



DEPARTMENT OF MECHANICAL ENGINEERING, SSIT

The Vision of the department:

To carve technically proficient and competent mechanical engineering graduates capable of addressing the needs of the society and the nation.

The Mission of the department:

- To impart quality technical education in the core area of Mechanical Engineering.
- To inculcate Industrial practices for better professional growth.
- To imbibe ethical values, promote entrepreneurship and impart soft skills and teamwork capabilities.
- To ensure self-learning capabilities with an aptitude for research mostly focusing on societal needs

Program Educational Objectives [PEO's]:

- PEO– 01** Provide students with sound foundation in mathematical, scientific and engineering fundamentals necessary to formulate, solve and analyze problems in the core/allied areas of Mechanical Engineering.
- PEO– 02** Provide graduates with competency in the synthesis, modeling and analysis of mechanical/thermal/fluid data, assemblies and systems, research and consultancy in core areas of mechanical engineering, ensuring noticeable social impact.
- PEO– 03** Promote awareness about Professional Ethics, inculcate skills for usage of software tools and prepare graduates of the program for continuous learning capabilities in interdisciplinary/multidisciplinary domains

Program Outcomes [PO's]:

Our Engineering Graduates will be able to:

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.



5. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and Team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life- Long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSO's):

Our Engineering graduates are able to

PSO1: Automated/Additive Manufacturing--demonstrate knowledge and understanding of manual and automated assembly/manufacturing systems including additive manufacturing systems.

PSO2: Entrepreneurship-- recognize the need for and ability to engage in entrepreneurial activities.



DEPARTMENT OF MECHANICAL ENGINEERING
SCHEME OF TEACHING AND EXAMINATION
Choice Based Credit System (CBCS) (Effective from the academic year 2020-21)
III SEMESTER

III Semester B.E. Mechanical Engineering / Industrial Engineering Management						
Sl. No.	Course Code		Course Title	Teaching Dept.	Board of Exam.	Credits
1.	BS	MA3TH1	Integral Transforms and Numerical Techniques	MA	MA	4
2.	PC	ME3TH2	Management & Entrepreneurship	ME	ME	3
3.	PC	ME3TH3	Engineering Thermodynamics	ME	ME	3
4.	PC	ME3TH4	Engineering Mechanics	ME	ME	3
5.	PC	ME3TH5	Mechanical Measurements and Metrology	ME	ME	3
6.	ES/ MA	ME3TH6/ MA3DP6	Metal Casting and Forming Process/DIP Mathematics*	ME/MA	ME/MA	3
7.	PC	ME3LB1	Computer Aided Machine Drawing	ME	ME	1.5
8.	PC	ME3LB2	Measurements and Metrology Lab	ME	ME	1.5
9.	PC	ME3LB3	Basic W/S Practice Lab	ME	ME	1.5
10.	HS	SK3DP1	Skill Development – I*	HS	HS	1
TOTAL						24.5
CIE-Continuous Internal Evaluation, SEE-Semester End Examination						

- **MA3DP6: DIP Mathematics for lateral entry students only**
- **There is no SEE for Skill Development -I Course, however all the Students Should maintain minimum 85% of attendance and 40% of CIE to get pass in the subject.**



Syllabus for the Academic Year – 2021 - 2022

Department: MATHEMATICS

Semester: III

Subject Name: INTEGRAL TRANSFORMS AND NUMERICAL TECHNIQUES

Subject Code: MA3TH1

L-T-P-C: 4-0-0-4

Course Objectives:

Sl.No	Course Objectives
1	Introduce the concept of Laplace Transform and problems on periodic function.
2	Introduce the concept of solving Linear Differential Equations by the method of Laplace Transform.
3	Represent a periodic function as a Fourier Series and Compute the Fourier coefficients numerically.
4	To develop the proficiency in Numerical techniques and solving Ordinary Differential Equations arising in engineering applications.

Unit	Description	Hours
I	Laplace Transforms: Definition, Laplace transforms of elementary functions. (Statements only). Derivations: Laplace transform of t^n , Laplace transform of division by t , Laplace transform of $\int_0^t f(t)dt$. Laplace transforms of Periodic function (Statement only) and problems on square wave, saw-tooth wave, triangular wave, full and half wave rectifier, Unit step functions -problems.	10
II	Inverse Laplace transforms: Definition, properties, evaluation using different methods. Convolution theorem (without proof), evaluation of $L^{-1}\{F(s)\}$ using convolution theorem. Application to solve ordinary linear differential equations by Laplace transforms method.	10
III	Fourier Series: Periodic function, Dirichlet's conditions. Fourier series of even and odd functions. Fourier series of periodic functions with period 2π and with arbitrary period $2l$. Applications to Engineering problems: Fourier series for Periodic square wave, Half wave rectifier, Full wave rectifier, Saw-tooth wave with graphical representation. Half range Fourier series, Practical harmonic analysis.	10
IV	Fourier Transforms: Infinite Fourier transforms. Fourier Sine and Cosine transforms. Inverse Fourier transforms, and simple problems. Z-Transforms: Basic definitions of Z-transform, Standard Z-transforms, Damping rule, Shifting rule, Initial value and Final value theorems (without proofs), problems, Inverse Z-transform, problems. Applications-solutions of difference equations using Z-transforms.	11



V	<p>Numerical solution of ordinary differential equations of first order and first degree: Taylor’s series method, Modified Euler’s method, Runge- Kutta method of fourth order, Milne’s and Adams-Bashforth Predictor and Corrector methods (No derivation of formulae) problems.</p> <p>Numerical Integration: Simpson’s $1/3^{rd}$, $3/8^{th}$ rule, Weddle’s rule, (without proof), problems.</p>	11
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Course Outcomes:

Course outcome	Descriptions
CO1	Understand the basic concepts of Fourier series and Integral transforms.
CO2	Apply Laplace transform and inverse Laplace transform in solving differential equation and integral equation arising in network analysis, control system and others fields of engineering.
CO3	Demonstrate Fourier series and Integral transforms to study behavior of periodic functions, discrete/continuous functions arising in single and system, field theory and system communication
CO4	Analyze and apply single step and multistep numerical methods in engineering problems.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Higher Engineering Mathematics	B.S.Grewal	43 rd Edition Khanna Publications,2015. ISBN:9788174091956
2	Advanced Engineering Mathematics	E.Kreyszig	10 th Edition JonWiley&Sons,2015. ISBN:9780470913611

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	A text book of Engineering Mathematics	N.P.Bali and Manish Goyal	7 th Edition Lakshmi Publishers,2010. ISBN:9788131808030
2	Higher Engineering Mathematics	B.V.Ramana	1 st Edition, Tata McGraw-Hill, 2006. ISBN:9780070634190
3	Higher Engineering Mathematics	H.K.Das and Er.Rajnish Verma	1 st Edition, Chand publishing, 2011. ISBN:9788121938907



Department: Mechanical Engineering

Semester: III

Subject Name: MANAGEMENT AND ENTREPRENEURSHIP

Subject Code: ME3TH2

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No	Course Objectives
1	To understand the concept of management and functions of a manager in industry.
2	To understand the concept of planning, organizing, directing and controlling process in management
3	To understand the concept of entrepreneurship and small-scale industries
4	To understand the concept of industrial ownership and partnership

Unit	Description	Hours
I	MANAGEMENT: Introduction, Meaning, nature and characteristics of Management, Management & Administration, Levels of Management, Principles and functions of Management PLANNING: Nature, importance and purpose of planning process Objectives, Types of plans (Meaning only) Decision making, Importance of Planning, steps in planning & planning premises	9
II	ORGANIZING: Nature and purpose of organization – Principles of organization Types of organization, Departmentation, Committees, Centralization Vs Decentralization of authority and responsibility, Span of control DIRECTING & CONTROLLING: Meaning and nature of directing, Leadership styles, Motivation Theories-Maslow hierarchy of needs & Herzberg's two factor theory, Communication, Meaning and importance, Coordination, Meaning and importance, Essentials of a sound control system	9
III	ENTREPRENEURSHIP: Meaning of Entrepreneur, Evolution of the Concept, Functions of an Entrepreneur, Types of Entrepreneur an emerging class. Concept of Entrepreneurship, Evolution of Entrepreneurship, Development of Entrepreneurship: stages in entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship; Entrepreneurship in India; Entrepreneurship & its Barriers	9
IV	MICRO AND SMALL ENTERPRISES: Definition of micro and small enterprises, characteristics and advantages of micro and small enterprises, steps in establishing micro and small enterprises, Government of India industrial policy 2007 on micro and small enterprises, case study (Microsoft), Case study (Captain G R Gopinath), case study (N R Narayana Murthy & Infosys),	9



