GLOBAL INSTITUTE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)
COURSE CATALOGUE
REGULATIONS B.TECH – GR - 24
MECHANICAL ENGINEERING
III 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										
ME501PC	Dynamics of Machinery	PCC	CORE	3	0	0	3	40	60	100
ME502PC	Design of Machine Elements	PCC	CORE	3	0	0	3	40	60	100
ME503PC	Metrology & Machine Tools	PCC	CORE	3	0	0	3	40	60	100
SM504MS	Business Economics & Financial Analysis	HSMC	Foundation	3	0	0	3	40	60	100
ME505PC	Steam Power & Jet Propulsion	PCC	CORE	3	0	0	3	40	60	100
ME506PC	CAD/CAM	PCC	CORE	2	0	0	2	40	60	100
PRACTICAL										
ME507PC	Thermal Engineering Laboratory	PCC	CORE	0	0	2	1	40	60	100
ME508PC	Metrology & Machine Tools Laboratory	PCC	CORE	0	0	2	1	40	60	100
ME509PC	Kinematics & Dynamics Laboratory	PCC	CORE	0	0	2	1	40	60	100
			Total Credits	**17**	**0**	**6**	**20**			

COURSE CONTENT

DYNAMICS OF MACHINERY								
III Year - I Semester: ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
ME501PC	**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: Kinematics of Machinery								

1. COURSE OVERVIEW

Dynamics of Machinery explores the principles of motion, forces, and stability in mechanical systems. Students learn gyroscopic effects, static and dynamic force analysis, turning moment diagrams, flywheel design, friction and clutches, braking systems, governors, balancing of engines, and vibration analysis. The course blends analytical and graphical methods to prepare students for designing and evaluating machines under dynamic operating conditions.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To study the inertia forces, torques and energy involved in different machine members.
2) To learn the theory involved in the analysis of clutches, brakes, dynamometers, governors, and flywheels.
3) To understand the balancing of reciprocating and rotary parts.
4) To be aware of situations like speed fluctuations, rotor imbalance and machine vibrations in industries.
5) To understand the importance of resonance and critical speed.

3. COURSE OUTCOMES

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

CO 1	Analyse the effect of a gyroscope on ships, aeroplanes, and automobile
CO 2	Explain the inertia forces in the working of important machine elements like flywheels, connecting rod etc.
CO 3	Understand the types of brakes and the role of friction
CO 4	Understand the working of governors and estimate the unbalanced forces in a multi-cylinder reciprocating engine.
CO 5	Estimate the longitudinal, transverse and torsional vibrations so as to avoid resonance.

Note: Design Data books are not permitted in the Examinations. The design must not only satisfy strength criteria but also rigidity criteria.

4. COURSE CONTENT

UNIT – I:

Precession: Gyroscopes – effect of precession – motion on the stability of moving vehicles such as motorcycle – motorcar – aeroplanes and ships.

Static and Dynamic Force Analysis: Static force analysis of planar mechanisms – Analytical Method – Dynamic Force Analysis – D'Alembert's principle, Dynamic Analysis of 4-link mechanism, Slider Crank Mechanism.

UNIT – II:

Turning Moment Diagram and Flywheels: Engine Force Analysis – Piston Effort, Crank Effort, etc., Inertia Force in Reciprocating Engine – Graphical Method - Turning moment diagram –fluctuation of energy

– flywheels and their design - Inertia of connecting rod- inertia force in reciprocating engines – crank effort and torque diagrams.

UNIT – III:

Friction: pivots and collars – uniform pressure, uniform wear – friction circle and friction axis: lubricated surfaces – boundary friction – film lubrication. Clutches – Types – Single plate, multi-plate and cone clutches.
Brakes and Dynamometers: Types of brakes: Simple block brake, band and block brake- internal expanding shoe brake-effect of braking of a vehicle. Dynamometers – absorption and transmission types. General description and methods of operation.

UNIT – IV:

Governors: Types of governors - Watt, Porter and Proell governors. Spring loaded governors – Hartnell and Hartung with auxiliary springs. Sensitiveness, isochronisms and hunting – stability – effort and power of the governors.

Balancing: Balancing of rotating masses- Primary, Secondary, and higher balancing of reciprocating masses. Analytical and graphical methods. Unbalanced forces and couples. Examination of "V" and multi cylinder in-line and radial engines for primary and secondary balancing- locomotive balancing – Hammer blow – Swaying couple – variation of tractive effort.

UNIT – V:

Vibrations: Free Vibration of mass attached to vertical spring- Damped free vibrations– Transverse loads – vibrations of beams with concentrated and distributed loads. Dunkerly's method – Raleigh's method. Whirling of shafts – critical speed – torsional vibrations – one, two and three rotor systems.

