GLOBAL INSTITUTE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)
COURSE CATALOGUE
REGULATIONS B.TECH – GR - 24
MECHANICAL ENGINEERING
II YEAR I SEMESTER

Course Code	Course Name	Subject Area	Category	Periods Per Week			Credits	Scheme of Examination Max Marks		
				L	T	P		CIA	SEE	Total
THEORY										
ME301PC	Mechanics of Solids	PCC	CORE	3	0	0	3	40	60	100
MA302BS	Probability, Statistics & Complex Variables	BSC	Foundation	3	1	0	4	40	60	100
ME303PC	Metallurgy & Material Science	PCC	CORE	3	0	0	3	40	60	100
ME304PC	Production Technology	PCC	CORE	3	0	0	3	40	60	100
ME305PC	Thermodynamics	PCC	CORE	3	1	0	4	40	60	100
PRACTICAL										
ME306PC	Production Technology Laboratory	PCC	CORE	0	0	2	1	40	60	100
ME307PC	Material Science & Mechanics of Solids Laboratory	PCC	CORE	0	0	2	1	40	60	100
ME308PC	Computer Aided Machine Drawing	PCC	CORE	0	0	2	1	40	60	100
MANDATORY COURSE										
*MC309	Gender Sensitization Laboratory	MC-III	MC	0	0	2	0			
			Total Credits	**15**	**2**	**8**	**20**			

COURSE CONTENT

MECHANICS OF SOLIDS								
II Year - I Semester: ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
ME301PC	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**-**	**-**	**3**	**40**	**60**	**100**
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil				**Total Classes: 48**		
Prerequisite: Engineering Mechanics								

1. COURSE OVERVIEW

This course provides a comprehensive foundation in the mechanics of materials, focusing on stress-strain behaviour, elasticity, and structural response under various loading conditions. It covers shear force and bending moment analysis for different beam configurations, along with flexural and shear stress calculations for diverse cross-sections. Students will explore principal stresses, strain analysis, and failure theories including Mohr's circle and Von Mises criteria. The curriculum also delves into torsion in circular shafts and the design of structural elements under combined loads. Finally, it introduces column stability through Euler's and Rankine's approaches, equipping learners with essential tools for structural design and analysis.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To understand the fundamental concepts of elasticity, stress-strain relationships, and strain energy to analyse material behaviour under various loading conditions.
2) To develop the ability to construct shear force and bending moment diagrams for different beam types and loading scenarios, and interpret their structural significance.
3) To apply bending and shear stress theories to calculate stresses in beams of various cross-sections and design simple structural elements based on stress distribution.
4) To analyse complex stress states using Mohr's circle and evaluate structural safety using different failure theories under combined loading conditions.
5) To examine torsional behaviour in circular shafts and assess column stability using Euler's and Rankine's theories to design safe and efficient structural members.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Analyse the stress-strain characteristics of materials under various loading conditions and compute elastic constants for different configurations.
CO 2	Construct and interpret shear force and bending moment diagrams for various types of beams subjected to different loading patterns.
CO 3	Calculate bending and shear stresses in beams of standard cross-sections and design basic structural components based on stress distribution.
CO 4	Determine principal stresses and strains using analytical and graphical methods, and apply failure theories to assess structural safety under combined loads.
CO 5	Analyse torsional behaviour in shafts and evaluate the stability of columns using classical theories, enabling safe and efficient structural design.

4. COURSE CONTENT

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. **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.

Columns and Struts: Euler's Theory, Limitations of Euler's theory, Equivalent Length, Rankine's Formula, Secant Formula.

5. 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.

6. 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.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**2**	1										**2**	
CO 2	**3**	**2**	**2**										**3**	
CO 3	**3**	**2**	**3**	**2**									**3**	**2**
CO 4	**3**	**3**	**2**	**2**									**2**	**2**
CO 5	**3**	**2**	**3**	**2**									**2**	**3**

COURSE CONTENT

PROBABILITY, STATISTICS & COMPLEX VARIABLES								
II Year - I Semester: ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
MA302BS	**Foundation**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**1**	**-**	**4**	**40**	**60**	**100**
Contact Classes: 48	Tutorial Classes: 16	Practical Classes: Nil				**Total Classes: 64**		
Prerequisite: Mathematics courses of the first year of study.								

1. COURSE OVERVIEW

The course **Probability, Statistics & Complex Variables** provides fundamental mathematical tools required for analysis and problem-solving in Mechanical Engineering applications.

