

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER

NAME OF THE COURSE: Automobile Engineering

PAPERCODE: DME- 501

RATIONAL

Automobile engineering covers a wide range of topics, including mobility design and aesthetics, automotive materials, automotive electrical and electronics, computer-aided vehicle design, vehicle maintenance, electric mobility, thermodynamics, engineering mechanics, manufacturing technology, fuels and lubricants, strength of materials, IC engines and gas turbine, automotive chassis, two-wheeler technology lab, vehicle dynamics, automotive component design, of materials, and of course, automobiles themselves.

CO's of Automobile Engineering

CO1: Prepare vehicle layouts with chassis specification.

CO2: Interpret power flow diagrams of transmission systems.

CO3: Select suitable braking and steering systems for different applications.

CO4: Select tyres and suspension system for different applications.

CO5: Describe simple electrical–electronics circuits for automobile systems.

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER

NAME OF THE COURSE: Automobile Engineering

PAPERCODE: DME - 501

Unit No.	COURSE CONTANT
1	Unit-I: Chassis & Body Engg: Types, Technical details of commercial vehicles, types of chassis, Layout, types of frames, testing of frames for bending & torsion on unutilized body frame, vehicle body and their construction, driver's visibility and methods for improvement, safety aspects of vehicles, vehicle aerodynamics, optimization of body shape, driver's cab design, body materials, location of engine, front wheel and rear wheel drive, four wheel drive.
2	Unit-II: Steering System: front axle beam, stub axle, front wheel assembly, principles of types of wheel alignment, front wheel geometry viz. camber, Kingpin inclination, castor, toe-in and toe-out, condition for true rolling motion, centre point steering, directional stability of vehicles, steering gear, power steering, slip angle, cornering power, over steer & under steer, gyroscopic effect on steering gears.
3	Unit-III: Transmission System: Function and types of clutches, single plate, multi-plate clutch, roller & spring clutch, clutch lining and bonding, double declutching, types of gear boxes, synchroniser, gear materials, determination of gear ratio for vehicles, gear box performance at different vehicle speed, automatic transmission, torque converters, fluid coupling.
4	Unit-IV: Suspension system : Basic suspension movements, Independent front & rear suspension, shock absorber, type of springs: leaf spring, coil spring, air spring, torsion bar location of shackles, power calculations, resistance to vehicle motion during acceleration and breaking, power & torque curve, torque & mechanical efficiency at different vehicle speeds, weight transfer, braking systems, disc theory, mechanical, hydraulic & pneumatic power brake systems, tyre specifications, construction and material properties of tyres & tubes.
5	Unit-V: Electrical and Control Systems: Storage battery, construction and operation of lead acid battery, testing of battery, principle of operation of starting mechanism, different drive systems, starter relay switch, regulator electric fuel gauge, fuel pump, horn, wiper, lighting system, head light dazzling, signaling devices, battery operated vehicles, choppers, importance of maintenance, scheduled and unscheduled maintenance, wheel alignment, trouble Shooting probable causes & remedies of various systems, microprocessor based control system for automobile, intelligent automobile control systems

List of Experiments:

1. Identify major automobile components (engine, chassis, transmission) and their functions on a real vehicle
2. Dismantling and assembly of engine components: cylinder head, piston, piston rings, connecting rod, crankshaft, camshaft, and valves.
3. Study of cooling systems: identify fan, radiator, pump, and thermostat; perform demonstration of air cooling and water cooling system.
4. Study of lubrication system: SAE oil rating, types of lubrication systems, demonstration of petrol and high-pressure lubrication systems.
5. Demonstration of fuel feed system: types of carburetors, fuel injection systems, fuel pumps, fuel filters, and injectors.
6. Dismantling and assembly of clutch: single plate and multi-plate types; identification of common faults and remedies.
7. Study and operation of gearbox: constant mesh and synchromesh gearboxes.
8. Study of propeller shaft and differential: construction, working, and differential action demonstration.
9. Study of steering system: recirculating ball and rack & pinion types; measurement of wheel geometry parameters – caster, camber, kingpin inclination, toe-in, toe-out.
10. Study of braking systems: mechanical, hydraulic, and air-operated; demonstration of drum and disc brake systems; master cylinder, wheel cylinder, and tandem cylinder operation.
11. Study of ignition system: battery ignition, magneto ignition, and electronic ignition; lead-acid battery construction and testing.
12. Study of starting system: Bendix and solenoid drive mechanisms; layout of starting system.
13. Identify and locate components of automobile air-conditioning system in a car.
14. Demonstration of car AC system operation: control of humidity, temperature, and air purity.
15. Study of safety precautions and maintenance of automobile AC system

