangana - 501 301.

(An Autonomous Institution, Affiliated to JNTUH ,Hyderabad)

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Ankushapur(V), Ghatkesar(M), Medchal Malkajgiri Dist - 501 301

(Autonomous)

B.TECH. SECOND YEAR FIRST SEMESTER

MECHANICAL ENGINEERING

COURSE STRUCTURE

II Year				I Semester			
S.No.	Course Type	Course Code	Course Title	Periods Per Week			Credits
				L	T	P	
1	BSC	MA301BS	Probability and Statistics & Complex Variables	3	1	0	4
2	PCC	ME302PC	Mechanics of Solids	3	1	0	4
3	PCC	ME303PC	Material Science and Metallurgy	3	0	0	3
4	PCC	ME304PC	Production Technology	3	0	0	3
5	PCC	ME305PC	Thermodynamics	3	1	0	4
6	PCC	ME306PC	Production Technology Lab	0	0	2	1
7	PCC	ME307PC	Machine Drawing Practice	0	0	2	1
8	PCC	ME308PC	Material Science and Mechanics of Solids Lab	0	0	2	1
9	*MC	MC309HS	Constitution of India	3	0	0	0
10	*MC	MC310ME	Auto CAD	0	0	3	0
Total				**18**	**3**	**9**	**21**

MA301BS: PROBABILITY AND STATISTICS & COMPLEX VARIABLES

B.Tech. II Year I Semester								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
MA301BS	**BSC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	1	-	4	30	70	100
Contact Classes: 45	**Tutorial Classes: 15**	**Practical Classes: Nil**				**Total Classes: 60**		

Prerequisite: Mathematical Knowledge at pre-university level

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.
- 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

- Formulate and solve problems involving random variables and apply statistical methods for analysing experimental data.
- Analyse the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems.
- Taylor's and Laurent's series expansions of complex function.

UNIT – I: Basic Probability, Random variables

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

UNIT - II: Probability distributions

Probability distributions: 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: Testing of Hypothesis

Testing of Hypothesis: Test of significance: Basic of testing of Hypothesis. Null and alternate Hypothesis, types of errors, level of significance, critical region. Large sample test for single proportion, difference of proportions, single mean, difference of means; small sample tests: Test for single mean, difference of means and test for ratio of variances

UNIT - IV: Complex Variables (Differentiation)

Complex Variables (Differentiation): 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.

UNIT – V: Complex Variables (Integration)

Complex Variables (Integration): Line integral, Cauchy's theorem, Cauchy's Integral formula, Zeros of analytic functions, Singularities, Taylor's series, Laurent's series; Residues, Cauchy Residue theorem, Conformal mappings, Mobius transformations and their properties.

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. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.

Web References:

1. SWAYAM Online Courses https://storage.googleapis.com/uniquecourses/online.html
2. Directory of Open Access Journals https://doaj.org/
3. Springer Open Journals https://www.springeropen.com/journals
4. UG/PG MOOCs http://ugcmoocs.inflibnet.ac.in/ugcmoocs/moocs_courses.php

E-Text Books:

1. National Digital Library: https://ndl.iitkgp.ac.in/
2. NCERT Text Books http://ncert.nic.in/textbook/textbook.htm
3. Directory of Open Access Books https://www.doabooks.org/

ME302PC: MECHANICS OF SOLIDS

B.Tech II year I semester								
Course Code	**Category**	**Hours/Week**			**Credits**	**Max Marks**		
ME302PC	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**1**	**0**	**4**	**30**	**70**	**100**
Contact Classes: 45	**Tutorial Classes: 15**	**Practical Classes: 0**				**Total Classes: 60**		

Prerequisite: Engineering Mechanics, Mathematics

Course Objectives: This course will advance the students' development of the following broad capabilities:

1. Students will be able to understand basic concepts of stress, strain and their relations based on linear elasticity. Material behaviors due to different types of loading will be discussed.
2. Students will be able to understand and know how to calculate stresses and deformation of a bar due to an axial loading under uniform and non-uniform conditions.
3. Students will understand how to develop shear-moment diagrams of a beam and find the maximum moment/shear and their locations
4. Students will understand how to calculate normal and shear stresses

Course Outcomes: Upon successful completion of the course, students will be able to:

1. Analyze the behavior of the solid bodies subjected to various types of loading;
2. Apply knowledge of materials and structural elements to the analysis of simple structures;
3. Undertake problem identification, formulation and solution using arrange of analytical methods;
4. 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.
5. Expectation and capacity to undertake lifelong learning.