The First half, **Probability & Statistics**, introduces students to the concepts of probability theory, random variables, and statistical distributions, which form the basis for data analysis and decision-making. The course also develops knowledge of estimation and hypothesis testing, enabling students to apply statistical inference methods to real-life case studies.

The second half, **Complex Analysis,** covers the differentiation and integration of complex functions. Topics such as analyticity, Cauchy-Riemann equations, harmonic conjugates, conformal mappings, Möbius transformations, Cauchy's theorem, integral formula, series expansions, singularities, and residue theorem are studied. These powerful tools are widely applied in mathematical modelling and engineering problem-solving, particularly in fields involving fluid mechanics, heat transfer, and vibration analysis.

2. COURSE OBJECTIVE

The students will try to Learn:

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

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Formulate and solve problems involving random variables and apply statistical methods for analysing experimental data.
CO 2	Apply the concept of estimation and testing of hypotheses to case studies.
CO 3	Test a hypothesis on single and double means. Estimating the ratio of two Variances
CO 4	Analyse the complex functions with reference to their analyticity, integration using Cauchy's integral and residue theorems.
CO 5	Taylor's and Laurent's series expansions of a complex function.

4. COURSE CONTENT

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

Probability spaces, conditional probability, independent events, and Bayes' theorem.
Random variables: Discrete and continuous random variables, Expectation of Random Variables, and Variance of random variables. Random Variables and Probability Distributions: Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions.

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 a 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 **10 L**

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).

5. 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 & Statistics for Engineers & Scientists, 9th Ed. Pearson Publishers.

6. 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 Education.
3) N.P. Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
4) J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Edition, McGraw-Hill, 2004.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**2**										**2**	**3**	**2**
CO 2	**2**	**3**										**2**	**2**	**3**
CO 3	**2**	**3**											**2**	**3**
CO 4	**3**	**-**	**1**		**2**								**3**	**-**
CO 5	**3**	**3**			**1**							**2**	**3**	**3**

COURSE CONTENT

METALLURGY & MATERIAL SCIENCE								
II Year - I Semester: ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
ME303PC	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**-**	**-**	**3**	**40**	**60**	**100**
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil				**Total Classes: 48**		
Prerequisite: Engineering Mechanics								

1. COURSE OVERVIEW

This course offers a comprehensive exploration of materials science, beginning with crystal structures and imperfections that influence mechanical behaviour. It delves into phase diagrams and alloy systems, emphasizing microstructural evolution and transformation mechanisms. Heat treatment processes are thoroughly covered, highlighting their impact on steel properties. Advanced thermal and surface hardening techniques are introduced to enhance performance. Finally, the course surveys a wide range of engineering materials—including steels, cast irons, non-ferrous alloys, ceramics, and composites—focusing on their properties and industrial applications..

2. COURSE OBJECTIVE

The students will try to Learn:

1) To understand the relationship between crystal structures, defects, and their influence on mechanical properties of materials.
2) To interpret binary phase diagrams to predict phase transformations and microstructural evolution in alloy systems.
3) To analyse the effects of various heat treatment processes on the microstructure and mechanical behaviour of steels.
4) To evaluate continuous cooling curves and surface hardening techniques to optimize material properties for engineering applications.
5) To identify and compare the properties and applications of ferrous, non-ferrous alloys, ceramics, and composite materials.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Analyse how crystal structures and defects influence the mechanical behaviour of engineering materials.
CO 2	Interpret binary phase diagrams and predict phase transformations and resulting microstructures in alloy systems.
CO 3	Evaluate the impact of various heat treatment processes on the microstructure and mechanical properties of steels.
CO 4	Apply knowledge of cooling curves and surface hardening techniques to enhance material performance in industrial applications.
CO 5	Classify and select appropriate engineering materials—including alloys, ceramics, and composites—based on their properties and intended applications.

4. COURSE CONTENT

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). Ceramics and Composites: Types, properties and applications

5. 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.