	Institutional support: Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC. Single Window Agency; SIS; NSIC; SIDBI; KSFC	
V	INDUSTRIAL OWNERSHIP: Definition and meaning of Partnership, Characteristics of Partnership, Kinds of Partners, Partnership Agreement or Partnership Deed, Registration of Partnership Firm, Rights, Duties and Liabilities of Partners, Advantages and Disadvantages of Partnership, Sole proprietorship, Features, Scope Advantages and Disadvantages of Sole Proprietorship.	9

Course Outcomes:

Course outcome	Descriptions
CO1	Describes the fundamentals of management, functions of a manager. Also explain the planning and decision making processes in management
CO2	Explain understanding of Entrepreneurships and Entrepreneurship development process.
CO3	Illustrate Small Scale Industries, various types of supporting agencies and financing available for an entrepreneur.
CO4	Summarize the concept of partnership and to explain about industrial ownership.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Principles of Management	P.C. Tripathi, P.N. Reddy	Tata McGraw Hill
2	Dynamics of Entrepreneurial Development & Management	Vasant Desai	Himalaya Publishing House

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Management Fundamentals Concepts, Application, Skill Development	Robers Luiser	Thomson
2	Entrepreneurship Development	S.S.Khans	S.Chand & Co
3	Entrepreneurship Development- Small Business Enterprises	Poornima.M.Char antimath	Pearson Education – 2006



Department: Mechanical Engineering

Semester: III

Subject Name: ENGINEERING THERMODYNAMICS

Subject Code: ME3TH3

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No	Course Objectives
1	To acquire the concept of work, heat, entropy and Internal energy changes for a given thermodynamic processes.
2	To remember and apply the Principles of fundamental laws of Thermodynamics and their corollaries.
3	To Acquire a knowledge of Thermodynamic property diagrams and properties of pure substance.
4	To understand & apply the concept of Entropy and the principle of increase of Entropy.

Unit	Description	Hrs
I	Basic Concepts: Thermodynamics: definition and applications, Microscopic and Macroscopic approaches, Open & Closed systems, system boundary and control surface, examples, Properties, State, Processes and Cycles, Quasi-static process, Equilibrium of systems, Equality of temperature, Zeroth law of thermodynamics, Temperature scales, Numerical problems on temperature scales. Ideal and perfect gases: Ideal gas laws, differences between perfect, ideal and real gases, equation of state, Universal and characteristic gas constants evaluation of properties of perfect and ideal gases. Real Gases: Introduction. Vander Waal's Equation of state, Van der Waal's constants in terms of critical properties, law of corresponding states, compressibility factor; compressibility chart.	9
II	Pure substance: Definition of a pure substance, phases of a substance, triple point and critical points, sub-cooled liquid, saturated liquid, dryness fraction, vapor pressure, two-phase mixture of liquid and vapor, saturated vapor and superheated vapor states of a pure substance with water as example. Representation of pure substance properties on P-T, T-h, T-S and P-V diagrams, Calorimeters, Steam tables and its use, Simple Numerical problems.	9
III	Work and heat: Thermodynamic definition of work; examples, sign convention, Displacement work; Expressions for displacement work-plotting on p-v diagrams, Other forms of work; electric work, shaft work, paddle wheel work, spring work. Free expansion with zero work transfer. Heat: definition, units and sign convention, Comparison of heat and work, Numerical problems.	9



IV	First law of thermodynamics: Joule's experiments, equivalence of heat and work, Statement of the First law of thermodynamics, Extension of the First law to non -cyclic processes, Energy, Energy as a property, Modes of energy, Specific heats, Internal energy and enthalpy of ideal gas, PMM1 Principle of Conservation of mass, Energy balance for steady flow system, Some steady flow engineering devices, Numerical problems.	9
V	Second law of Thermodynamics: Limitations of First Law, Statements of second law, Thermal Energy reservoirs, Equivalence of Kelvin Plank and Clausius Statements, Heat Engines, Energy Conversion efficiencies, Refrigerators and Heat Pumps, Coefficient of performance, Perpetual motion machines, Reversible process, Factors that make a process irreversible, Carnot cycle, Carnot's Heat engine (reversible heat engines), Carnot Principle, Thermodynamic temperature scale, Simple Numerical problems. Entropy: Clausius inequality; statement, proof, definition, a property, Entropy, Increase of Entropy principle, Entropy generation, entropy as a quantitative test for irreversibility, isentropic process, property diagrams involving entropy, Tds relation, entropy change for liquids, solids, and gases (Ideal), Entropy balance, Simple Numerical problems.	9

Course Outcomes:

Course outcome	Descriptions
CO1	Understand Concept of work, heat, entropy and Internal energy changes for a given thermodynamic processes.
CO2	Understand & apply the laws of Thermodynamics for analyzing thermodynamic processes.
CO3	Analyze the thermodynamic processes for internal energy, change in entropy, work and heat transfer.
CO4	Adopt the knowledge of thermodynamics to suggest the solutions for thermodynamic problems.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Thermodynamics An engineering approach	Yunus.A.Cengel, Michael .A .Boles	Tata McGraw hill, 2002.
2	Engineering Thermodynamics (Principals and Practices)	Dr. D S Kumar,	S.K. Kataria & Sons; Reprint 2013 edition (2012).



Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Engg Thermodynamics	J.B.Jones and G.A.Hawkins,	John Wiley and Sons Ltd; 2nd edition (May 7, 1986)
2	Thermal Engineering	R.K. Rajput,	Laxmi Publications; Tenth edition (2018)
3	A Course in Thermal Engineering	Domkundawar	Dhanpat Rai & Co. (P) Limited (2016)

Department: Mechanical Engineering

Semester: III

Subject Name: ENGINEERING MECHANICS

Subject Code: ME3TH4

L-T-P-C: 3-0-0-3

Course Objectives:

SI.No	Course Objectives
1	To understand the principles of mechanics and resolution of forces and moments for a given force system and apply them to practical engineering problems.
2	To draw the free body diagram of a system of coplanar forces and determine its equilibrium.
3	To analyze the types of friction for static bodies and problems related to friction
4	To determine the centroid and second moment of area

Unit	Description	Hours
I	Basic Concepts of Engineering Mechanics - Definition, Law of Parallelogram of Forces, Lami's Theorem, Resolution of a Force, Moment of a Force, Laws of Mechanics, Principle of Transmissibility of Forces. Force System and Classification – Coplanar Collinear and Concurrent Forces, Classification of a Force System, Resultant of Several Forces, Resultant of Coplanar Forces, Resultant of Collinear Coplanar Forces, Resultant of Concurrent Coplanar Forces.	9
II	Equilibrium of Coplanar Force System and Free Body Diagram: Equilibrium of Coplanar Force System, Action and Reaction, Free body diagrams, Equilibrium of a Body under three forces, Lami's Theorem. Numerical Problems	9
III	Determination of Support Reactions: Introduction, Types of Supports, Types of Loading, Determination of Reaction of a Beam. Numerical Problems	9
IV	Friction: Introduction, Co-efficient of Friction, Angle of Friction, Cone of Friction, Types of Friction, Coulomb's laws of Friction, Angle of Response,	9

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	Equilibrium of a body lying on a rough inclined plane, Applications of Friction, Wedge Friction, Belt Friction	
V	Centroid: Determination of centroid of simple geometric figures such as triangle, rectangle, and segment of a circle, Centroid of combinations of plane Geometric figures. Moment of Inertia: Parallel and perpendicular axis theorems, Radius of gyration Determination of moment of inertia and radius of gyration of triangle rectangle circular areas, moment of inertia of combination of plane geometric figures.	9

Course Outcomes:

Course outcome	Descriptions
CO1	Understand the basic concepts, illustrate, formulate, and solve engineering mechanics problems.
CO2	Apply the principles and laws of mechanics to determine the equilibrium of a particle.
CO3	Analyse the action of forces, Moments of other loads on systems of rigid bodies and compute the relative forces that develop as a result of the external loads.
CO4	Evaluate the frictional forces on general plane motion, determine the centroid and compute Moment of Inertia.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Engineering Mechanics	R K Bansal,	Revised Eighth Edition, Laxmi Publications (p) Ltd.
2	Engineering Mechanics	S S Bavikatti, and K G Rajashekharappa,	New Age International (P) Ltd.

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Engineering Mechanics	K L Kumar,	Tata McGraw-Hill Publication Ltd.
2	Applied Mechanics	S Ramamurtham	Dhanpath Rai & sons.
3	Applied Mechanics	I B Prasad	Khanna Publishers.
4	Engineering Mechanics	F L I Singer Harper	Collins Publishers.
5	Engineering Mechanics	Timoshenko & Young	McGraw-Hill publication Ltd.