REFERENCE BOOKS

1. Automobile Engineering R.K. Rajput Laxmi Publications
2. Automobile Engineering Dr. Kirpal Singh Standard Publishers
3. A Textbook of Automobile Engineering K. K. Jain PHI Learning Pvt. Ltd.
4. Automotive Mechanics C. P. Sharma S. Chand & Co.
5. Automobile Engineering (Theory & Practice) Dr. K. M. Gupta Satya Prakashan
6. Internal Combustion Engines & Automobile Engineering G. B. S. Narang S. Chand & Co

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER

NAME OF THE COURSE: Machine Tool Technology

PAPERCODE: DME - 502

RATIONAL

Machine tool technology is a branch of mechanical engineering that involves the design, creation, and operation of machines that manufacture metal parts and products. This field encompasses various machines like lathes, milling machines, and grinders, all of which are essential for precision in industrial manufacturing. Understanding machine tool technology is crucial for careers in manufacturing, engineering, and maintenance, as it combines principles of mechanics, material science

CO's of Machine Tools Technology

CO1: Explain the construction and working of common machine tools.

CO2: **Select** cutting tools, speeds, and feeds for machining operations.

CO3: Apply safe operation and maintenance practices for machine tools.

CO4: Perform basic machining operations on lathe, milling, drilling, and grinding machines.

CO5: Explain the principles of finishing operations, jigs, fixtures, and maintenance.

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER

NAME OF THE COURSE: Machine Tool Technology

PAPERCODE: DME - 502

Unit No.	COURSE CONTENT
1	Introduction to Machine Tools, Lathe: Overview of machine tools and their importance in manufacturing. Classification: turning, drilling, milling, shaping, grinding, and others. Main elements of a machine tool: bed, column, carriage, spindle, power feed, and controls. Lathe: types (centre lathe, engine lathe, turret lathe, CNC lathe). Main parts: headstock, tailstock, carriage, bed, lead screw. Lathe operations: turning, facing, taper turning, threading, knurling, parting. Cutting tool materials: HSS, carbide, ceramics, coated tools; tool geometry and nomenclature. Cutting parameters: speed, feed, depth of cut. Lathe accessories: chuck types, collets, face-plates, centers, tail-stock attachments.
2	Drilling Machines and Operations: Types of drilling machines: sensitive drill, pillar drill, radial drill, and CNC drill. Parts of a drilling machine: spindle, table, column, base, feed mechanism. Drill bits: twist drills, spot drills, step drills, and their nomenclature. Operations: drilling, reaming, counter boring, countersinking, tapping, and use of dies. Boring operations: boring bars, internal diameter finishing, precision hole finishing. Practical considerations: selection of drill speed and feed, lubrication, chip removal.
3	Milling, Slotting, and Planing Machines: Milling machine types: horizontal, vertical, universal. Main parts: table, spindle, arbor, knee, column, saddle. Cutters: plain, side, slab, end mills, face mills, gear cutters. Operations: plain milling, face milling, slotting, angular milling, gear cutting. Indexing methods: plain, simple, compound, and differential indexing. Slotter and planer: construction, working principle, applications, and basic operations.
4	Grinding and Finishing Operations, Jigs & Fixtures: Grinding: surface grinding, cylindrical grinding, tool & cutter grinding. Grinding wheels: types, material, selection criteria, dressing, balancing. Finishing operations: honing, lapping, super finishing for precision surfaces. Introduction to jigs and fixtures: purpose, types (template, angle plate, drilling jigs), and basic design principles.
5	Machine Tool Maintenance and Metrology: Preventive maintenance: daily, weekly, and monthly maintenance schedules. Alignment checks: level, spindle alignment, tailstock alignment. Lubrication: types, frequency, and methods. Common faults and remedies in lathes, drilling, milling, and grinding machines. Safety rules in the workshop, use of PPE. Basic metrology: limits, fits, tolerances, surface finish symbols. Measuring instruments: Vernier calipers, micrometers, dial gauges, height gauges, indicators.