UNIT-I

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 & volumetricstrain– Elasticmoduli&therelationshipbetweenthem–Barsofvaryingsection–composite bars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT-II

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 abeam.

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.
Theories of Failure: Introduction – Various theories of failure - Maximum Principal Stress Theory, Maximum Principal Strain Theory, Strain Energy and Shear Strain Energy Theory (Von Mises Theory).

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.

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– Thin spherical shells.

Text Books:

1. Strength Of Materials, by Ramamrutham S, Dhanpat Rai Publishing Company (P) Limited,
2. Strength of Materials by S. S. Rattan, Tata McGraw Hill Education Pvt. Ltd.

Reference Books:

1. Strength of Materials -By Jindal, Umesh Publications.
2. Solid Mechanics, by Popov
3. Strength of Materials – Ryder. G.H.; Macmillan Long Man Pub.
4. Strength of Materials – W.A. Nash, TMH
5. Analysis of structures by Vazirani and Ratwani.
6. Mechanics of Structures Vol –I by H. J. Shah and S. B. Junnarkar, Charotar Publishing House Pvt. Ltd.
7. Strength of Materials by D.S Prakash Rao, Universities Press Pvt. Ltd.
8. Fundamentals of Solid Mechanics by M. L. Gambhir, PHI Learning Pvt. Ltd
9. Strength of Materials by R.K Rajput, S. Chand &Company Ltd.
10. Strength of materials – R.S. Kurmi and Gupta.

ME303PC: MATERIAL SCIENCE AND METALLURGY

B.Tech II year I semester

Course Code	Category	Hours/Week			Credits	Max Marks		
		L	T	P	C	CIA	SEE	Total
ME303PC	Core	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0				Total Classes: 45		

Prerequisite: None

Course Objectives: This course provides students an understanding of basic structure and crystal arrangement of materials, the phase diagrams, advantages of heat treatment and the method of heat treatment processes.

Course Outcomes: Upon successful completion of the course, students will be able to:

1. Identify the properties of metals with respect to crystal structure and grain size
2. Interpret the phase diagrams of materials
3. Describe the concept of heat treatment of steels & strengthening mechanisms
4. Describe the concept of surface hardening of steels & strengthening mechanisms
5. Classify and Distinguish different types of cast irons, steels and non ferrous alloys

UNIT-I

Crystal Structure: Unit cells, Metallic crystal structures, Ceramics. Imperfection in solids: Point, line, interfacial and volume defects; dislocation strengthening mechanisms and slip systems, critically resolved shear stress.

UNIT-II

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

UNIT-III

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

UNIT-IV

Continuous cooling curves (TTT) and interpretation of final microstructures and properties-austempering, martempering, subzero treatment, case or surface hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum and plasma hardening

UNIT-V

Alloying of steel, properties of stainless steel and tool steels, maraging steels- cast irons; grey, white, malleable and spheroidal cast irons- copper and copper alloys (Brass, bronze and cupro-nickel)- Aluminium and Al-Cu – Mg alloys- Titanium alloys.

Text Books :

1. V. Raghavan, "Material Science and Engineering', Prentice Hall of India Private Limited, 1999.
2. W. D. Callister, 2006, "Materials Science and Engineering-An Introduction", 6th Edition, WileyIndia

Reference Books :

1. Kenneth G. Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 4th Indian Reprint,2002.
2. U. C. Jindal, "Engineering Materials and Metallurgy", Pearson, 2011
3. Sidney H Avner , "Introduction to physical metallurgy", Second Edition, Tata McGraw-Hill Education
4. Narula, Narula & Gupta, "Material science", Tata McGraw-Hill Education, 1989

ME304PC: PRODUCTION TECHNOLOGY

B.Tech II year I semester								
Course Code	**Category**	**Hours/Week**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
ME304PC	**Core**	**3**	**0**	**0**	**3**	**30**	**70**	**100**
Contact Classes: 45	**Tutorial Classes: 0**	**Practical Classes: 0**				**Total Classes: 45**		
Prerequisite: None								

Course Objectives:

1. To teach the process-level dependence of manufacturing systems through tolerances
2. To expose the students to a variety of manufacturing processes including their suitability and capabilities.
3. To teach the important effects that manufacturing processes may have on the material properties of the processed part with a focus on the most common processes.
4. To teach the thermal and mechanical aspects, such as force, stress, strain, and temperature of the most common processes.
5. To provide a technical understanding of common processes to aid in appropriate process selection for the material and required tolerances
6. To provide a technical understanding of common processes to aid in appropriate material selection for a predetermined process.