5. TEXT BOOKS

1) Theory of Machines, S. S. Rattan, Mc Graw Hill, 2017.
2) Theory of Machines /Sadhu Singh/ Pearson.

6. REFERENCE BOOKS

1) Theory of Machines and Mechanisms, Joseph E. Shigley, Fifth Edition, Oxford University Press
2) Mechanism and Machine Theory, Rao, J.S & R.V. Duggipati, New Age
3) Bansal R.K, Brar J.S, Theory of Machines, Lakshmi Publications (P) Ltd, 2016 Edition.

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**	**2**	**2**	**2**				**1**	**1**		**2**	**3**	**1**
CO 2	**3**	**3**	**3**	**3**	**2**				**1**	**1**		**2**	**3**	**2**
CO 3	**3**	**3**	**3**	**2**	**2**				**1**	**1**		**2**	**3**	**3**
CO 4	**3**	**3**	**3**	**2**	**2**				**1**	**1**		**2**	**3**	**2**
CO 5	**3**	**3**	**3**	**2**	**3**				**1**	**1**		**2**	**3**	**3**

COURSE CONTENT

DESIGN OF MACHINE ELEMENTS								
III Year - I Semester: ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
ME502PC	**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, mechanics of solids, manufacturing processes, metallurgy and material science.								

1. COURSE OVERVIEW

This course provides a comprehensive foundation in machine design, guiding students through material selection, tolerances, and static strength analysis. It emphasizes fatigue design principles to ensure durability under fluctuating stresses, while also developing practical skills in designing riveted, welded, and bolted joints. Learners explore keys, cotters, and knuckle joints for secure load transmission, and advance to the design of shafts, seals, and couplings in compliance with BIS codes. By integrating theory with application, the course prepares students to design reliable, industry-ready mechanical systems.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To develop understanding of engineering material properties, tolerances, fits, and BIS codes, and apply them in designing components for static strength and rigidity.
2) To gain knowledge of fatigue phenomena, stress concentration, and endurance limits, and learn to design machine elements under fluctuating stresses using fatigue criteria.
3) To acquire skills to design riveted, welded, and bolted joints under different loading conditions, ensuring strength, efficiency, and reliability of mechanical connections.
4) To understand the design principles of keys, cotters, and knuckle joints, and analyse stresses to ensure safe and effective load transmission.
5) To learn to design shafts, gaskets, seals, and couplings for strength, rigidity, and compliance with BIS codes to achieve reliable power transmission.

3. COURSE OUTCOMES

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

CO 1	Apply material properties, tolerances, fits, and BIS codes to design components for static strength, rigidity, and stiffness under various loads.
CO 2	Evaluate stress concentration, notch sensitivity, and fluctuating stresses; design elements for fatigue strength using endurance limits and fatigue criteria.
CO 3	Design riveted, welded, and bolted joints under axial, bending, torsional, and eccentric loads, ensuring strength, efficiency, and reliability.
CO 4	Design keys, cotters, and knuckle joints to transmit loads effectively and analyse stresses for safe mechanical connections.
CO 5	Design shafts, gaskets, seals, and couplings for strength, rigidity, and compliance with BIS codes to ensure reliable power transmission.

Note: Design Data books are not permitted in the Examinations. The design must not only satisfy strength criteria but also rigidity criteria.

4. COURSE CONTENT

UNIT-I:

Introduction: General considerations in the design of Engineering Materials and their properties, Selection, Manufacturing consideration in design. Tolerances and fits, BIS codes of steels.

Design for Static Strength: Simple stresses, Combined stresses, Torsional and Bending stresses, Impact stresses, Stress - strain relationship, Theories of failure, Factor of safety, Design for strength and rigidity, Preferred numbers. The concept of stiffness in tension, Bending, Torsion and combined situations.

UNIT-II:

Design for Fatigue Strength: Stress concentration, Theoretical stress Concentration factor–Fatigue stress concentration factor, Notch Sensitivity, Design for fluctuating stresses, Endurance limit, Estimation of Endurance strength, Gerber's curve, Goodman's line, Soderberg's line.

UNIT-III:

Riveted, Welded and Bolted Joints: Riveted joints: Methods of failure of riveted joints, Strength equations, Efficiency of riveted joints, eccentrically loaded riveted joints.

Welded Joints: Design of fillet welds, axial loads, Circular fillet welds under bending, Torsion. Welded joints under eccentric loading.

Bolted joints: Design of bolts with pre-stresses, Design of joints under eccentric loading – locking devices, bolts of uniform strength.

UNIT – IV:

Keys, Cotters and Knuckle Joints: Design of keys, Stresses in keys, Cotter joints, Spigot and Socket, Sleeve and Cotter, Gib and Cotter joints, Knuckle joints.