LIST OF EXPERIMENTS

- 1 Turning operation on a lathe: plain turning, facing, and step turning.
- 2 Taper turning and threading operation on a lathe.
- 3 Knurling and parting operations on a lathe.
- 4 Drill hole using a drilling machine; perform reaming, counterboring, and countersinking.
- 5 Tapping and die operations for internal and external threads.

- 6 Boring operation using a boring bar for internal diameter finishing.
- 7 Milling operations: plain milling, face milling, and slot milling.
- 8 Indexing and gear cutting on a milling machine.
- 9 Slotting and planning operations on respective machines.
- 10 Grinding operations: surface grinding and cylindrical grinding.
- 11 Tool & cutter grinding for HSS tools.
- 12 Finishing operations: honing, lapping, and super finishing of components.
- 13 Alignment checks and preventive maintenance of lathe, milling, and drilling machines.
- 14 Lubrication of machine tool parts and practice in using measuring instruments (vernier caliper, micrometer, dial gauge).
- 15 CNC programming basics: write and simulate simple G-code, M-code programs.
- 16 CNC machining practice: turning or milling using a CNC machine.

REFERENCE BOOKS

1. Principles of Machine Tools S.K. Hajra Choudhury, A.K. Hajra Choudhury, Nirjhar Roy
Media Promoters & Publishers Pvt. Ltd.
2. Machine Tools R.K. Jain Khanna Publishers
3. Production Technology (Manufacturing Processes) HMT (Hindustan Machine Tools)
Tata McGraw-Hill
4. Workshop Technology – Part I & II W.A.J. Chapman (Indian Edition) Charotar Publishing
House
5. Fundamentals of Manufacturing & Machine Tools P.C. Sharma S. Chand Publishing
6. Manufacturing Technology R.K. Purohit Jai Prakash Nath & Co.
7. Production Engineering P.C. Pandey S. Chand Publishing
8. Workshop Technology B.S. Raghuvanshi Dhanpat Rai & Sons

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER

NAME OF THE COURSE: Theory of Machine

PAPER CODE: DME - 503

RATIONAL

The work of mechanical and production engineer is not only to supervise, run and plan production processes, but also include fault diagnosis and prevention of breakdowns. This can only be done, if he is familiar with the working of basic mechanism used on shop floors and in machines, how they fail and what are the loads coming on different members and different joints of the machines. The aim of the course is to provide acquaintance of the basic mechanism and machines to the students. This will enhance their capability of fault diagnosis and of taking corrective measure, which in turn will reduce the down time.

CO's of Theory of Machine

- CO1: Identify kinematic parameters of machine.
- CO2: Explain the kinematic/Geometric relationship of motion parameters
- CO3: Explain working of flywheel/governor and balancing of machine elements
- CO4: Draw profile of radial cam with knife edge / roller follower
- CO5: Explain working of dynamometers and power transmission in clutches/brakes.