Course Outcomes: Upon successful completion of the course, students will be able to:

1. Understand the idea for selecting materials for patterns.
2. Know Types and allowances of patterns used in casting and analyze the components of moulds.
3. Design core, core print and gating system in metal casting processes.
4. Understand the arc, gas, solid state and resistance welding processes.
5. Develop process-maps for metal forming processes using plasticity principles.
6. Identify the effect of process variables to manufacture defect free products.

UNIT-I

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 sands. 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; Solidification of casting – Solidification of pure metal, Directional Solidification.

UNIT-II

Classification – Types of welds and welded joints; Welding Positions - Gas welding - Types, oxy-fuel gas cutting – standard time and cost calculations. Arc welding, forge 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: Limitations, Principles of Explosive Forming, Electro-hydraulic Forming, Electro-magnetic forming and rubber pad Forming.

Text Books :

1. Manufacturing Technology / P.N. Rao Vol.1 & 2 / Mc GrawHill
2. Manufacturing Engineering & Technology / SeropeKalpakjian / Steven R. Schmid /Pearson

Reference Books :

1. Metal Casting / T.V Ramana Rao / NewAge
2. Production Technology / G. Thirupathi Reddy /Scitech
3. Manufacturing Processes/ J.P. Kaushish / PHIPublications

ME305PC: THERMODYNAMICS

B.Tech II year I semester

Course Code	Category	Hours/Week			Credits	Max Marks		
		L	T	P	C	CIA	SEE	Total
ME305PC	Core	3	1	0	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: 0				Total Classes: 60		

Prerequisite: Engineering Chemistry and Physics

Course Objectives:

To understand the treatment of classical Thermodynamics and to apply the First and Second laws of Thermodynamics to engineering applications

Course Outcomes: Upon successful completion of the course, students will be able to:

1. To Understand and differentiate between different thermodynamic systems and processes.
2. Understand and apply the laws of Thermodynamics to different types of systems undergoing various processes and to perform thermodynamic analysis.
3. Understand and analyze the Thermodynamic cycles and evaluate performance parameters.

UNIT-I

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 – VaderWaals Equation of State – Compressibility charts – variable specific Heats – Gas Tables Mixtures of perfect Gases –Mole Fraction, Mass friction 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.Heat 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.

Refrigeration Cycles:

Brayton and Rankine cycles – Performance Evaluation–combined cycles, Bell-Coleman cycle, Vapour compression cycle - performance Evaluation.

Text Books :

1. Engineering Thermodynamics / PK Nag / Mc GrawHill
2. Thermodynamics for Engineers / Kenneth A. Kroos ; Merle C. Potter/Cengage

Reference Books :

1. Engineering Thermodynamics / Chattopadhyay/Oxford
2. Engineering Thermodynamics / Rogers /Pearson
3. Treatise on Heat Engineering, by V.P. Vasandani and D.S. Kumar Metropolitan book Co Pvt Ltd , 2000

ME306PC: PRODUCTION TECHNOLOGY LAB

B.Tech. II Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ME306PC	Core	-	-	2	1	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 30				Total Classes: 30		

Prerequisite: Production Technology

Course Objectives:

- Know about the basic Physical, Chemical Properties of materials
- Explain why some material(s) are better to be used in a product for given design requirements
- Learn the basic operation of various manufacturing processes
- Learn how various products are made using traditional, non-traditional, or Electronics manufacturing processes
- Design simple process plans for parts and products
- Understand how process conditions are set for optimization of production
- Learn how CNC machines work
- Write and execute CNC machining programs to cut parts on a milling machine
- Measure a given manufactured part to evaluate its size, tolerances and surface finish
- Design and fabricate a simple product

List of Experiments: 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 - 1Exercise

II. Welding Lab:

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

ME307PC: MACHINE DRAWING PRACTICE

B.Tech. II Year I Semester								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
ME307PC	**Core**	-	-	2	1	30	70	100
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 30**				**Total Classes: 30**		
Prerequisite: Engineering graphics								

Course Objectives:

To familiarize with the standard conventions for different materials and machine parts in working drawings. To make part drawings including sectional views for various machine elements. To prepare assembly drawings given the details of part drawings.

Course Outcomes:

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.

Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.

Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.

Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.

Title boxes, their size, location, and details - common abbreviations and their liberal usage

Types of Drawings – working drawings for machine parts.