UNIT – V:

Shafts: Design of solid and hollow shafts for strength and rigidity, Design of shafts for combined bending and axial loads, Shaft sizes, BIS code. Gaskets and seals (stationary and rotary).

Shaft Couplings: Rigid couplings: Muff, Split muff and Flange couplings. Flexible couplings: Flange coupling (Modified).

5. TEXT BOOKS

1) Design of Machine Elements, V.B. Bhandari, McGraw-Hill, 5th Edition, 2010.
2) Machine Design, Jindal, Pearson, 1st Edition, 2010.

6. REFERENCE BOOKS

1) Design of Machine Elements, V. M. Faires, Macmillan.
2) Design of Machine Elements - I, M.H Annaiah, New Age International Publishers.

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**	**2**	**2**	**2**	**1**					**1**	**2**	**3**	**1**
CO 2	**3**	**3**	**3**	**2**	**2**	**1**	**1**				**1**	**2**	**3**	**2**
CO 3	**3**	**3**	**3**	**2**	**2**	**2**					**1**	**2**	**3**	**3**
CO 4	**3**	**2**	**3**	**2**	**2**	**1**					**1**	**2**	**2**	**2**
CO 5	**3**	**3**	**3**	**2**	**2**	**2**	**2**				**3**	**2**	**3**	**3**

COURSE CONTENT

METROLOGY & MACHINE TOOLS								
III Year - I Semester: ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
ME503PC	**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:								

1. COURSE OVERVIEW

This course introduces the fundamentals of metal cutting mechanics, machine tool operations, and precision metrology. Students gain practical knowledge of lathes, drilling, milling, grinding, and advanced finishing processes, alongside measurement techniques, limits & fits, surface roughness evaluation, and CMM applications.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To impart the fundamental aspects of the metal cutting principles and their application in studying the behaviour of various machining processes.
2) To train in knowing the fundamental parts of various machine tools and their kinematic schemes.
3) To improve problem solving skills by determining the machining time of various machining processes.
4) To provide technical understanding of basic concepts of engineering metrology and its practice in the industry.
5) To make the student to improve applications aspect in the measurements and control of a process in manufacturing.

3. COURSE OUTCOMES

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

CO 1	Explain the principles of metal cutting and working of lathe machine tools.
CO 2	Understand working of drilling, boring, shaping, slotting, planning machine tools and estimation of machining time.
CO 3	Describe the principles of working and operations performed on milling and grinding machines
CO 4	Explain the use of various measuring instruments, gauges and system of limits, fits and tolerances.
CO 5	Describe the process of measuring the surface roughness, screw thread parameters & principles of coordinate measuring machines.

4. COURSE CONTENT

UNIT – I:

Metal cutting: Introduction, elements of cutting process – Geometry of single point tool, Chip formation and types of chips, tool materials, tool life, tool wear, cutting fluids, Analysis of orthogonal cutting- Merchant's force diagram, Machinability.

Engine lathe – Principle of working, types of lathes, specifications, operations on lathe, Taper turning methods, Lathe attachments. Capstan and Turret lathe – Single spindle and multi-spindle automatic lathes – tool layouts.

UNIT – II:

Drilling and Boring Machines – Geometry of twist drill, Principles of working, specifications, types, operations performed, machining time calculations, Types of Boring machines and applications.

Shaping, slotting and planing machines –Principles of working, specifications, types of operations performed, applications, quick return mechanisms, machining time calculations.

UNIT – III:

Milling machines – Principles of working – Types of milling machines – Geometry of milling cutters methods of indexing. Grinding – theory of grinding – classification of grinding machines. Types of abrasives, bonds. Selection of a grinding wheel. Lapping, honing and broaching machines, comparison and Constructional features, machining time calculations.

UNIT – IV:

Introduction to Metrology: Need, Types, Terminology, Methods of measurements, Selection of measuring Instruments Linear Measurement: Line and end standard, slip gauges, micro meters, spirit level.

Limits, fits and tolerances- Types of Fits - Unilateral and bilateral tolerance system, hole and shaft basis system. Interchangeability and selective assembly.

Limit Gauges: Taylor's principle, Design of GO and NO-GO gauges.

Measurement of angles using Bevel protractor and Sine bar. Measurement of flatness using straight edges, surface plates, optical flat and auto collimator.

UNIT – V:

Surface Roughness Measurement: Factors affecting the surface roughness, reasons for controlling the surface texture, elements of surface texture-Roughness, Waviness, evaluation of surface roughness-CLA, RMS, Rz Values. Methods of measurement of surface finish, Talysurf. Screw thread measurement, Gear measurement; Machine Tool Alignment Tests on lathe, milling and drilling machines. Coordinate Measuring Machines: Types and Applications of CMM.