Department: Mechanical Engineering

Semester: III

Subject Name: MECHANICAL MEASUREMENTS AND METROLOGY

Subject Code: ME3TH5

L-T-P-C: 3-0-0-3

Course Objectives:

SI.No	Course Objectives
1	Apply the concepts he has to learn in metrology for applying the same in the selection appropriate slip gauges and systems, application and standards.
2	Apply the concepts of limits, fits and tolerance during selective assembly and interchangeability in actual manufacturing process.
3	Understand and apply the concepts of measurement systems for checking accuracy, precision and calibration procedure of measuring instruments.
4	Understand the basic working principles of different transducers, intermediate and modifying devices and terminating devices, force, torque, pressure, temperature and strain etc.

Unit	Description	Hours
I	Introduction to Metrology: Definition, objectives and concept of metrology, Need of inspection, Principles, process, methods of measurement, Classification and selection of measuring instruments and systems. Accuracy, precision and errors in measurement. System of measurement, Material Standard, Wavelength Standards, Subdivision of standards, Line and End standards, Classification of standards and Traceability, calibration of End bars (Numerical) Linear Measurement and angular measurements: Slip gauges- Indian standards on slip gauges, wringing of slip gauges, uses slip gauges, care of slip gauges, problems on building of slip gauges (M87, M112). Measurement of angles - sine bar, sine center, angle gauges, optical instruments for angular measurements, Auto collimator-applications for measuring straightness and squareness.	9
II	System of Limits, Fits, Tolerance and Gauging: Definition of tolerance, Specification in assembly, Principle of interchangeability and selective assembly, limits of size, Indian standards, concept of limits of size and tolerances, definition of fits, hole basis system, shaft basis system, types of fits and their designation (IS 919-1963), geometric tolerance, position-tolerances. Classification of gauges, brief concept of design of gauges (Taylor's principles), Wear allowance on gauges, Types of gauges-plain plug gauge, ring gauge, snap gauge, limit gauge and gauge materials. Comparators: Functional requirements, classification, mechanical -	9



	Johnson Mikrokator, sigma comparators, dial indicator, electrical principles, LVDT, Pneumatic- back pressure gauges, solex comparators and optical comparators - Zeiss ultra-optimizer.	
III	<p>Measurement of screw thread and gear: Terminology of screw threads, measurement of major diameter, minor diameter, pitch and angle, Tool maker's microscope, Types of gears, gear tooth terminology, use of gear tooth vernier caliper and micrometer.</p> <p>Measurements and Measurement systems: Definition, requirements of measurement, significance of measurement, fundamental methods of measurement, generalized measurement system, definitions and basic concepts of accuracy, precision, calibration, threshold, sensitivity, hysteresis, repeatability, linearity, loading effect, system response-times delay. Errors in measurement, classification of errors.</p>	9
IV	<p>Transducers: Introduction to Transducers, transfer efficiency, primary and secondary transducers, mechanical transducers, electrical transducers, electronic transducers, advantages and disadvantages of each type transducers.</p> <p>Intermediate modifying and terminating devices: Mechanical systems, inherent problems, electrical intermediate modifying devices, input circuitry, ballast circuit, electronic amplifiers. Terminating devices, Cathode ray oscilloscope, Oscillographs, X-Y plotters</p>	9
V	<p>Force, Torque and Pressure Measurement: Direct methods and indirect method, force measuring instrument, Torque measuring instrument, Types of dynamometers, Absorption dynamometer, Prony brake and rope brake dynamometer, Pressure measurement, principle, use of elastic members, Bridgeman gauge, McLeod gauge, Pirani gauge.</p> <p>Temperature and Strain measurement: Resistance thermometers, thermocouple, law of thermocouple, materials used for construction, measurement of thermal emf, total radiation pyrometers, optical pyrometer. Strain measurements, strain gauge, preparation and mounting of strain gauges, gauge factor, methods of strain measurement.</p>	9

Course Outcomes:

Course outcome	Descriptions
CO1	Remember and understand the terminology associated with metrology, tolerance, screw thread profiles, generalized measurement system.
CO2	Understand and explain the theoretical working principles of comparators, gauges, transducers, intermediate and modifying and terminating devices.
CO3	Apply the basic principles and concepts of limit gauges, fits, tolerance and



	determine its solutions.
CO4	Analyze the type of fit as specified in the problem and evaluate the corresponding dimensions of hole and shaft.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Mechanical Measurements,	Beckwith Marangoni and Lienhard,	Pearson Education, 6th Edition, 2006.
2	Engineering Metrology,	R.K. Jain,	Khanna Publishers, Delhi, 2009.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Engineering Metrology and Measurements.	Bentley	Pearson Education.
2	Engineering Metrology	Gupta I.C.	Dhanpat Rai Publications.
3	Engineering Metrology and Measurements,	N.V.Raghavendra and L.Krishnamurthy,	Oxford University Press.

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Semester: III

Subject Name: METAL CASTING AND FORMING PROCESSES

Subject Code: ME3TH6

L-T-P-C: 3-0-0-3

Course Objectives:

SI.No	Course Objectives
1	Explain different manufacturing processes
2	Acquire knowledge of pattern, core, gating, riser and moulding machines for expandable moulds, explore different furnaces and compare special moulding techniques of casting
3	Acquire knowledge of metal forming process, hot and cold working, various forging operations, Rolling operations, drawing operations, extrusion process, compare various sheet metal forming.
4	Describe the metal joining techniques



Unit	Description	Hours
I	<p>Introduction: Definition, Classification of manufacturing processes, factors governing the selection of foundry sand, Green sand, core sand, dry sand</p> <p>Patterns: Definition, classification, materials used for pattern, various pattern allowances and their importance.</p> <p>Cores: Definition, need, types. Method of making cores,</p> <p>Concept of gating (top, bottom, parting line, horn gate) and risers (open, blind) Functions and types.</p> <p>Sand moulding: Types of base sand, requirement of base sand. Binder, Additives definition, need and types; preparation of sand moulds. Melding machines- Jolt type, squeeze type and Sand slinger.</p> <p>Study of important moulding process: sweep mould, CO2 mould, shell mould, investment mould, plaster mould, cement bonded mould.</p>	9
II	<p>Melting furnaces: Classification of furnaces, Gas fired pit furnace, Resistance furnace, Coreless induction furnace, electric arc furnace, constructional features & working principle of cupola furnace.</p> <p>Casting using metal moulds: Gravity die casting, pressure die casting, centrifugal casting, squeeze casting, slush casting, thixocasting, and continuous casting processes.</p>	9
III	<p>Mechanical Working of Metals: Introduction to metal forming processes & classification of metal forming processes. Hot Working & cold working of metals.</p> <p>Forging: Classification, Smith forging, drop forging & press forging. Forging Equipment, Defects in forging.</p> <p>Sheet Metal Operations: Blanking, piercing, punching, drawing, draw ratio, drawing force, variables in drawing, Trimming, and Shearing</p>	9
IV	<p>Rolling: Rolling process, Angle of bite, Types of rolling mills, Variables of Rolling process, Rolling defects.</p> <p>Drawing & Extrusion: Drawing of wires, rods & pipes, Variables of drawing Process. Difference between drawing & extrusion. Various types of Extrusion processes.</p>	9
V	<p>Welding process: Definition, Principles, classification, application, advantages & limitations of welding. Arc welding: Principle, Metal arc welding (MAW), Flux Shielded Metal Arc Welding (FSMAW), Inert Gas Welding (TIG & MIG) Submerged Arc Welding (SAW) and Atomic Hydrogen Welding (AHW).</p> <p>Special type of welding: Resistance welding principles, Seam welding, Butt welding, Spot welding and Projection welding. Friction welding, Explosive welding, Thermit welding, Laser welding and Electron beam welding.</p> <p>Metallurgical Aspects in Welding, Soldering, and Brazing: Structure of</p>	9



	<p>welds, Formation of different zones during welding, Heat Affected Zone (HAZ), Parameters affecting HAZ. Effect of carbon content on structure and properties of steel, Shrinkage in welds& Residual stresses. Concept of electrodes, filler rod and fluxes. Welding defects, causes & remedy.</p> <p>Soldering, brazing, gas welding: Soldering, Brazing, Gas Welding: Principle, oxy-Acetylene welding, oxy-hydrogen welding, air-acetylene welding, Gas cutting, Inspection methods: Methods used for inspection of casting and welding. Visual, magnetic particle, ultrasonic. Radiography, eddy current, holography methods of inspection.</p>	
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Course Outcomes:

Course outcome	Descriptions
CO1	Understand and develop simplified manufacturing processes.
CO2	Understand and remember moulding techniques, metal forming processes, welding processes, sheet metal forming to manufacture the products.
CO3	Identify and control the appropriate process parameters and possible defects in manufacturing processes.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	“Principles of metal casting”	Rechard W. Heine, Carl R. Loper Jr., Philip C. Rosenthal, Tata	McGraw Hill Education Private Limited Ed.1976.
2	Manufacturing Process-I”	Dr. K. Radhakrishna	Sapna Book House, 5th Revised Edition 2009.