List of Experiments:

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, setscrews.
2. Keys, cottered joints and knuckle joint.
3. Rivetted joints for plates
4. Shaft coupling, spigot and socket pipe joint.
5. Journal, pivot and collar and footstep bearings.

Assembly Drawings:

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

1. Steam engine parts – stuffing boxes, cross heads, Eccentrics.
2. Machine tool parts: Tail stock, Tool Post, Machine Vices.
3. Other machine parts-Screws jacks, Petrol engine connecting rod, Plummer block, Fuel Injector
4. Valves - Steam stop valve, spring loaded safety valve, feed check valve and air cock.

TEXT BOOKS:

- Machine Drawing by / Bhattacharyya / Oxford
- Machine Drawing with Auto CAD / Goutham Pohit, Goutam Ghosh / Pearson

REFERENCE BOOKS:

- Machine Drawing / Ajeet Singh / Mc Graw Hill
- Machine Drawing / N.D. Bhat / Charotar

ME308PC: MATERIAL SCIENCE & MECHANICS OF SOLIDS LAB

B.Tech. II Year I Semester								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
ME308PC	**Core**	-	-	2	1	30	70	100
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 30**				**Total Classes: 30**		
Prerequisite: Nil								

Course Objectives:

MATERIAL SCIENCE: Thepurposeofthiscourseistomakethestudentslearntheconceptsof Metallurgy and Material Science role in all manufacturing processes which convert raw materials into useful products adapted to human needs.

MECHANICS OF SOLIDS: 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.

List of Experiments: MATERIAL SCIENCE

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 – C steels.
4. Study of the Microstructures of Cast Irons.
5. Study of the Microstructures of Non-Ferrous alloys.
6. Hardenability of steels by Jominy End Quench Test.

List of Experiments: MECHANICS OF SOLIDS

1. Direct tension 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. Tension springs
7. Izod Impact test/ Charpy Impact test

MC310ME: AutoCAD

B.Tech. II Year I Semester								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
MC310ME	**Core**	-	-	2	1	30	70	100
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 30**				**Total Classes: 30**		
Prerequisite: Nil								

Course Objectives:

1. Develop skills to generate mechanical engineering drawings using AUTOCAD tools
2. Learn various tools and functions in AUTOCAD

Course Outcomes:

1. Develop 2D and 3D models using modeling software.
2. Draw engineering drawings with different views, and an assembly of the objects that make up engineering systems, using a CAD system.
3. Describe the principles of Computer Aided Designing systems and the concepts of Geometric modeling, solid modeling, and feature-based design modeling.

List of Exercises:

1. CAD: Introduction to Computer Aided Drafting, Advantages and Disadvantages of CAD.
   AUTOCAD: Introduction and Features of AUTOCAD Software.

2. **Environment of AutoCAD:** Workspace, Application Menu, Quick Access Toolbar, Ribbon, Search for information, Pull-down menu, Status bar, Function keys.
   Coordinate systems: Used in AutoCAD - absolute and relative, Cartesian and polar coordinate systems.

   Basic Managing/ Display control Tools: New, Save, Qnew, Open, Close, Quit/Exit, Undo, Redo, Limits, Units, Zoom, Pan, Steering Wheel, View Cube etc.
   Basic Drafting Tools: Line, Polylines, Point, Circle, Arc, Spline, Ellipse, Rectangle, Polygons, Text, Hatch.

   Editing/ Inquiry Tools: Erase, oops, Move, Copy, Mirror, Rotate, Scale, Fillet, Chamfer, Trim, Extend, Break, Join, Stretch, Offset, Array, Distance, Radius, Angle, Area, Volume.
   Dimensioning Tools: Linear, Aligned, Radius, Diameter, Centre, Angular, Baseline, Continuous, Ordinate, Arc Length, Jogged Radius Dimension, Dimension Space, Dimension Break, Inspection Dimension, Multileader and its Style.

3. Coordinate systems (absolute, relative, polar, etc.)
4. Study of script, DXE & IGES Files.
5. Practice of 2D sketches.
6. Generation of various 3D Model through Extrude, Revolve, Blend and sweep.
7. Feature based and Boolean based modeling.
8. Design of simple components & Assembly.
9. Automatic conversion of 3D to 2D.
10. Project

REFERENCE BOOKS:

1. AutoCAD Workbook (Mechanical) by C.S.Changeriya (Author)
2. Engineering Graphics with AutoCAD, Revised Edition Kindle Edition by Anand P. Rastogi (Author)