5. TEXT BOOKS

1) Machine Tool Practices/ Kibbe, Johne. Neely, T. White, Rolando O. Meyer/ Pearson
2) Engineering Metrology/ R.K. Jain/ Khanna Publishers.

6. REFERENCE BOOKS

1) Gupta I.C., Engineering Metrology, Dhanpat Rai Publications (P) Ltd, 2021 Edition.
2) Principles of Machine Tools, Bhattacharyya A and Sen.G.C / New Central Book Agency.
3) Fundamentals of Dimensional Metrology / Connie Dotson / Thomson.
4) Fundamentals of Metal Machining and Machine Tools / Geoffrey Boothroyd / McGraw Hill
5) Principles of Engineering Metrology/ Rega Rajendra/ Jaico Publishers.
6) Metrology and Measurement/ Bewoor & Kulkarni/ Tata Mc Graw Hill.

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**	**2**					**1**		**2**	**3**	**2**
CO 2	**3**	**2**	**2**	**2**	**3**				**1**	**2**		**2**	**3**	**2**
CO 3	**3**	**2**	**2**	**2**	**3**				**1**	**2**		**2**	**3**	**3**
CO 4	**3**	**2**		**3**	**3**					**2**		**2**	**3**	**2**
CO 5	**3**	**2**		**3**	**3**					**2**		**3**	**3**	**3**

COURSE CONTENT

BUSINESS ECONOMICS & FINANCIAL ANALYSIS								
III Year - I Semester: ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
SM504MS	**Foundation**	**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: Nil								

1. COURSE OVERVIEW

This course introduces the fundamentals of **business, economics, and financial accounting**, focusing on business structures, demand and supply analysis, production and cost functions, market structures, and pricing strategies. It also covers accounting principles, preparation of financial statements, and ratio analysis, enabling students to apply economic and accounting tools for effective business decision-making.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To learn the basic business types, impact of the economy on Business and Firms specifically.
2) To analyze the Business from the Financial Perspective.

3. COURSE OUTCOMES

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

CO 1	Understand the structure of business firms and apply economic concepts such as national income, inflation, and business cycles in analyzing business decisions.
CO 2	Apply the concepts of demand, elasticity, and supply in business decision making and forecasting.
CO 3	Analyze production and cost functions, and evaluate pricing strategies under different market structures.
CO 4	Prepare and interpret basic financial statements using accounting principles, conventions, and the double-entry system.
CO 5	Evaluate financial performance of a business through ratio analysis and interpretation.

4. COURSE CONTENT

UNIT – I (10L)

Introduction to Business and Economics Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance. Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply and Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT – II (10L)

Demand and Supply Analysis Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting. Supply Analysis: Determinants of Supply, Supply Function and Law of Supply.

UNIT – III (10L)

Production, Cost, Market Structures & Pricing Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and Long run Cost Functions. Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition. Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT – IV (9L)

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts (Simple Problems).

UNIT – V (9L)

Financial Ratios Analysis: Concept of Ratio Analysis, Importance and Types of Ratios, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios – Analysis and Interpretation (simple problems).

5. TEXT BOOKS

1) D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2) Dhanesh K Khatri, Financial Accounting, Tata Mc –Graw Hill, 2011.
3) Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata Mc Graw Hill Education Pvt. Ltd. 2012

6. REFERENCE BOOKS

1) Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2) S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

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**	**1**	**2**	**1**	**1**						
CO 2	**3**	**3**	**3**	**1**	**1**	**1**	**2**	**1**						
CO 3	**3**	**3**	**3**	**2**	**1**	**2**	**1**	**1**						
CO 4	**3**	**3**	**2**	**2**	**2**	**1**	**1**	**2**						
CO 5	**3**	**3**	**3**	**2**	**2**	**1**	**1**	**2**						

COURSE CONTENT

STEAM POWER & JET PROPULSION								
III Year - I Semester: ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
ME505PC	**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: Thermodynamics								

1. COURSE OVERVIEW

This course offers a focused study of thermal and propulsion systems, covering steam power plants, turbines, nozzles, condensers, gas turbines, jet propulsion, and rockets. It emphasizes cycle analysis, efficiency improvement methods, component design, and performance evaluation, equipping students with the ability to analyse and optimize modern energy and propulsion technologies for engineering applications.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To introduce the fundamentals of steam power plants, Rankine cycle analysis, and methods to enhance efficiency.
2) To develop understanding of steam nozzles, their flow characteristics, performance parameters, and design criteria.
3) To impart knowledge of steam turbines, their classification, velocity diagrams, efficiency conditions, and compounding techniques.
4) To explain the working principles and performance of steam condensers and gas turbines, including cycle modifications and combined cycle concepts.
5) To provide insights into jet propulsion and rocket systems, covering principles, performance evaluation, thrust augmentation, and propellant types.