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Process and Materials of Manufacturing”,	Roy A Lindberg,	4th Ed.Pearson Edu. 2006.
2	Manufacturing Technology”,	Serope Kalpakjian, Steuen. R. Sechmid,	Pearson Education Asia, 5th Ed. 2006.



Department: MATHEMATICS

Semester: III

Subject Name: FUNDAMENTAL MATHEMATICS

Subject Code: MA3DP6

L-T-P-C: 4-0-0-3

Course Objectives:

Sl.No	Course Objectives
1	Introduce concept of nth derivative and Multiple integrals.
2	Introduce the concept of differential equations.
3	Introduce concept of probability.
4	Study the concept of partial differential equations.

Unit	Description	Hours
I	Differential Calculus: List of standard derivatives including hyperbolic functions, rules of differentiation. Polar curves: Polar coordinates, angle between radius vector and tangent, angle between two polar curves, Problems. Taylor's and Maclaurin's series expansions of one variable.	9
II	Integral Calculus: List of standard integrals, integration by parts. Definite integrals – problems. Statement of reduction formulae for $\sin^n x$, $\cos^n x$, and $\sin^m x$, $\cos^n x$ and evaluation of these with standard limits-Examples. Double and triple integrals-Simple examples.	9
III	Differential equations: Introduction to first order differential equations. Variables separable, Linear equation. Exact differential equation, Problems. Ordinary differential equations with constant coefficients: Homogeneous differential equations, non-homogeneous differential equations, Particular integral for functions of the type $f(x) = e^{ax}$, $\sin(ax)$, $\cos(ax)$, x^n .	9
IV	Vector calculus and Partial differentiation: Del operator, gradient-directional derivative, divergence, curl, problems. Introduction to Partial differentiation. Illustrative examples. Differentiation of composite functions. Jacobians (without proof) – Simple Problems.	9
V	Probability: Introduction, Sample space and events. Axioms of probability. Addition and multiplication theorems, Conditional probability-illustrative examples. Baye's theorem-problems.	9



Course Outcomes:

Course outcome	Descriptions
CO1	To understand the basic concept of differentiation and integration
CO2	To understand the concepts of partial differentiation and differential equations arising in a variety of engineering applications.
CO3	To understand the double and triple integrals.
CO4	To understand concept of Vectors and probability.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Higher Engineering Mathematics	B.S.Grewal	43 rd Edition Khanna Publications,2015. ISBN:9788174091956
2	Advanced Engineering Mathematics	E.Kreyszig	10 th Edition JonWiley&Sons,2015. ISBN:9780470913611

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	A text book of Engineering Mathematics	N.P.Bali and Manish Goyal	7 th Edition Lakshmi Publishers, 2010. ISBN:9788131808030
2	Higher Engineering Mathematics	B.V.Ramana	1st Edition, Tata McGraw-Hill, 2006. ISBN:9780070634190
3	Higher Engineering Mathematics	H.K.Das and Er.Rajnish Verma	1 st Edition, Chand publishing, 2011. ISBN:9788121938907
4	A First Course in Probability	S. Ross	8 th Edition, Pearson, 2010, ISBN:9780136033134
5	An Introduction to Probability Theory and its Applications	W. Feller	3 rd Edition, John Wiley & Sons, Inc, 2008, ISBN9788126518050



Department: Mechanical Engineering

Semester: III

Subject Name: COMPUTER AIDED MACHINE DRAWING

Subject Code: ME3LB1

L-T-P-C: 0-0-3-1.5

Course Objectives:

Sl. No	Course Objectives
1	To provide basic understanding & drawing practice of various joints, simple mechanical parts and sectional views of solids.
2	To acquire the drawing knowledge of fasteners (Bolts, Nuts and riveted joints)
3	To draw the assembly drawing from the individual part drawing.
4	To develop the skills for usage of SOLIDEDGE modeling software package.

Unit	Description	Hours
PART -A		
I	Sections of Solids: Sections of Pyramids, Prisms, Cones and Cylinders resting only on their bases (True shape of sections).	03
II	Orthographic views: Conversion of pictorial views into orthographic projections of simple machine parts without section. (Bureau of Indian Standards conventions are to be followed for the drawings) Hidden line conventions and Precedence of lines.	03
PART-B		
III	Fasteners: Hexagonal headed bolt and nut with washer (assembly), square headed bolt and nut with washer (assembly) simple assembly using stud bolts with nut and lock nut.	03
IV	Riveted Joints: Single and double riveted lap joints, butt joints with single/double cover straps (Chain and Zigzag).	03
PART-C		
V	Assembly drawings: (part drawings should be given) 1. Universal Coupling 2. Screw jack (Bottle type) 3. Plummer block (Pedestal Bearing) 4. Machine vice 5. Tailstock of Lathe	30

Question paper Pattern:

The question paper should contain two questions from each part, in which student can answer any one. Part A & B, each carry 10 marks and Part C carry 30 marks. Part A & B should be manual drawing only. Part C to be drafted on computer using SOLID EDGE software.



Part C assembly drawing:

Component drawings to be made in 3D, Assembled in Proper form and 2D drawing of the complete assembly with minimum 2 views, section plane in proper place and sectional view as per question.

Course Outcomes:

Course outcome	Descriptions
CO1	Understand the elements and annotation of a detail drawing, 3D modeling and assembling features of software package.
CO2	Understand the orthographic views and sectional views of basic parts of machine.
CO3	Apply the empirical design concepts for couplings, riveted joints, nuts and bolts as per BIS standards.
CO4	Apply the skills required for usage of Modeling and Assembling tools of “ SOLIDEDGE ” Software Package.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Machine Drawing	N D Bhat & V M Panchal.	Charotar publishing Ltd., 2014, 50th edition
2	A Primer on Computer aided Machine drawing		Published by VTU, Belgaum

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Machine drawing	Sri. K L Narayan, P.Kannaiah & K.Venkat Reddy,	New-Age International publications,2001.
2	Machine drawing	Sri K R Gopal Krishna,	Subhas publications, Bangalore.



Department: Mechanical Engineering

Semester: III

Subject Name: MEASUREMENTS AND METROLOGY LAB

Subject Code: ME3LB2

L-T-P-C: 0-0-3-1.5

Course Objectives:

Sl. No	Course Objectives
1	To provide students with the necessary skills for calibration and testing of different gauges and instruments
2	To provide students with necessary skills to collect data, perform analysis and interpret results to draw valid conclusions through standard test procedures using various metrology instruments

Unit	Description	Hours
PART A (MECHANICAL MEASUREMENTS)		
I	<ol style="list-style-type: none"> 1. Calibration of Pressure Gauge 2. Calibration of Thermocouple 3. Calibration of LVDT 4. Calibration of Load cell 5. Determination of modulus of elasticity of a mild steel specimen using strain gauges. 6. Calibration of Torque meter. 7. Measurement of Rotational speed using Strobometer 	
PART B (METROLOGY)		
II	<ol style="list-style-type: none"> 1. Measurement using Optical Projector / Tool maker Microscope. 2. Measurement of angle using Sine Center / Sine bar 3. Measurement of alignment using Autocollimator 4. Measurement of Screw thread Parameter using Floating carriage micrometer 5. Measurement of Surface roughness using Surf test Sj301 6. Measurement using Mechanical comparator. 7. Measurement of gear tooth profile using gear tooth vernier / gear tooth micrometer. 8. Calibration of a micrometer using slip gauges. 9. Measurement using Optical Flats. 	

Question paper Pattern:

One question to be set from 1 or 2 – 25 marks
 One question to be set from 3 – 15 Marks
 Viva-voce – 10 Marks



Course Outcomes:

Course outcome	Descriptions
CO1	Identify and select the equipment to conduct the experiments related to metrology and measurements lab.
CO2	Demonstrate the procedure for conduction of experiments.
CO3	Apply the techniques for data collection.
CO4	Analyze the data collected and interpret the results.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Mechanical Measurements,	Beckwith Marangoni and Lienhard,	Pearson Education, 6th Edition, 2006.
2	Engineering Metrology,	R.K. Jain,	Khanna Publishers, Delhi, 2009.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Engineering Metrology,	Gupta I.C.	Dhanpat Rai Publications.
2	Engineering Metrology and Measurements,	N.V.Raghavendra and L.Krishnamurthy,	Oxford University Press.