6. 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.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**2**											**3**	
CO 2	**3**	**3**	**2**										**3**	**2**
CO 3	**3**	**2**	**2**										**3**	**2**
CO 4	**3**	**2**	**2**	**2**									**3**	**2**
CO 5	**3**	**2**			**2**								**3**	**2**

COURSE CONTENT

PRODUCTION TECHNOLOGY								
II Year - I Semester: ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
ME304PC	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**-**	**-**	**3**	**40**	**60**	**100**
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil				**Total Classes: 48**		
Prerequisite: Engineering Mechanics								

1. COURSE OVERVIEW

This course introduces the core manufacturing processes used in modern industry, starting with casting techniques and pattern design, followed by an in-depth look at welding methods from basic gas welding to advanced laser and friction stir welding. It covers metal forming operations like rolling, drawing, and sheet metal work, emphasizing practical applications and force calculations. Students also explore extrusion and forging processes, including high-energy rate forming technologies. Throughout, the focus remains on understanding real-world applications, identifying defects, and optimizing production efficiency.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To understand the principles, materials, and design considerations involved in casting operations, including pattern making, moulding techniques, gating systems, and casting defects.
2) To gain foundational knowledge of welding processes, joint types, welding positions, and cost estimation, with emphasis on gas and arc welding techniques.
3) To explore specialized welding methods and develop the ability to identify welding defects and apply appropriate testing procedures.
4) To analyse hot and cold working processes, sheet metal operations, rolling, and drawing techniques, focusing on force calculations and equipment used in industrial forming.
5) To understand the mechanics and applications of extrusion and forging processes, including high-energy rate forming methods and their role in modern manufacturing.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Analyse and apply casting techniques, design gating and riser systems, and identify casting defects to optimize manufacturing quality.
CO 2	Demonstrate proficiency in basic welding operations, select appropriate welding methods for different joints, and estimate time and cost for welding tasks.
CO 3	Evaluate advanced welding processes, diagnose welding defects, and implement suitable testing methods to ensure weld integrity and performance.
CO 4	Apply principles of hot and cold working, perform sheet metal operations, and calculate forces and power requirements for rolling and drawing processes.
CO 5	Distinguish between various extrusion and forging methods, analyse forming forces, and assess the suitability of high-energy rate forming techniques for specific applications.

4. COURSE CONTENT

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 Risers 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.

5. 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.

6. 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.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**2**	1										**2**	
CO 2	**3**	**2**	**2**										**3**	
CO 3	**3**	**2**	**3**	**2**									**3**	**2**
CO 4	**3**	**3**	**2**	**2**									**2**	**2**
CO 5	**3**	**2**	**3**	**2**									**2**	**3**

COURSE CONTENT

THERMODYNAMICS								
II Year - I Semester: ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
ME305PC	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**1**	**-**	**4**	**40**	**60**	**100**
Contact Classes: 48	Tutorial Classes: 16	Practical Classes: Nil				**Total Classes: 64**		
Prerequisite:								

1. COURSE OVERVIEW

This course introduces the fundamental principles of thermodynamics, including the study of systems, properties, and processes. It covers the First and Second Laws of Thermodynamics and their application to closed and open systems. Students learn about entropy, thermodynamic property relations, and the behaviour of ideal and real gases. The course explores psychometrics, gas mixtures, and various power and refrigeration cycles. Emphasis is placed on applying theoretical knowledge to analyse energy systems and evaluate cycle performance.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To introduce the basic concepts and laws of thermodynamics.
2) To apply the first and second laws to closed and open systems.
3) To understand the properties of pure substances and their use in thermodynamic processes.
4) To study the working principles and performance of thermodynamic cycles.
5) To prepare students for applications in engines, power plants and refrigeration.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Understand the basics of Thermodynamics
CO 2	Apply first and second laws of thermodynamics to different systems
CO 3	Determine the feasibility of a process w.r.to entropy changes
CO 4	Apply concepts of thermodynamic property relations to ideal gas and real gases
CO 5	Evaluate performance of power cycles and refrigeration cycles

4. COURSE CONTENT

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 – Vader Waals 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. 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.

5. 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.

6. 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.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**2**	**2**		**1**								**2**	**2**
CO 2	**3**	**3**	**2**	**2**	**1**		**2**						**3**	**2**
CO 3	**3**	**3**	**3**	**2**	**2**								**3**	**2**
CO 4	**3**	**2**	**2**	**2**	**3**								**2**	**3**
CO 5	**3**	**2**	**2**	**2**	**3**		**2**						**2**	**3**

COURSE CONTENT

PRODUCTION TECHNOLOGY LABORATORY								
II Year - I Semester: ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
ME306PC	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	**-**	**2**	**1**	**40**	**60**	**100**
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 32				**Total Classes: 32**		
Prerequisite: Production Technology								