3. COURSE OUTCOMES

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

CO 1	Analyse Rankine cycle and boiler performance, and apply methods to improve steam power plant efficiency.
CO 2	Evaluate nozzle flow characteristics, critical pressure ratio, and effects of supersaturation.
CO 3	Differentiate impulse and reaction turbines, construct velocity diagrams, and assess efficiency and compounding methods.
CO 4	Examine condenser operation, efficiency, and air leakage control; analyse gas turbine cycles and modifications.
CO 5	Explain jet propulsion and rocket principles, evaluate thrust augmentation, and compare solid and liquid propellant engines.

Note: Steam Table book permitted in examination.

4. COURSE CONTENT

UNIT – I:

Steam Power Plant: Rankine cycle - Schematic layout, Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance – Regeneration & reheating.

Boilers – Classification – Working principles with sketches including H.P. Boilers – Mountings and Accessories – Working principles- Boiler horse power, Equivalent Evaporation, Efficiency and Heat balance – Draught- Classification – Height of chimney for given draught and discharge- Condition for maximum discharge- Efficiency of chimney.

UNIT – II:

Steam Nozzles: Stagnation Properties- Function of nozzle – Applications and Types- Flow through nozzles- Thermodynamic analysis – Assumptions -Velocity of nozzle at exit-Ideal and actual expansion in nozzle- Velocity coefficient- Condition for maximum discharge- Critical pressure ratio- Criteria to decide nozzle shape- Super saturated flow, its effects, Degree of super saturation and Degree of under cooling - Wilson line.

UNIT – III:

Steam Turbines: Classification – Impulse turbine; Mechanical details – Velocity diagram – Effect of friction – Power developed, Axial thrust, Blade or diagram efficiency – Condition for maximum efficiency. De-Laval Turbine - its features- Methods to reduce rotor speed-Velocity compounding and Pressure compounding- Velocity and Pressure variation along the flow – Combined velocity diagram for a velocity compounded impulse turbine.

Reaction Turbine: Mechanical details – Principle of operation, Thermodynamic analysis of a stage, Degree of reaction –Velocity diagram – Parson's reaction turbine – Condition for maximum efficiency.

UNIT – IV:

Steam Condensers: Requirements of steam condensing plant – Classification of condensers – Working principle of different types – Vacuum efficiency and Condenser efficiency – Air leakage, sources and its effects, Air pump- Cooling water requirement.

Gas Turbines: Simple gas turbine plant – Ideal cycle, essential components – Parameters of performance – Regeneration, Inter cooling and Reheating –Closed and Semi-closed cycles – Merits and Demerits- Combustion chambers and turbines of Gas Turbine Plant- Brief Concepts**,** combined cycle.

UNIT – V:

Jet Propulsion: Principle of Operation –Classification of jet propulsive engines – Working Principles with schematic diagrams and representation on T-S diagram - Thrust, Thrust Power and Propulsion Efficiency – Turbo jet engines – Needs and Demands met by Turbo jet – Schematic Diagram, Thermodynamic Cycle, Performance Evaluation Thrust Augmentation – Methods.

Rockets: Application – Working Principle – Classification – Propellant Type – Thrust, Propulsive Efficiency – Specific Impulse – Solid and Liquid propellant Rocket Engines.

5. TEXT BOOKS

1) Thermal Engineering / Mahesh M Rathore/ Tata Mc Graw Hill
2) Gas Turbines – V. Ganesan /Tata Mc Graw Hill.

6. REFERENCE BOOKS

1) Gas Turbine Theory/ Saravanamuttoo, Cohen, Rogers, Straznicky, Nix / Pearson
2) Fundamentals of Engineering Thermodynamics / Rathakrishnan/ PHI.
3) Thermal Engineering/ R.K. Rajput/ Lakshmi 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**	**3**	**2**	**2**	**1**							**1**	**3**	**3**
CO 2	**3**	**3**	**2**		**1**							**1**	**3**	**3**
CO 3	**3**	**3**	**2**	**3**	**2**							**1**	**3**	**2**
CO 4	**3**	**3**	**2**	**2**	**1**		**2**					**1**	**3**	**2**
CO 5	**3**	**3**	**2**		**1**		**2**					**1**	**3**	**2**

COURSE CONTENT

CAD/CAM								
III Year - I Semester: ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
ME506PC	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		2	**-**	**-**	**2**	**40**	**60**	**100**
Contact Classes: 32	Tutorial Classes: Nil	Practical Classes: Nil				**Total Classes: 32**		
Prerequisite: Engineering Graphics / Engineering Drawing, Computer Fundamentals, and Mathematics (Linear Algebra & Geometry)								

1. COURSE OVERVIEW

This course introduces the principles and applications of Computer-Aided Design (CAD) and Computer-Aided Manufacturing (CAM) in modern engineering. It covers fundamentals of CAD/CAM systems, geometric and solid modelling, surface representation, and numerical control programming. Students will learn group technology, computer-aided process planning, and resource planning methods to improve manufacturing efficiency. The course also explores advanced topics such as flexible manufacturing systems, automated quality control, and computer-integrated manufacturing (CIM).