Department: Mechanical Engineering

Semester: III

Subject Name: BASIC WORKSHOP PRACTICE LAB

Subject Code: ME3LB3

L-T-P-C: 0-0-3-1.5

Course Objectives:

SI. No	Course Objectives
1	To acquire skills in basic engineering practice.
2	To identify the hand tools and instruments.
3	To acquire measuring skills.



Unit	Description	Hours
PART A		
I	Fitting i. Demonstration on fitting tools, fitting operations and joints. ii. Preparation of models involving rectangular, triangular, semi-circular and dovetail joints (Minimum 3 models)	
PART B		
II	Welding i. Demonstration of electric arc – welding, tools and equipment's. ii. Preparation models using electric arc welding – butt joint, lap joint, T joint or L – joint (Minimum 3 models)	
PART C		
III	Sheet metal i. Demonstration on Sheet metal, Sheet metal tools, Soldering, Soldering tools. ii. Development of cone, Cylinder and combination of Solids (Minimum 2 models)	

Question paper Pattern:

Fitting	30Marks
Welding or sheet Metal	10Marks
Viva Voce	10Marks

Course Outcomes:

Course outcome	Descriptions
CO1	Identify and select the equipment to conduct the experiments related to workshop lab.
CO2	Practice elementary metal joining processes like Welding & Soldering.
CO3	Perform metal fitting operations using hand tools like scribes, Hand-files, hacksaw, chisels, hammer etc.
CO4	Fabricate simple sheet metal components using elementary surface development techniques.



Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Work shop technology	Hajra Chaudhary	Media Promoters, January 2008

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Elements of Mechanical Engineering	Hajra Chaudhary	Media Publishing. & Promoters, India; 4 th Revised edition (October 1, 1978)
2	Elements of Mechanical Engineering	Mathur & Mehta	science technology - Jain Brothers; 14th Edition, 2019

Department: Placement & Training

Semester: III

Subject Name: Skill Development-I

Subject Code: SK3DP1

L-T-P-C: 0-0-2-1

Course Objectives:

SI.No	Course Objectives
1	Unique shortcut techniques for mental ability to improve speed and accuracy
2	Improve logical thinking to solve various questions and puzzles in reasoning
3	Excellent communication, time management and problem solving
4	Approach oriented training and interactive methodology
5	Create amicable relationships to meet professional objectives
6	To give better idea on different topics to increase the competency of the students in the subject

UNIT	Description	Hours
I	Introduction, Training Objective Advantage of learning Aptitude, Importance of Learning Aptitude, how to crack Aptitude Vedic mathematics, squaring, cubing, one to one method, two to one method Shortcuts, Basic Mathematics, Square root method, Multiplication method	3
II	Number system, prime number concept, linear equations, age problems, HCF and LCM, Factorial Concept, Last Digit Concept, Remainders Concept, approximation and simplifications, inequalities Square root and Cube root, Coding and Decoding- mirror image	6



III	Percentage-percent to decimal fraction conversion, percentage to quantity, inverse case, percentage change, relative percentage, product constancy, problems based on population, results on depreciation, Ratio and proportion, Inverse Proportion, blood relation & family tree, Time speed and distance, relative speed and conversions, train problems, Direction Problems, Downstream and Upstream, direction sense.	8
IV	Verbal analogies, Spotting errors, Antonyms, Synonyms, Spellings, Ordering of words, Sentence improvement, Closet test, one-word substitution	6
V	Introduction, Soft Skills, Communication Skills, LSRW, Team Building and Leadership Building Skill Training, stress management, Behavioral management	5

Course Outcomes:

Course outcome	Descriptions
CO1	Understand the basic concepts of quantitative ability, logical reasoning, verbal reasoning and also soft skills
CO2	Inclusive and engaging environment for a dynamic campus community
CO3	Proficient use of qualitative and quantitative methods in problem solving
CO4	Critical and analytical thinking across a range of discipline

Reference Books:

1. Arun Sharma – Quantitative aptitude for CAT
2. R.S.Aggarwal- Quantitative aptitude for competitive examinations
3. Arihant publications- Fast Track objective Arithmetic
4. R.D.Sharma- mathematics class 11th and 12th
5. SarveshK.Verma- Quantitative Aptitude quantum CAT
6. R.S.Aggarwal-s chand publications -Verbal and non-verbal reasoning
7. The power of soft skills- Robert A. Johnson
8. The 7 habits of highly effective people- Stephen R. Covey



DEPARTMENT OF MECHANICAL ENGINEERING
SCHEME OF TEACHING AND EXAMINATION
Choice Based Credit System (CBCS) (Effective from the academic year 2020-21)
IV SEMESTER

IV Semester B.E. Mechanical Engineering / Industrial Engineering Management						
Sl. No.	Course Code		Course Title	Teaching Dept.	Board of Exam.	Credits
1.	BS	MA4ME1	Engineering Mathematics-IV*	MA	MA	3
2.	PC	ME4TH2	Fluid mechanics	ME	ME	3
3.	PC	ME4TH3	Kinematics of Machines	ME	ME	3
4.	PC	ME4TH4	Mechanics of Materials	ME	ME	3
5.	PC	ME4TH5	Machine Tools & Machining Process	ME	ME	3
6.	PC	ME4TH6	Material Science and Metallurgy	ME	ME	3
7.	PC	ME4LB1	Manufacturing Process Lab	ME	ME	1.5
8.	PC	ME4LB2	Material Testing & Metallography Lab	ME	ME	1.5
9.	PC	ME4LB3	Production Technology Lab	ME	ME	1.5
10.	HS	SK4DP2	Skill Development – II*	HS	HS	1
TOTAL						23.5
CIE-Continuous Internal Evaluation, SEE-Semester End Examination						

- **MA4TH1: Engineering Mathematics is not common for all the branches (syllabus is based on department request)**
- **There is no SEE for Skill Development -I Course, however all the Students Should maintain minimum 85% of attendance and 40% of CIE to get pass in the subject.**



Department: **MECHANICAL ENGINEERING**

Semester: **IV**

Subject Name: PROBABILITY AND CALCULUS OF VARIATIONS

Subject Code: **MA4ME1**

L-T-P-C: 4-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	Apply least square method to fit a curve for the given data and evaluate the correlation coefficient and regression lines for the data.
2.	To develop probability distribution and joint probability distribution of discrete and continuous random variables.
3.	Determine continuity/differentiability/analyticity of a function and evaluate a contour integral using Cauchy's integral formula.
4.	Compute extreme values of variational problems like geodesics, least time and shortest path.

UNIT	Description	Hours
I	Statistics: Correlation and regression- Karl Pearson's coefficient of Correlation, problems. Regression analysis- lines of regression (without proof) problems. Curve Fitting: Curve fitting by the method of least square- Fitting of the curves: Linear, polynomial, exponential function of the form $y=ab^x$.	9
II	Probability Distributions: Review of basic probability theory. Random variables (Discrete and Continuous), Probability of mass/density functions. Binomial distribution, Poisson's distribution, exponential distribution and Normal distribution (without derivations) and problems.	9
III	Joint probability distribution: Joint probability distribution for two discrete random variables, Marginal distributions, Expectation, Co-variance, Correlation coefficient. Calculus of Variations: Functional, Euler's Equation (Without derivations) standard variation problems, Minimal surface of revolution, Hanging chain problem, Brachistochrone problem.	9
IV	Calculus of Complex functions: Review of function of a complex variables, limits, continuity, and differentiability. Analytic functions, Cauchy-Riemann equations in Cartesian and polar forms (without proof). Construction of analytic functions by Milne-Thompson Method-problems. Bilinear Transformations.	9
V	Special functions: Series solution of ODE by power series method and Frobenius method, Series solution of Bessel's differential equation leading to Bessel's function of first kind, Series solution of Legendre's differential equation leading to Legendre's function, Legendre's polynomial-problems.	9

Department: **MECHANICAL ENGINEERING**



Course Outcomes:

Course Outcomes	Descriptions
CO-01	Make use of correlation and regression analysis to fit a suitable mathematical model for the statistical data.
CO-02	Apply discrete and continuous probability distributions for one and two variables in analyzing the probability models arising in engineering field.
CO-03	Determine Extremal of the functional and solution of special functions arising in dynamic of rigid bodies and vibrational analysis.
CO-04	Use the concept of complex variables and Series solutions in engineering field.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1.	Higher Engineering Mathematics	B.S.Grewal	43 rd Edition Khanna Publications,2015. ISBN:9788174091956
2.	Advanced Engineering Mathematics	E.Kreyszig	10 th Edition JonWiley&Sons,2015. ISBN:9780470913611

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1.	A text book of Engineering Mathematics	N.P.Bali and Manish Goyal	7 th Edition Lakshmi Publishers,2010. ISBN:9788131808030
2.	Higher Engineering Mathematics	B.V.Ramana	1st Edition, Tata McGraw-Hill, 2006.ISBN:9780070634190
3.	Higher Engineering Mathematics	H.K.Das and Er. Rajnish Verma	1 st Edition, Chand publishing, 2011. ISBN:9788121938907
4.	A First Course in Probability	S. Ross	8 th Edition, Pearson,2010, ISBN:9780136033134
5.	An Introduction to Probability Theory and its Applications	W. Feller	3 rd Edition, JohnWiley&Sons, Inc,2008, ISBN9788126518050



Department: **MECHANICAL ENGINEERING**

Semester: **IV**

Subject Name: FLUID MECHANICS

Subject Code: **ME4TH2**

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	Know the knowledge of fluid, its properties, and behavior under various conditions of internal and external flows.
2.	Understand principles of pressure, hydrostatic law, principle of buoyancy and stability of a floating body.
3.	Understand Fluid Dynamics and estimate the associated pressure variations in moving fluids using Euler's and Bernoulli's equations.
4.	Inculcate the importance of fluid flow measurement; determine the losses in a flow system and its applications in Industries.