1. COURSE OVERVIEW

This course offers hands-on training in key manufacturing processes, beginning with metal casting techniques including pattern design, sand testing, and molten metal handling. Students gain practical welding experience through ARC, TIG, spot, plasma welding, and brazing exercises. Mechanical press working covers blanking, piercing, deep drawing, extrusion, and bending operations using both compound and progressive tools. The curriculum also introduces plastic processing methods such as injection and blow moulding. This course builds foundational skills in fabrication, forming, and joining technologies essential for industrial applications.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To develop foundational skills in pattern making, sand testing, and executing basic casting operations.
2) To gain hands-on experience in diverse welding techniques and understand their industrial applications.
3) To understand and perform essential press working operations using various tooling methods.
4) To explore and apply plastic moulding techniques for manufacturing polymer-based components.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Design casting patterns, assess sand properties, and successfully perform basic casting operations with quality control awareness.
CO 2	Demonstrate competence in executing various welding techniques and understand their applications in fabrication and repair processes.
CO 3	Apply press working principles to perform operations like blanking, deep drawing, and bending using appropriate tooling methods.
CO 4	operate injection and blow moulding equipment to produce plastic components, understanding process parameters and product quality.
CO 5	Design casting patterns, assess sand properties, and successfully perform basic casting operations with quality control awareness.

4. COURSE CONTENT

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

5. REFERENCE BOOKS

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

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**2**	**3**	**2**	**2**	1	1	**1**	**1**	**2**	**1**	**2**	**3**	**3**
CO 2	**3**	**2**	**3**	**2**	**2**	1	1	**1**	**2**	**2**	**1**	**2**	**3**	**2**
CO 3	**3**	**2**	**3**	**2**	**2**	1	1	**1**	**1**	**2**	**1**	**2**	**3**	**2**
CO 4	**3**	**2**	**3**	**2**	**2**	1	1	**1**	**1**	**2**	**1**	**2**	**3**	**2**
CO 5	**3**	**2**	**3**	**2**	**2**	1	1	**1**	**1**	**2**	**1**	**2**	**3**	**3**

COURSE CONTENT

MATERIAL SCIENCE & MECHANICS OF SOLIDS LABORATORY								
II Year - I Semester: ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
ME307PC	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	**-**	**2**	**1**	**40**	**60**	**100**
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 32				**Total Classes: 32**		
Prerequisite: Metallurgy & Material Science and Mechanics of Solids								

1. COURSE OVERVIEW

This integrated lab course offers hands-on experience in both Material Science and Mechanics of Solids, essential for understanding the behaviour of engineering materials. Students will explore crystal structures and analyse microstructures of metals, steels, cast irons, and non-ferrous alloys. The course emphasizes practical techniques for studying material science. In the Mechanics of Solids segment, learners perform tension, bending, torsion, hardness, and impact tests to evaluate mechanical properties. Together, these labs build foundational skills for material selection and structural analysis in engineering applications

2. COURSE OBJECTIVE

The students will try to Learn:

1) To develop practical understanding of material structures by examining crystal models and microstructures of metals, steels, and alloys.
2) To enhance analytical skills through microscopic evaluation of various ferrous and non-ferrous materials.
3) To build proficiency in mechanical testing techniques, including tension, bending, torsion, hardness, and impact tests.
4) To correlate material properties with mechanical behaviour, enabling informed decisions in engineering design and manufacturing.
5) To prepare students for real-world applications by integrating theoretical knowledge with hands-on laboratory experience.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Understand crystal structures and demonstrate the ability to model and differentiate between various lattice arrangements.
CO 2	Analyse microstructures of pure metals, steels, cast irons, and non-ferrous alloys to interpret their physical and mechanical properties.
CO 3	Perform and interpret mechanical tests such as tension, bending, torsion, hardness, and impact to evaluate material behaviour under various loading conditions.
CO 4	Assess steel hardenability using the Jominy End Quench Test and relate it to practical heat treatment applications.
CO 5	Correlate microstructural features with mechanical performance, enabling informed material selection and design decisions in engineering practice.

4. COURSE CONTENT

Material Science Lab

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 Carbon steels.
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

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) Test on springs
7) Izod Impact test/ Charpy Impact test

5. REFERENCE BOOKS

1) "Materials Science and Engineering: An Introduction" by William D. Callister Jr. and David G. Rethwisch.
2) "Strength of Materials" by R.K. Bansal.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**2**	**2**									**1**	**3**	**3**
CO 2	**3**	**3**											**3**	**2**
CO 3	**3**	**3**	**2**										**3**	**2**
CO 4	**3**	**2**											**3**	**2**
CO 5	**3**	**3**	**2**									**1**	**3**	**2**