2. COURSE OBJECTIVE

The students will try to Learn:

1) To introduce CAD/CAM concepts, applications, benefits, and supporting hardware, software, and databases.
2) To develop understanding of wireframe, curve, and surface modelling using parametric and advanced techniques.
3) To familiarize students with solid modelling methods and NC/CNC programming and control systems.
4) To explain group technology, computer-aided process planning, and resource planning for efficient manufacturing.
5) To expose students to FMS, computer-aided quality control, and CIM for modern industrial integration.

3. COURSE OUTCOMES

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

CO 1	Understand CAD/CAM fundamentals and their industrial applications.
CO 2	Apply geometric, surface, and solid modelling techniques.
CO 3	Develop NC part programs and appreciate CNC/DNC systems.
CO 4	Implement group technology and process planning for efficiency.
CO 5	Analyse advanced manufacturing systems and quality control methods.

4. COURSE CONTENT

UNIT – I:

Fundamentals of CAD/ CAM, Application of computers for Design and Manufacturing, Benefits of CAD/ CAM - Computer peripherals for CAD/ CAM, Design workstation, Graphic terminal, CAD/ CAM software-definition of system software and application software, CAD/ CAM database, and structure.

Geometric Modelling: Wire frame modelling, wire frame entities, Interpolation and approximation of curves, Concept of parametric and non-parametric representation of curves, Curve fitting techniques, definitions of cubic spline, Bezier, and B-spline.

UNIT – II:

Surface modelling: Algebraic and geometric form, Parametric space of surface, blending functions, parametrization of surface patch, Subdividing, Cylindrical surface, ruled surface, Surface of revolution Spherical surface, Composite surface, Bezier surface. B-spline surface, Regenerative surface, and pathological conditions.

Solid Modelling: Definition of cell composition and spatial occupancy enumeration, Sweep representation, Constructive solid geometry, Boundary representations.

UNIT – III:

NC Control Production Systems: Numerical control, Elements of NC system, NC part programming: Methods of NC part programming, manual part programming, Computer assisted part programming, Post Processor, Computerized part program, SPPL (A Simple Programming Language). CNC, DNC, and Adaptive Control Systems.

UNIT – IV:

Group Technology: Part families, Parts classification, and coding. Production flow analysis, Machine cell design.

Computer aided process planning: Difficulties in traditional process planning, Computer aided process planning: retrieval type and generative type, Machinability data systems.

Computer aided manufacturing resource planning: Material resource planning, inputs to MRP, MRP output records, Benefits of MRP, Enterprise resource planning, Capacity requirements planning.

UNIT – V:

Flexible manufacturing system: F.M.S equipment, FMS layouts, Analysis methods for FMS benefits of FMS.

Computer aided quality control: Automated inspection- Off-line, On-line, contact, Non-contact; Coordinate measuring machines, Machine vision.

Computer Integrated Manufacturing: CIM system, Benefits of CIM.

5. TEXT BOOKS

1) CAD/CAM Concepts and Applications / Alavala / PHI
2) CAD/CAM Principles and Applications / P. N. Rao / Mc Graw Hill
3) CAD/CAM: Computer Aided Design and manufacturing, Groover M.P., Zimmers / Pearson

6. REFERENCE BOOKS

1) CAD/CAM/CIM/ Radhakrishnan and Subramanyam / New Age

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**						**1**		**2**	**3**	**3**
CO 2	**3**	**3**	**2**	**2**	**2**					**1**		**2**	**3**	**3**
CO 3	**3**	**3**	**3**	**2**	**2**					**2**		**3**	**3**	**2**
CO 4	**2**	**2**	**3**	**2**	**3**	**1**			**2**	**2**		**3**	**3**	**2**
CO 5	**2**	**3**	**3**	**2**	**3**	**2**			**2**	**2**		**3**	**3**	**2**

COURSE CONTENT

THERMAL ENGINEERING LAB								
III Year - I Semester: ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
ME507PC	**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: Thermodynamics and IC Engines & Gas Turbines								

1. COURSE OVERVIEW

This practical course equips students with hands-on skills in evaluating internal combustion engines and thermal systems. Through experiments on valve timing, performance testing, compressor efficiency, and boiler studies, learners gain hands-on experience in diagnosing and improving engine performance, bridging theory with industrial application.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To introduce students to valve and port timing diagrams and fundamental performance testing methods for SI and CI engines.
2) To develop the ability to conduct Morse, retardation, motoring, and heat balance tests to evaluate engine efficiency and performance.
3) To enable learners to analyse the influence of operating parameters such as air–fuel ratio, compression ratio, and economical speed on engine behaviour.
4) To provide hands-on experience in determining volumetric efficiency of compressors and in disassembly/assembly of engines to build practical skills.
5) To familiarize students with auxiliary systems such as boilers and integrate experimental data to assess overall engine performance and reliability.