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER

NAME OF THE COURSE: Theory of Machine

PAPER CODE: DME - 504

Unit No	COURSE CONTANT
1	Fundamentals of Kinematics and Mechanisms: Definition of Kinematics, Dynamics, statics, Kinetics, Kinematics link, Kinematics pair and its types, Constrained motion and its types, Kinematic chain and its types, machine and structure. Mechanism, Degree of freedom. Inversions of Kinematic Chain: Four bar chain, Single slider Crank and Double Slider Crank Chain
2	Kinematic Analysis of Plane Mechanism: Concept of relative velocity and relative acceleration of a point on a link, angular acceleration, inter-relation between linear and angular velocity and acceleration. Drawing of velocity and acceleration diagram of simple Mechanism. Determination of velocity and acceleration of point on link by relative method (Excluding Coriolis's component of acceleration). Analytical method and Klein's construction to determine velocity and acceleration of different links of single slider crank mechanism.
3	Flywheel, Governor: Flywheel: Flywheel – Concept, function and application of flywheel with the help of turning moment diagram for single cylinder 4-Stroke I.C Engine (simple numerical on energy.) Coefficient of fluctuation of energy, coefficient of fluctuation of speed and its significance. Types of governor(Centrifugal, Watt and Porter), Terminology of Governors, sensitiveness, stability, Isochronism, Hunting, Effort and power of governor, Comparison between Flywheel and Governor
4	Cam and Followers: Concept, definition and application of Cams and followers. Classification of Cams and followers Different follower motions and their displacement diagrams like uniform velocity, SHM, uniform acceleration and Retardation. Drawing of profile of radial cam with knife edge and roller follower with and without offset with reciprocating motion.
5	Friction Bearing & Clutches, Brakes and Dynamometer Definition of friction, its necessity, Laws of friction, Friction between dry surfaces, coefficient of friction. Pivot and collar friction, uniform pressure and uniform wear assumptions, power absorbed in flat bearings. Study of single plate, multiple plate clutch. Simple numerical on power transmitted by them. Construction and working of Block brake, Band brake.

LIST OF EXPERIMENTS

- 1 Study of inversions of four bar chain mechanism
- 2 Study of inversions of single slider crank chain mechanism (a) cranks slotted lever mechanism (b) Whitworth quick return motion mechanism
- 3 Dynamic force analysis of single cylinder four stroke engines.
- 4 Study of flywheel
- 5 Study of governor
- 6 Study of different cam and follower
- 7 Study of different gear trains
- 8 Study of power transmission methods
- 9 Study of different types of brake and dynamometer
- 10 Study of types of vibration and their measurement methods
- 11 Study of dynamic balancing procedure of rotating parts

REFERENCE BOOKS

- 1 Theory of Machines by J.M. Shah & H.M. Jadhvani.
- 2 Theory of Machines by Abdulla Shariff
- 3 Theory of Machines by M.R. Malhotra & H.C. Gupta. (Technical India Pub.)
- 4 Theory of machines by P.L. Ballani .
- 5 Theory of Machines by Thomas Bevan.
- 6 Theory of Machines by S. S. Ratan.
- 7 Theory of Machines By R.S.Khurmi
- 8 Theory of Mechanism and Machine By Jagdish Lal

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER

NAME OF THE COURSE: Advanced Manufacturing Processes

PAPERCODE: DME - 503

RATIONAL

The manufacturing industry is always evolving, requiring manufacturers to quickly respond to industry change and make a strong commitment to efficiency in every aspect of business to stay competitive. Advanced manufacturing are innovative technologies to create new products, refine existing products, and perform production activities that will improve the quality and process of manufacturing to give manufacturers a competitive edge.

CO'S of Advanced Manufacturing Processes

- CO1: Explain the principles and applications of advanced manufacturing processes.
- CO2: Select appropriate advanced manufacturing processes for specific applications.
- CO3: Analyze the advantages and limitations of various advanced manufacturing processes.
- CO4: Demonstrate the setup and operation of advanced manufacturing equipment.
- CO5: Evaluate the role of robotics in advanced manufacturing processes