UNIT	Description	Hours
I	Properties of Fluids: Introduction, basic properties of fluids like Density, Specific weight, Specific volume, Specific gravity, Viscosity, Kinematic viscosity, Newton's law of viscosity, Variation of viscosity with temperature, Classification of fluids, Surface tension and capillarity, Vapour pressure and cavitation. Numerical problems.	9
II	Fluid Statics: Pressure and Measurement: Fluid pressure at a point, Pascal's law, pressure variation in a static fluid, Absolute, gauge, atmospheric and vacuum pressures, simple manometers, differential manometers and inverted manometers, Numerical problems.	9
III	Hydrostatics: Total pressure and center of pressure on vertical plane surface submerged in liquid and inclined plane surface submerged in liquid, Numerical problems. Buoyancy: Buoyancy, Archimedes Principle, center of buoyancy, metacenter and metacentric height, conditions of equilibrium of floating bodies, determination of Metacentric height experimentally and theoretically, Numerical problems	9
IV	Fluid Dynamics: Introduction, equations of motion, Euler's equation of motion Bernoulli's equation from Euler's equation, Numerical examples. Fluid flow measurements: Introduction, Concept of fluid flow measurement, Principle and derivation of expression for discharge through - venturi meter, orificemeter, Pitot tube, rectangular and triangular notches, Numerical problems	9



V	Flow through pipes: Frictional loss in pipe flow, Darcy Equation for loss of head due to friction in pipes, Chezy's equation for loss of head due to friction in pipes, Hydraulic gradient and total energy line. Minor losses in the pipe, Numerical problems	9
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Course Outcomes:

Course Outcomes	Descriptions
CO-01	Define and Describe the properties of fluids for fluid flow applications (L1, L5)
CO-02	Explain the principles of pressure, buoyancy, floatation and solve the forces on submerged and floating bodies. (L2, L5)
CO-03	Describe and apply the knowledge of fluid statics and dynamics for a fluid flow (L3)
CO-04	Estimate the discharge of the fluid flow and Analyzing the fluid flow losses in the pipe. (L3, L4, L5)

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1.	Fluid Mechanics	Dr. Bansal.R.K,	Lakshmi Publications, 2006.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1.	Fluid Mechanics, Fundamental & Applications,	Yunus A Cengel, John M Cimbala,	Tata McGraw Hill, 2006.
2.	Fluid Mechanics	John F.Douglas, Janul and M.Gasiosek and john A. Swaffield,	Pearson Education Asia, 5th ed., 2006
3.	Fluid Mechanics and Fluid Power Engineering,	Kumar.D.S.	Kataria and Sons., 2004.



Department: **MECHANICAL ENGINEERING**

Semester: **IV**

Subject Name: KINEMATICS OF MACHINES

Subject Code: **ME4TH3**

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	To understand the concept of machines, mechanisms and related terminologies.
2.	To expose the students to various mechanisms and motion transmission elements used in mechanical engineering.
3.	To analyze mechanisms for displacement, velocity and acceleration at any point in a moving link.
4.	To understand the theory of cams, gears and gear trains.

UNIT	Description	Hours
I	Introduction: Definitions Link or element, kinematic pairs, Degrees of freedom, Grubler's criterion (without derivation), Kinematic chain, Mechanism, Structure, Mobility of Mechanism, Inversion, Machine. Kinematic Chains and Inversions: Inversions of Four bar chain; Single slider crank chain and Double slider crank chain.	9
II	Mechanisms: Quick return motion mechanisms-Drag link mechanism, Whitworth mechanism and Crank and slotted lever Mechanism. Straight line motion mechanisms Peaucellier's mechanism and Robert's mechanism. Intermittent Motion mechanisms -Geneva wheel mechanism and Ratchet and Pawl mechanism. Toggle mechanism, Pantograph, Ackerman steering gear mechanism.	9
III	Velocity and Acceleration Analysis of Mechanisms (Graphical Methods): Velocity and acceleration analysis of Four Bar mechanism, slider crank mechanism and Simple Mechanisms by vector polygons: Relative velocity and acceleration of particles .in a common link, relative velocity and accelerations of coincident Particles on separate links- Coriolis component of acceleration. Angular velocity and angular acceleration of links, velocity of rubbing. Velocity Analysis by Instantaneous Center Method: Definition, Kennedy s Theorem, Determination of linear and angular velocity using instantaneous center method Klein s Construction: Analysis of velocity and acceleration of single slider crank mechanism.	9



IV	Spur Gears: Gear terminology, law of gearing, Characteristics of involute action, Path of contact, Arc of contact, Contact ratio of spur, helical, bevel and worm gears, Interference in involute gears. Methods of avoiding interference, Back lash. Comparison of involute and cycloidal teeth. Profile Modification. Gear Trains: Simple gear trains, Compound gear trains for large speed reduction, Epicyclic gear trains, Algebraic and tabular methods of finding velocity ratio of epicyclic gear trains. Tooth load and torque calculations in epicyclic gear trains.	9
V	Cams: Types of cams, Types of followers. Displacement, Velocity and, Acceleration time curves for cam profiles. Disc cam with reciprocating follower having knife-edge, roller and flat face follower, Disc cam with oscillating roller follower. Follower motions including SHM, Uniform velocity, uniform acceleration and retardation and Cycloidal motion.	9

Course Outcomes:

Course Outcomes	Descriptions
CO-01	Define and explain the terminology associated with kinematic pairs, kinematic chain, kinematic mechanisms, velocity, and acceleration analysis of mechanisms (graphical methods and analytical methods), velocity and acceleration by instantaneous center method, klein's construction, spur gears, gear trains and cams.
CO-02	Understand and explain the essential principles of kinematic pairs, kinematic chain, kinematic mechanisms, velocity and acceleration analysis of mechanisms (graphical methods and analytical methods), velocity and acceleration by instantaneous center method, klein's construction, spur gears, gear trains and cams.
CO-03	Apply the concepts related to kinematic pairs, kinematic chain , kinematic mechanisms, velocity and acceleration analysis of mechanisms (graphical methods and analytical methods), velocity and acceleration by instantaneous center method, klein's construction ,spur gears, gear trains and cams. And determine the solutions required.
CO-04	Analyze the velocity and acceleration analysis of mechanisms (graphical methods and analytical methods), velocity and acceleration by instantaneous center method, klein's construction, spur gears, gear trains and cams.



Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1.	Theory of Machines	Sadhu Singh	Pearson Education Pvt.Ltd., 3rd edition-2019.
2.	Mechanism and Machine Theory	G. Ambekar	PHI ,2009.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1.	Theory of Machines	Rattan S S	Tata McGraw- Hill Publishing, 3rd edition-2014.
2.	Theory of Machines	R S Khurmi	S Chand and Company, New Delhi.

