

MECHANICAL ENGINEERING SECTION

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME



DIPLOMA IN

MECHANICAL
ENGINEERING

V AND VI
SEMESTER

INCHARGE:

Dr. SHAHNAWAZ MOHSIN

w.e.f.

2019-2020

UNIVERSITY POLYTECHNIC, AMU, ALIGARH, UP, INDIA

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-501	Industrial Engineering	Compulsory	Theory	4	-	-

Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

UNIT	Topics Covered	Marks
I	INDUSTRIAL MANAGEMENT: Introduction to industrial management, Management of men material and machines, Scientific management and its principles, Functions of management, Structure of industrial organization, Types and applications. INDUSTRIAL OWNERSHIP: Introduction to Ownership and its types: Partnership organization, Joint Stock Company, Private Limited Companies, Public Limited Companies, Private sector and Public sector organization, Concept of the heavy, medium, small scale, cottage and village industries.	15
II	FINANCIAL MANAGEMENT: Sources of finance, Elements of costs, Prime cost, Factory cost, Other overheads, Total cost, selling price and problems on them Depreciation, Classification and methods of providing depreciation, Problems. WAGES AND INCENTIVES: Job evaluation and merit ratings, Definition and objectives, Ranking and point rating methods, Introduction to wages, Types of wages, Introduction to incentives, Types of incentives, Problems based on Halsey and Rowan systems.	20
III	HUMAN RESOURCE MANAGEMENT: Objectives of HRM, Staff development, Training strategies and methods. LABOUR AND INDUSTRIAL LAWS: Importance and necessity, Types of Labour laws and disputes, Brief description of the Acts such as Factories Act 1948, Workmen's Compensation Act 1923, Minimum wage Act 1948, Employee's provident fund Act 1952. ACCIDENTS: Introduction, Classification, Causes and Effects of accidents, Types of industrial hazards.	20
IV	ENTREPRENEURSHIP DEVELOPMENT: Concept of entrepreneurship, Characteristics of entrepreneur, Role of Entrepreneur, Role of entrepreneurs in Economic Development; Entrepreneurship in India, Entrepreneurship – its Barriers, Preparation of project report, Steps of planning a small to medium enterprises. (SMEs). MOTIVATION AND LEADERSHIP: Definition of motivation, Methods for improving motivation, Definition of leadership, Functions of leadership, Manager as a leader.	20

Text Book and/or Reference Material

- Industrial Engineering and Production Management by Mart andTelsang (S. Chand Pub.)
- Industrial Engineering and Management by D. Ravi Shankar (Galgotia Pub.)
- Industrial Engineering and Production Management by M. Mahajan (Dhanpat Rai Pub.)
- Industrial Engineering by N.J. Manek (Laxmi Pub.)
- Industrial Engineering and Management by O.P. Khanna (Dhanpat Rai Pub.)

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-502	Hydraulics & Pneumatics	Compulsory	Theory	4	-	-

Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

UNIT	Topics Covered	Marks
I	Introduction: Fluid, types of fluids, Difference between fluid mechanics and hydraulics. Properties of Fluid: Mass density, weight density (specific weight), specific volume, specific gravity, viscosity, kinematic & dynamic viscosity, surface tension, and their units. Intensity of pressure, pressure head, center of pressure, total pressure on horizontal & vertical flat surfaces (without proof) and simple problems on them. Pressure Measurement: Pressure (Atmospheric, Gauge, Absolute, Vacuum), Pascal's law and its paradox. Pressure Measuring Devices: Piezometric tube, simple manometer, differential manometer, inverted differential manometer, simple problems on them.	15
II	Flow of fluids: Types of fluid flow, steady & unsteady, uniform & non-uniform, laminar & turbulent flows, rate of flow & its units, continuity equation for I-D steady flow, Reynolds no & its significance, Energy of liquid in motion total energy, velocity head, pressure head, potential head, Bernoulli's theorem (Statement & proof), its applications & assumptions, discharge measurement with the help of venturimeter, problem on the same.	20
III	Flow through Orifices: Types of orifices, hydraulic coefficients, relationship between C_c , C_v & C_d , Vena-contracts. Flow through Pipes: Minor & major losses, loss of head in pipes due to sudden enlargement, sudden contraction, obstruction in flow path and pipe fitting (without proof), problems, water hammering in pipes & surge tanks.	20
IV	Hydraulic Machines: Concept of hydraulic pumps, construction and working of centrifugal pumps and reciprocating pumps, Selection of pumps. Concept of hydraulic Turbines- Classification, construction & description of main components of Pelton, Francis & Kaplan Turbines. Description and application of hydraulic ram, hydraulic accumulator and hydraulic press. Pneumatic System: Basic elements of pneumatic system and their functions such as- Air Compressor (Types & selection), generation of compressed air, Air-filters, Pressure regulators and Lubricators, their necessity in pneumatic circuits, Application of Pneumatics, Characteristic / features of pneumatic system. Pneumatic valves, pneumatic actuators (Brief idea only), pneumatic system safety, cleanliness and preventive maintenance.	20