COURSE CONTENT

COMPUTER AIDED MACHINE DRAWING								
II Year - I Semester: ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
ME308PC	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	**-**	**2**	**1**	**40**	**60**	**100**
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 32				**Total Classes: 32**		
Prerequisite: Engineering Graphics								

1. COURSE OVERVIEW

This course offers a comprehensive study of machine elements and assemblies through both manual and computer-aided drafting techniques. Students will learn to create detailed drawings of screw threads, fasteners, joints, bearings, and couplings with appropriate proportions and multiple views using first angle projection. Emphasis is placed on understanding mechanical conventions and producing accurate part and assembly drawings of steam engine components, machine tool parts, and valves. CAD tools are integrated to enhance precision and efficiency in drafting complex assemblies. By the end of the course, learners will be equipped to interpret, design, and document mechanical systems with professional standards.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To develop proficiency in interpreting and creating detailed drawings of machine elements such as screw threads, bolts, nuts, keys, joints, and bearings using first angle projection.
2) To demonstrate understanding of mechanical connections and joints by drafting various types such as riveted joints, cottered joints, knuckle joints, and shaft couplings with appropriate views.
3) To analyse and visualize mechanical assemblies including steam engine parts, machine tool components, and valves, and represent them through precise and proportionate drawings.
4) To apply manual and computer-aided drafting techniques to produce accurate part and assembly drawings of mechanical components, ensuring adherence to engineering standards and conventions.
5) To integrate CAD software tools effectively to enhance the speed, clarity, and accuracy of mechanical drawings, preparing students for industry-level design documentation.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Demonstrate the ability to create accurate and proportionate drawings of machine elements using first angle projection principles.
CO 2	Construct detailed assembly drawings of mechanical systems including steam engine components, machine tool parts, and valves, applying standard conventions and drafting techniques.
CO 3	Utilize computer-aided drafting (CAD) tools effectively to produce professional-quality part and assembly drawings, enhancing precision and productivity.
CO 4	Interpret and analyse engineering drawings to understand the function and fit of individual components within mechanical assemblies.
CO 5	Apply knowledge of mechanical design standards and drawing practices to solve real-world engineering problems through clear and communicative technical documentation.

4. COURSE CONTENT

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 foot step 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.

5. TEXT BOOKS

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

6. REFERENCE BOOKS

1) Machine Drawing by / Bhattacharyya / Oxford
2) Machine Drawing / Ajeet Singh / Mc Graw Hill

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

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**2**	**2**	**1**	**2**							**2**	**3**	**3**
CO 2	**3**	**2**	3	**2**	**2**							**2**	**3**	**2**
CO 3	**2**	**3**	**3**	**2**	3							**2**	**3**	**2**
CO 4	**3**	**2**	**2**	**2**	**2**							**2**	**3**	**2**
CO 5	**3**	**2**	**3**	**2**	**3**							**3**	**3**	**2**

COURSE CONTENT

GENDER SENSITIZATION LAB								
II Year - I Semester: ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
***MC309**	**Mandatory**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	**-**	**2**	**0**	**40**	**60**	**100**
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 32				**Total Classes: 32**		
Prerequisite: Nil								

1. COURSE OVERVIEW

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality. This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To develop students' sensibility with regard to issues of gender in contemporary India.
2) To provide a critical perspective on the socialization of men and women.
3) To introduce students to information about some key biological aspects of genders.
4) To expose the students to debates on the politics and economics of work.
5) To help students reflect critically on gender violence.
6) To expose students to more egalitarian interactions between men and women.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Students will have developed a better understanding of important issues related to gender in contemporary India.
CO 2	Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film
CO 3	Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
CO 4	Students will acquire insight into the gendered division of labor and its relation to politics and economics.
CO 5	Men and women students and professionals will be better equipped to work and live together as equals.

4. COURSE CONTENT

Unit-I: UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men- Preparing for Womanhood. Growing up Male. First lessons in Caste.

Unit – II: GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences- Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary.

Unit – III: GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work.

-Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

Unit – IV: GENDER - BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No!-Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu".

Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."

Unit – V: GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature-Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks- The Brave Heart.

Note: Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

- Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".
- ESSENTIAL READING: The Textbook, "Towards a World of Equals: A Bilingual Textbook on Gender" written by A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu published by Telugu Academy, Telangana Government in 2015.

ASSESSMENT AND GRADING:

- Discussion & Classroom Participation: 20%.
- Project/Assignment: 30%
- End Term Exam: 50%

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1								**3**	**3**					
CO 2								**3**	**3**					
CO 3								**3**	**3**					
CO 4								**3**	**3**					
CO 5								**3**	**3**					