Department: **MECHANICAL ENGINEERING**

Semester: **IV**

Subject Name: MECHANICS OF MATERIALS

Subject Code: **ME4TH4**

L-T-P-C: 3-0-0-3

Course Objectives:

SI. No.	Course Objectives
1.	To prepare the students understand the basic concepts of theory of stress, strain, deflections and principal stresses, and strains.
2.	Study & analyze beams under various loading conditions.
3.	Analyze the stress distribution in the shafts of circular section subjected to torsion
4.	Analyze and study stress distribution in thick and thin cylinders subjected to internal pressures

UNIT	Description	Hours
I	Simple Stress and Strain: Introduction, Properties of Materials, stress, strain, Hook's law, Poisson's Ratio, Stress-Strain diagram for ferrous and non-ferrous materials, Principles of super position, total elongation of tapering bars of circular and rectangular cross sections. Elongation due to self-weight. Volumetric strain: expression for volumetric strain, elastic constants, relationship among Elastic constants, thermal stresses including compound bars.	9

Department: **MECHANICAL ENGINEERING**



II	Bending moment and shear force in beams: Introduction, types of beam loading and supports, shearing force in beams, bending moment, sign convention, relationship between loading shear force and bending moment, SFD, BMD for cantilever beams, simply supported beams and overhanging beams considering point loads, UDL, UVL, Couple.	9
III	Bending stress and shear stress in beams: Introduction, Bending stress in beams, assumptions in simple bending theory and pure bending, modulus of rupture, section modulus, flexural rigidity, beam of uniform strength, expression for horizontal shear stress in beams, shear stress diagram for rectangular, symmetrical I and T section.(fletched beams not included) Principal stresses and strains: Principal planes, principal stresses and strains, biaxial state of stress combined with shear, concept of Mohr's circle diagram.	9
IV	Deflection of beams: Derivation of the relations between curvature, slope, deflection and moment. Assumptions, methods of determining slope and deflections. Determination of deflection of a simply supported beam subjected to concentrated load at centre, subjected to UDL, cantilever beam subjected to point load at free end, and also UDL. Elastic stability of columns: Introduction, effective length, slenderness ratio, short and long columns, radius of gyration, buckling load, assumptions derivations of Euler's theory, Rankine's formula.	9
V	Torsion of circular shafts: Introduction, pure torsion equations of circular shafts, strength and stiffness, Torsional rigidity, torsional flexibility, polar modulus, power transmitted by solid and hollow circular sections. Thin and Thick cylinders: Thin and thick cylinders subjected to pressure, change in length, diameter, volume, Lamé's equation (compound cylinders not included).	9

Course Outcomes:

Course Outcomes	Descriptions
CO-01	Understand the concepts of stresses, strains and deflections, principal stresses and strains.
CO-02	Analyze Beams under various loading and support conditions.



CO-03	Analyze the stress distribution in the shaft of circular cross section, strength deflection and rigidity criteria.
CO-04	Understand the Analysis of thick and thin cylinders subjected to internal pressure and theory of torsion.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1.	Strength of Materials	R K Bansal,	Laksmi Publications, New Delhi.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1.	Strength of Materials,	S.S. Bhavikatti,	Vikas Publications Pvt. Ltd., New delhi
2.	Strength of Materials,	B.C. Punmia, Ashok Jain	Lakshmi Publications.
3.	Strength of materials,	Timoshenko and Young,	East west press.
4.	Strength of materials,	Ramamrutham,	Dhanpath Rai publishers, New Delhi

Department: MECHANICAL ENGINEERING

Semester: IV

Subject Name: MACHINE TOOLS & MACHINING PROCESS

Subject Code:ME4TH5

L-T-P-C: 3-0-0-3

Course Objectives:

SI. No.	Course Objectives
1.	To develop fundamental knowledge on metal cutting parameters tool materials, cutting fluids and tool wear mechanisms.
2.	To understand the fundamentals of machining processes and machine tools.
3.	To apply knowledge of basic mathematics to calculate the machining parameters for different machining processes.
4.	To understand the principles of non-traditional machining process.



UNIT	Description	Hours
I	<p>Theory of Metal Cutting: Single point cutting tool nomenclature, tool geometry, Chip formation, Orthogonal and Oblique cutting, Merchants circle diagram and analysis, Shear angle relationship(only formula), tool wear , tool failure, tool life-effects of cutting parameters on tool life, tool failure criteria, Taylor's tool life equation, numerical.</p> <p>Cutting tool materials: Properties, types of cutting tool materials – HSS, coated carbide tools, carbide tools, ceramics, CBN,</p> <p>Cutting fluids: properties, types and selection of cutting fluids</p> <p>Heat generation in metal cutting: Factors affecting heat generation, heat affected zones.</p>	9
II	<p>Lathe: Classification of lathe, constructional features of capstan and turret lathe, lathe operations, tool layout, tool and work holding devices, machining time calculation.</p> <p>Drilling Machines: Classification of drilling machines, constructional features of Bench drilling and Radial drilling machine, tool and work holding devices, types of drill bits, nomenclature of twist drill, machining time calculation.</p>	9
III	<p>Shaping and Planing Machines: Classification, constructional features of horizontal shaper, constructional features of double house planner, Operations, tool and work holding devices, machining time calculations,</p> <p>Broaching Machines: Classification, principle of broaching, nomenclature of broach, application of broaching machine.</p>	9
IV	<p>Milling Machines: Classification of milling machines. Constructional features of Column and knee milling machine, milling cutters- types. Cutter nomenclature. Milling operations, machining time calculation.</p> <p>Indexing: Indexing mechanism, Simple, Angular types of indexing, numerical.</p>	9
V	<p>Non-Traditional Machining Processes: Need for non-traditional machining, Principle and operation of Laser Beam, Plasma Arc Machining, Electro Chemical Machining, Ultrasonic Machining, Abrasive Jet Machining, Water Jet Machining, Electron Beam Machining, and Electron Discharge Machining.</p>	9



Course Outcomes

Course Outcomes	Descriptions
CO-01	Identify cutting tool geometry and understanding of metal cutting principles.
CO-02	Explain the basic working principles of machine tools.
CO-03	Analyze the process parameters of various machine tools.
CO-04	Explain the principle and operations of non-traditional machining process.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1.	Manufacturing Technology Metal cutting and Machine tools.	P.N. Rao,	Tata McGraw-Hill publications.

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1.	Workshop Technology	Hazra Choudhry	Vol-II, Media Promoters & Publishers Pvt Ltd,2004
2.	Production Technology.	R.K. Jain	Khanna Publications,2003
3.	Production Technology.	HMT	TATA McGraw Hill, 2001

Department: **MECHANICAL ENGINEERING**

Semester: **IV**

Subject Name: MATERIAL SCIENCE AND METALLURGY

Subject Code: **ME4TH6**

L-T-P-C: 3-0-0-3

Course Objectives:

Sl. No.	Course Objectives
1.	To gain an understanding of the relationships between the structures, properties, processing and applications of various engineering materials.
2.	The foundation for understanding the various modes of failures in materials in mechanical engineering.
3.	To discuss the phase transformations in metals, microstructural and property change in iron carbon alloys.
4.	Acquire knowledge of composite materials and their processing methods used for various Engineering applications and other materials.

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UNIT	Description	Hours
I	<p>Crystal Structure: Introduction, structure of crystalline solids, fundamental concepts of crystal geometry, crystal structure of BCC, FCC, and HCP, coordination number, atomic packing factors, crystal imperfections, point defects, line defects and surface defects.</p> <p>Mechanical Behavior: Stress- strain diagrams to show ductile and behavior of materials, linear and non-linear elastic behavior and properties. Mechanical properties in plastic range yield strength, offset yield strength, ductility, ultimate tensile strength, and toughness and yield point phenomena. Plastic deformation of single crystal by slip, dislocation and twinning, deformation of polycrystalline metals.</p>	9
II	<p>Fracture, fatigue & creep: Introduction, Fracture, Types of fracture, Ductile & Brittle fracture, Ductile to Brittle transition, Fatigue, Types of fatigue loading with example, fatigue Text, S-N curve, factors affecting fatigue life, fatigue protection methods, Creep, creep Text, creep curve, Mechanism of creep, factors affecting creep, creep resistant materials.</p> <p>Solidification: Mechanism of solidification, Homogenous and Heterogeneous Nucleation, crystal growth. Cast metal structures.</p>	9
III	<p>Phase diagram: Solid solutions, Hume Rothery rules, substitution, and interstitial solid solutions, Gibbs phase rule, construction of equilibrium diagrams, equilibrium diagrams involving complete and partial solubility, lever rule. Numerical on phase diagrams.</p> <p>Iron Carbon system: Iron carbon equilibrium diagram description of phases, Solidification of steels and cast irons and invariant reactions.</p> <p>TTT Diagrams: TTT curves, continuous cooling curves, Effect of cooling rate on TTT diagram, effect of carbon and alloying elements on TTT diagram.</p>	9
IV	<p>Heat treatment of metals: Annealing and its types, Normalizing, Hardening, Tempering, Martempering, Austempering, Hardenability, surface hardening methods like Carburizing cyaniding, Nitriding flame hardening and induction hardening, age hardening of aluminum-copper alloys.</p> <p>Introduction to Composite Materials: Definition, Classification, Types of matrix materials and reinforcements, Characteristics & selection, Fiber composites, laminated composites, Particulate composites and sandwich construction.</p>	9
V	<p>Manufacturing of Composites: Lay-up and curing - open and closed mould processing, Hand lay-Up techniques, spray Lay-up</p>	9



process, Bag moulding and filament winding, Pultrusion, compression moulding, Injection moulding, stir casting, squeeze casting, Sheet Moulding compound (SMC) process, Resin Transfer Moulding. Ferrous and Non-ferrous materials: Properties, composition and uses of (a) Grey cast iron, malleable iron, Spheroidal graphite (S.G.) iron and steels - [AISI & B I S designation of steels], (b) Copper alloys Brasses and Bronzes. - Aluminum alloys- Al-Cu, Al- Si, Al-Zn alloy.	
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Course Outcomes:

Course Outcomes	Descriptions
CO-01	Understand the concepts of atomic configuration and crystalline structure of Engineering Materials, their inherent defects and their relationship with Mechanical behavior.
CO-02	Understand the concepts underlying the fracture, creep and fatigue stresses of materials
CO-03	Understand and apply the rules, governing the formation of solid solution, Phase diagram, Iron-Carbon Equilibrium, TTT diagrams etc.
CO-04	Understand the principles underlying various heat treatments processing for altering the crystal structure of metals and basics of composites materials and different manufacturing processes of composite materials and other materials.