3. COURSE OUTCOMES

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

CO 1	Demonstrate the ability to conduct valve and port timing diagram experiments and interpret engine operating cycles.
CO 2	Perform performance tests on SI and CI engines, including Morse, retardation, motoring, and heat balance tests, and analyse efficiency parameters.
CO 3	Evaluate the effect of air–fuel ratio, compression ratio, and economical speed on engine performance through experimental investigation.
CO 4	Determine volumetric efficiency of compressors and gain hands-on experience in disassembly and assembly of engines, ensuring practical skill development
CO 5	Analyse auxiliary systems such as boilers and apply experimental data to assess overall engine performance, reliability, and operational characteristics.

4. COURSE CONTENT

List of Experiments

1. I.C. Engines Valve / Port Timing Diagrams
2. I.C. Engines Performance Test for 4 Stroke SI engines
3. I.C. Engines Performance Test for 2 Stroke SI engines

4. I.C. Engines Morse, Retardation, Motoring Tests
5. I.C. Engine Heat Balance – CI/SI Engines
6. I.C. Engines Economical speed Test on a SI engine
7. I.C. Engines effect of A/F Ratio in a SI engine
8. Performance Test on Variable Compression Ratio Engine
9. IC engine Performance Test on a 4S CI Engine at constant speed
10. Volumetric efficiency of Air – Compressor Unit
11. Dis-assembly / Assembly of Engines
12. Study of Boilers

Note: Perform a minimum of any 10 out of the 12 Exercises.

5. LAB MANUALS:

1. Internal Combustion Engines Laboratory Manual, Dr. K. Sudhakar and Dr. S. Ramasamy, VSRD Academic Publishing, 2021.
2. Thermal Engineering Lab Manual, Er. R.K. Rajput and Er. R.S. Khurmi, S. Chand Publications, 2022.

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**					**2**		**1**	**3**	**2**
CO 2	**3**	**2**	**3**	**2**	**2**					**2**		**1**	**3**	**2**
CO 3	**3**	**2**	**3**	**2**	**2**					**2**		**1**	**3**	**2**
CO 4	**3**	**2**	**3**	**2**	**2**					**2**		**1**	**3**	**2**
CO 5	**3**	**3**	**3**	**2**						**2**		**1**	**3**	**2**

COURSE CONTENT

METROLOGY & MACHINE TOOLS LAB								
III Year - I Semester: ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
ME508PC	**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: Theoretical exposure to Metrology and machine tools.								

1. COURSE OVERVIEW

This course provides hands-on experience in basic machining operations and precision measurement techniques. Students practice turning, drilling, milling, grinding, and gear cutting using conventional machines, while also learning to measure dimensions, angles, threads, and surface roughness with instruments such as vernier calipers, micrometers, comparators, and surface testers. The lab emphasizes both manufacturing skills and quality inspection methods, preparing students to produce accurate components and ensure compliance with engineering standards.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To provide hands-on training in basic machining operations using lathe, drilling, milling, and grinding machines.
2) To develop skills in precision measurement using instruments such as vernier calipers, micrometers, and comparators.
3) To impart knowledge of gear cutting, thread cutting, and surface finishing techniques.
4) To familiarize students with advanced measurement methods for angles, tapers, threads, and surface roughness.
5) To cultivate practical competence in applying manufacturing processes and inspection techniques for quality control.

3. COURSE OUTCOMES

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

CO 1	Perform basic machining operations such as step turning, taper turning, thread cutting, drilling, boring, and grinding.
CO 2	Apply gear cutting and tool grinding techniques to produce accurate components.
CO 3	Use precision instruments (vernier calipers, micrometers, bore gauges, comparators) for dimensional measurement.
CO 4	Conduct specialized measurements including gear tooth parameters, angles, tapers, threads, and surface roughness.
CO 5	Demonstrate practical skills in machining and inspection, ensuring quality and accuracy in manufactured parts.