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER

NAME OF THE COURSE: Advanced Manufacturing Processes

PAPERCODE: DME - 503

Unit No.	COURSE CONTENT
1	Introduction to Advanced Manufacturing Processes: Overview of manufacturing processes and their evolution. Classification of advanced manufacturing processes: mechanical, thermal, chemical, and hybrid processes. Selection criteria for advanced processes based on material, geometry, precision, and cost. Comparison with conventional/traditional processes: advantages and limitations. Industrial applications and case studies.
2	Non-Traditional Machining Processes: Introduction to non-traditional machining (NTM) and its importance. Electrical Discharge Machining (EDM): principle, equipment, applications, process parameters. Electrochemical Machining (ECM): mechanism, setup, advantages, limitations. Ultrasonic Machining (USM) and Abrasive Jet Machining (AJM): working principle and industrial applications. Laser Beam Machining (LBM): operation, types, applications, and advantages. Comparison of NTM processes in terms of precision, surface finish, material removal rate, and cost.
3	Rapid Prototyping and Additive Manufacturing: Concept of rapid prototyping (RP) and additive manufacturing (AM). Techniques of RP: stereo lithography (SLA), selective laser sintering (SLS), fused deposition modeling (FDM), laminated object manufacturing (LOM). 3D printing technologies for metals, polymers, and composites. Applications of RP and AM in product design, tooling, and customized production. Advantages, limitations, and future trends in additive manufacturing.
4	Advanced Welding Techniques: Overview of welding processes and classification. Laser welding: principle, setup, process parameters, advantages, and industrial applications. Electron Beam Welding (EBW): working, vacuum requirement, and applications. Friction Stir Welding (FSW): technique, tool design, and benefits. Selection criteria for welding methods based on material and application. Case studies in aerospace, automotive, and precision engineering.
5	Automation in Manufacturing: Definition and objectives of automation. Types of automation: fixed, programmable, and flexible. Components of automated systems: sensors, actuators, controllers. Robotics in manufacturing: industrial robots, applications in assembly, welding, material handling. Integration of automation in production lines and smart factories. Benefits and limitations of automation.

REFERENCE BOOKS

- 1: Advanced Manufacturing Processes H.K. Gupta S. Chand Publishing
- 2: Modern Machining Processes P.C. Pandey & H.S. Shan Tata McGraw-Hill
- 3: Manufacturing Engineering and Technology Serope Kalpakjian & Steven R. Schmid Pearson
- 4: Additive Manufacturing Technologies Ian Gibson, David W. Rosen, Brent Stucker Springer

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER

NAME OF THE COURSE: Industrial Engineering

PAPERCODE: DIP- 504 A

RATIONAL

Industrial engineering is a branch of engineering that focuses on optimizing complex systems and processes. It combines knowledge from multiple disciplines such as engineering, mathematics, business, and human sciences. Unlike other engineering branches that focus solely on machinery or infrastructure, industrial engineering is centered on improving how things work, like designing efficient workstations, reducing waste or managing supply chains. In manufacturing, industrial engineers act as the managing hands between management and operations, ensuring that systems are not only technically sound but also economically viable.

CO's of Industrial Engineering

CO1: Understand the principles of industrial engineering and quality control.

CO2: Apply work study techniques to improve productivity.

CO3: Implement methods for quality assurance and control in manufacturing processes.

CO4: Analyze and design efficient layouts for manufacturing systems.

CO5: Utilize statistical tools for quality control and improvement.

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER

NAME OF THE COURSE: Industrial Engineering

PAPERCODE: DIP- 504 A

Unit No.	COURSE CONTENT
1	Introduction to Industrial Engineering: Definition, scope, and objectives of industrial engineering; role of industrial engineers in organizations.
2	Work Study: Methods study: principles, procedures, and techniques; work measurement: time study, work sampling, standard data; applications in improving productivity. PERT & CPM.
3	Quality Control : Quality assurance vs. quality control; control charts; acceptance sampling; quality circles; total quality management (TQM).
4	Plant Layout and Material Handling Types of layouts; principles of layout planning; material handling systems; factors influencing layout design.
5	Statistical Quality Control: Introduction to statistical methods; control charts for variables and attributes; process capability analysis; acceptance sampling plans.