Text Books:

Sl. No	Text Book title	Author	Volume and Year of Edition
1.	Materials science and metallurgy for engineers,	Dr. V.D. Kodigere,	Everest Publishing House, Pune, 38 th Edition, 2016.
2.	Material science and Engineering	William D. Callister,	Ed. 5, John wiley & sons, 2001

Reference Books:

Sl. No	Text Book title	Author	Volume and Year of Edition
1.	Foundations of Materials Science and Engineering	Smith	3rd Edition McGraw Hill, 1997.
2.	Structure and properties of Engineering materials	V.S.R Murthy	Tata McGraw Hill, 2003.
3.	An Introduction to Metallurgy	Alan Cottrell	University Press India, Oriental Longman Pvt. Ltd, 1974.



Department: **MECHANICAL ENGINEERING**

Semester: **IV**

Subject Name: MANUFACTURING PROCESS LAB

Subject Code: **ME4LB1**

L-T-P-C: 0-0-3-1.5

Sl. No.	Description
1.	Lathe Operation: Plain turning, Taper turning, Step turning, Thread cutting, Facing, Knurling.
2.	Milling Operation: Cutting of gear teeth using Milling machine.
3.	Shaping Operation: Cutting of V-groove/Dovetail/Rectangular groove using Shaping machine.

Scheme of Examination:

One question to be set from 1	:	30 Marks
One question to be set from 2,3	:	10 Marks
Viva-voce	:	10 Marks
TOTAL MARKS	:	50 Marks

Course Outcomes:

Course outcome	Descriptions
CO1	Identify and select the proper tools to prepare the models
CO2	Apply the techniques to use instruments/ equipment's to obtain the models
CO3	Demonstrate the procedure to prepare the accurate model with safety precautions
CO4	Develop the accurate model for the given dimension & maintain work area clean.

Department: **MECHANICAL ENGINEERING**

Semester: **IV**

Subject Name: MATERIAL TESTING & METALLOGRAPHY LAB

Subject Code: **ME4LB2**

L-T-P-C: 0-0-3-1.5

Sl. No.	Description
PART-A	
1.	Conduction of tensile, shear, compression and bending test of metallic and nonmetallic specimen using a universal testing machine.
2.	Conduction of Izode and Charpy test on mild steel specimen.
3.	Experiments on wear studies using ferrous, nonferrous & composite materials for different parameters.
4.	Brinell, Rockwell and Vicker's hardness test.
5.	Torsion test
6.	Fatigue test.

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PART-B	
1.	Preparation of specimen for metallographic examination of different engineering materials. Identification of the microstructure of plain carbon steel, tool steel, grey C.I., S.G iron, and brass, bronze & composite.
2.	Heat Treatment: Annealing, normalizing, hardening and tempering of steel. Hardness studies of heat-treated samples.
3.	Non-destructive test experiments. <ol style="list-style-type: none"> a. Ultrasonic flaw detector b. Magnetic crack detector c. Dye penetrant testing

Scheme of Examination:

One question to be set from PART A	:	20 Marks
One question to be set from PART B	:	20 Marks
Viva-voce	:	10 Marks
TOTAL MARKS	:	50 Marks

Course Outcomes:

Course outcome	Descriptions
CO1	Identify and select the equipment to conduct the experiments related to materials science and metallography lab.
CO2	Demonstrate the procedure for conduction of experiments.
CO3	Apply the techniques for data collection.
CO4	Analyze the data collected and interpret the results.

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Semester: **IV**

Subject Name: **PRODUCTION TECHNOLOGY LAB**

Subject Code: **ME4LB3**

L-T-P-C: **0-0-3-1.5**

Unit	Description	Hours
	<p style="text-align: center;">Part -A</p> <p>1. Foundry practice: Use of foundry tools and equipment's, preparation of sand mold using Hand Cutting, solid pattern models, split pattern models.</p> <p style="text-align: center;">Part-B</p> <p>1. GFN of foundry sand by Sieve Analysis 2. Tension test of Green sand Mold 3. Compression test of Green sand Mold 4. Shear test of Green sand Mold</p>	

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	<ol style="list-style-type: none">5. Permeability test on sand Mold6. Clay content test of foundry sand7. Static testing of Machine tools to check the concentricity, parallelism of the Lathe spindle, flatness of lathe bed etc.8. Lathe tool dynamometer to measure cutting forces during turning operation9. Drill tool dynamometer to measure drilling forces during drilling.	
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Question paper Pattern:

One Question from part A - 15 marks
One Question from part B - 25 marks
Viva-Voce -10 marks

Course Outcomes:

Course outcome	Descriptions
CO1	Identify and select the proper tools to prepare the models
CO2	Apply the techniques to use instruments/ equipment's to obtain the models for testing
CO3	Demonstrate the procedure to prepare the accurate model with safety precautions
CO4	Develop the accurate model for the given dimension & maintain work area clean.

Department: PLACEMENT AND TRAINING DEPT.

Semester: IV

Subject Name: SKILL DEVELOPMENT II

Subject Code:SK4DP2

L-T-P-C: 0-0-2-1

Course Objectives:

Sl. No.	Course Objectives
1.	Unique shortcut techniques for mental ability to improve speed and accuracy
2.	Improve logical thinking to solve various questions and puzzles in reasoning.
3.	Excellent communication, time management and problem solving
4.	Approach oriented training and interactive methodology.
5.	Create amicable relationships to meet professional objectives
6.	To give better idea on different topics to increase the competency of the students in the subject.



UNIT	Description	Hours
I	Time and Work, Chain Rule, pipes and cisterns, work and wages, Number series-perfect square series, perfect cube series, geometric series, two stage type series, mixed series, missing number series, order and ranking, square roots and cube roots, Data interpretation- bar graph, line graph, tabular form, caselet form, radar/web, piechart, missing data.	04
II	Simple Interest and Compound Interest , Puzzles, brain teasers, data sufficiency, Mixtures and allegation, statement course and action, statement course and effect ,clocks and calendars	04
III	Permutation and Combination, Probability, Mathematical reasoning, logical reasoning, visual sequence, set theory, Venn diagrams, seating arrangements ,cubes and dice, alphabet test, analogy classification	06
IV	Change voice, Paragraph Formation, Reading Compression, Idioms and phrases, Ordering sentence, Completing sentence, Selecting words, Change of speech.	08
V	Extempore, Accent Training, Business Communication Skills, Articulation Skills, Presentation Skills, Business Writing Skills, Resume building, Group Discussion.	06

Question paper Pattern:

The question paper will have 50 questions. Each question carrying one marks.

Course Outcomes:

Course Outcomes	Descriptions
CO-01	Understand the basic concepts of quantitative ability, logical reasoning, verbal reasoning and also soft skills.
CO-02	Inclusive and engaging environment for a dynamic campus community
CO-03	Proficient use of qualitative and quantitative methods in problem solving
CO-04	Critical and analytical thinking across a range of discipline.

Text Books

Sl No	Text Book title	Author	Volume and Year of Edition
1.	Quantitative aptitude for cat	Arun Sharma	
2.	Quantitative aptitude for competitive examinations	R.S.Aggarwal	



Reference Books

SI No	Text Book title	Author	Volume and Year of Edition
1.	Fast Track objective Arithmetic	Arihant publications	
2.	Quantitative Aptitude quantum cat	Sarvesh K.Verma	
3.	Verbal and nonverbal reasoning	R.S. Aggarwal	s chand publications
4.	The power of soft skills	Robert A. Johnson	