4. COURSE CONTENT

List of Experiments

1. Step turning on lathe machine
2. Taper turning on lathe machine
3. Thread cutting and knurling on lathe machine (2 exercises)
4. Measurement of cutting forces on lathe

5. Machining of holes using Drilling and boring machines.
6. Gear cutting on the Milling machine
7. Grinding of Tool angles using Cylindrical / Surface Grinding
8. Measurement of lengths, heights, diameters by vernier calipers, micrometers.
9. Measurement of Diameter of bores by internal micrometers and dial bore indicators.
10. Use of gear teeth vernier calipers for checking the chordal addendum and chordal height of the spur gear.
11. Angle and taper measurements by bevel protractor and sine bars.
12. Thread measurement by 2-wire and 3-wire methods.
13. Surface roughness measurement by Tally Surf.
14. Use of mechanical comparator.

Note: Perform a minimum of any 10 out of the 14 Exercises.

5. LAB MANUALS:

1. Workshop / Manufacturing Practices (with Lab Manual) – by Veeranna D.K., Khanna Publishing House (AICTE Prescribed).
2. Manufacturing Processes II Lab Manual – by Arul R, Notion Press, 2020.
3. Metrology and Measurements Laboratory Manual, Dr. R. Manikandan, 2020.

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**				**2**	**1**		**2**	**3**	**2**
CO 2	**3**	**2**	**3**	**2**	**3**				**2**	**1**		**2**	**3**	**2**
CO 3	**3**	**3**	**2**	**2**	**3**				**2**	**1**		**3**	**3**	**2**
CO 4	**3**	**3**	**2**	**3**	**3**				**2**	**1**		**3**	**3**	**2**
CO 5	**3**	**3**	**3**	**3**	**3**	**2**			**2**	**1**		**3**	**3**	**2**

COURSE CONTENT

KINEMATICS & DYNAMICS LAB								
III Year - I Semester: ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
ME509PC	**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: Kinematics & Dynamics of Machines								

1. COURSE OVERVIEW

This lab provides practical exposure to the dynamic behaviour of mechanical systems, focusing on balancing, vibrations, governors, cams, gyroscopic effects, and lubrication. Students perform experiments to determine natural frequencies, critical speeds, pressure distribution, and motion characteristics of machine elements. The course emphasizes hands-on measurement, analysis, and application of dynamics principles, enabling learners to connect theory with real-world machine performance and stability.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To provide practical understanding of balancing of machines and rotating systems.
2) To study vibration characteristics of mechanical systems including torsional, longitudinal, and pendulum vibrations.
3) To analyse the performance of governors and cams under varying conditions.
4) To demonstrate gyroscopic effects and their influence on machine stability.
5) To impart knowledge of lubrication and pressure distribution in journal bearings.

3. COURSE OUTCOMES

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

CO 1	Determine the balance of machines for primary and secondary forces and analyse rotating mass systems.
CO 2	Measure natural frequencies and time periods of torsional, longitudinal, and pendulum vibrations.
CO 3	Evaluate the effect of varying mass on governors and analyse cam follower motion.
CO 4	Demonstrate gyroscopic effects and assess their impact on mechanical systems.
CO 5	Analyse pressure distribution in journal bearings and apply concepts of lubrication in practice.

4. COURSE CONTENT

List of Experiments

1. To determine the state of balance of machines for primary and secondary forces.
2. To determine the frequency of torsional vibration of a given rod.
3. Determine the effect of varying mass on the centre of sleeve in porter and proell governor.
4. Find the motion of the follower if the given profile of the cam.
5. The balance masses statically and dynamically for single rotating mass systems.
6. Determine the critical speed of a given shaft for different n-conditions.
7. For a simple pendulum determine time period and its natural frequency.
8. For a compound pendulum determine time period and its natural frequency.
9. Determine the effect of gyroscope for different motions.
10. Determine time period, amplitude and frequency of undamped free longitudinal vibration of single degree spring mass systems.

11. Determine the pressure distribution of lubricating oil at various load and speed of a Journal bearing.
12. Determine time period, amplitude and frequency of damped free longitudinal vibration of single degree spring mass systems.

Note: Perform a minimum of any 10 out of the 12 Exercises.

5. REFERENCE BOOKS

1. Theory of Machines, R.S. Khurmi & J.K. Gupta, S. Chand & Company Ltd., New Delhi, 2022.
2. Dynamics of Machinery, J.S. Rao & R.V. Dukkipati, New Age International Publishers, New Delhi, 5th Edition (2021).

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**	**2**	**2**	**2**				**2**	**1**		**2**	**3**	**2**
CO 2	**3**	**3**	**2**	**3**	**3**				**2**	**1**		**2**	**3**	**2**
CO 3	**3**	**2**	**3**	**2**	**2**				**2**	**1**		**3**	**3**	**2**
CO 4	**3**	**2**	**2**	**2**	**2**	**2**			**2**	**1**		**3**	**3**	**2**
CO 5	**3**	**2**	**2**	**3**	**3**	**2**			**2**	**1**		**3**	**3**	**2**