REFERENCE BOOKS

1. Industrial Engineering and Management O.P. Khanna Dhanpat Rai & Sons
2. Introduction to Work Study I L O International Labour Office
3. Quality Control and Management Juran & Gryna Tata McGraw-Hill
4. Industrial Engineering and Production Management Martand Telsang S. Chand Publishing
5. Statistical Quality Control M. Mahajan Dhanpat Rai & Sons

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER

NAME OF THE COURSE: Marketing &Entrepreneurship

PAPERCODE: DIP- 505B

RATIONAL

Entrepreneurial marketing is a dynamic approach that emphasis on experimental, and strategic growth making it ideal for startups and new ventures. Success for businesses operating with minimal resources relies on adopting an entrepreneurial mindset that prioritizes creativity and resourcefulness to tell your brand's story. In entrepreneurial marketing, is to discover what needs to be sold, and how, and to whom, and with what messages, explains..As an entrepreneurial marketer, play a pivotal role in shaping the company's direction. By enhance marketing strategies to determine which approaches resonate most with your customers.

CO's of Marketing &Entrepreneurship

CO1: Understand the principles of entrepreneurship, business setup, and startup ecosystem.

CO2: Identify business opportunities, generate ideas, and prepare detailed business plans.

CO3: Analyze financial requirements, investment planning, and funding sources for startups.

CO4: Apply marketing principles and strategies for product/service promotion.

CO5: Understand legal, regulatory, and compliance requirements for new ventures.

CO6: Develop entrepreneurial mindset, leadership, and problem-solving skills.

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER

NAME OF THE COURSE: Marketing & Entrepreneurship

PAPERCODE: DIP- 505B

Unit No.	COURSE CONTENT
1	Introduction to Entrepreneurship: Definition, concept, and significance of entrepreneurship. Characteristics, qualities, and skills of an entrepreneur. Types of entrepreneurs: innovative, replicative, social, and entrepreneurs. Role of entrepreneurs in economic development and job creation. Difference between entrepreneur and manager.
2	Idea Generation & Opportunity Recognition: Techniques for idea generation: brainstorming, mind mapping, SCAMPER, lateral thinking. Sources of business ideas: market demand, technological innovation, personal interests. Feasibility study: technical, market, financial, operational feasibility. SWOT analysis for evaluating business potential. Risk assessment and mitigation strategies.
3	Business Plan Development: Components of a business plan: executive summary, business model, market analysis, operations plan. Product/service planning and development. Marketing strategy in business plan: target market, positioning, pricing. Operational planning, human resources, and workflow design. Setting objectives, milestones, and KPIs for the business.
4	Startup Financing & Financial Planning: Estimation of startup cost and working capital requirements. Sources of finance: own funds, loans, venture capital, angel investors, crowd funding. Government schemes, subsidies, and incentives for startups. Financial planning: budgeting, cash flow management, break-even analysis. Cost control and profitability analysis.
5	Marketing Strategies for Startups: Principles of marketing: product, price, place, promotion (4Ps). Branding and positioning for new ventures. Digital marketing: social media email marketing, SEO, content marketing. Customer acquisition and retention strategies. Sales strategy, distribution channels, and marketing mix. Market expansion and scaling up strategies.
6	Legal, Regulatory & Business Ethics: Business registration and licensing procedures. Intellectual property rights: patents, trademarks, copyrights. Taxation and compliance requirements. Labor laws, contracts, and agreements. Environmental regulations and sustainable practices. Ethical considerations in entrepreneurship and corporate social responsibility.

REFERENCE BOOKS

1. Entrepreneurship Development S.S. Khanka S. Chand Publishing
2. Entrepreneurship: Theory, Process, Practice Donald F. Kuratko Cengage Learning
3. The Lean Startup Eric Ries Crown Business
4. Startup Nation: The Story of Israel's Economic Miracle Dan Senor & Saul Singer Twelve
5. The Art of the Start 2.0 Guy Kawasaki Penguin Portfolio
6. Fundamentals of Marketing Philip Kotler, Gary Armstrong Pearson