Text Book and/or Reference Material

1. Fluid Mechanics by Frank M White (McGraw Hill Publication).
2. Introduction to Fluid Mechanics and Fluid Machines by S K Som and Gautam Biswas (McGraw Hill Publication).
3. A text book of Fluid Mechanics and Hydraulic Machines by R. K Rajput (S. Chand Publishers).
4. Fluid Mechanics and Hydraulic Machines by S.S. Rattan, (Khanna Publishers).
5. Pneumatic Systems Principles and maintenance by S.R Majumar. (McGraw Hill Publications.)
6. Hydraulic and Pneumatic- A Technician's and Engineer's Guide by Andrew Parr, (Jaico Publication House).
7. Hydraulic & Hydraulic Machines by Bansal.
8. A text book of Hydraulics by Bawa

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-503	Applied Thermodynamics	Compulsory	Theory	4	-	-

Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

UNIT	Topics Covered	Marks
I	Gas Power and Vapour Power Cycles Gas power cycles: Air standard efficiency, Description of Otto cycle, Diesel cycle and Dual combustion cycles. Air standard efficiency of Otto cycle and Diesel cycle (without derivation). Problems. Vapour power cycles: Carnot cycle and Rankine cycle. Comparison of Rankine cycle with Carnot cycle. Use of Mollier diagram, Problems.	15
II	Steam Nozzles, Turbines and Condensers Steam nozzles: Introduction. Types of nozzles, velocity of steam at exit of the nozzle, mass of steam discharge through nozzle, condition of maximum discharge through a nozzle, maximum discharge through a nozzle. Problems Steam turbines: Principal of operation of impulse and reaction turbines. Pressure, Velocity and Pressure-velocity compounding, their advantages. Steam condensers: Functions of condenser in a steam power plant. Types of condenser. Comparison of jet and surface condenser. Quantity of cooling water required. Effects of air leakage in condenser. Problems.	20
III	Air Compressors Industrial uses of compressed air. Classification of air compressors. Description of single reciprocating compressors. Effect of clearance, work done and volumetric efficiency. Description of multi-stage compressors. Advantages of multistage compression. Condition for maximum efficiency. Problems. Introduction to rotary compressors. Description of axial flow and centrifugal compressor.	20
IV	I.C. Engine and Gas Turbine Heat engines, Introduction and classification of I.C. engines, Basic terminology, Working principles of two stroke and four stroke cycles. Petrol and diesel engines and their comparison. Measurement of indicated power and brake power, Performance parameters, Morse test and Heat balance sheet. Gas turbines: Descriptive treatment of gas turbines, operation of gas turbine, open and closed gas turbine cycles. Performance and efficiency. Gas turbine versus reciprocating engines. Problems	20

Text Book and/or Reference Material

1. Onkar Singh, Applied Thermodynamics, New Age International Publishers, New Delhi
2. R. Joel, Basic Engineering Thermodynamics, Pearson's Education, New Delhi.
3. D. S. Kumar, Engineering Thermodynamics, S. K. Kataria and Sons Publishers, New Delhi.
4. R. Basu, Thermal Engineering- Heat Power, Dhanpat Rai & Co. Pvt. Ltd., New Delhi.
5. T. Roy Choudhary, Basic Engineering Thermodynamics, Tata McGraw Hill Publishing Company Limited, New Delhi.

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-504	Refrigeration & Air Conditioning	Compulsory	Theory	4	-	-

Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

UNIT	Topics Covered	Marks
I	Refrigeration Cycles: Principles of refrigeration, unit of refrigeration, various methods of refrigeration. Air refrigeration systems – Reversed Carnot and Bell Coleman cycles. Vapour compression refrigeration system and analysis of its cycle. Effects of sub cooling and superheating, Vapour absorption refrigeration system.	15
II	Refrigeration Components and Refrigerants: Refrigeration components and controls such as Compressor, Condenser, Evaporator and Throttling valve and Thermostat. Introduction to refrigerants and their desirable properties, primary and secondary refrigerants. Nomenclature of refrigerants. Important properties of some common refrigerants such as R-11, R-22, R-502, R-134a and NH ₃ .	20
III	Psychometric: Psychometric properties of air, psychometric processes and their representation on psychometric chart. Bypass factor, Mixing of air streams. Brief idea of metabolism 20 in human body. Introduction to human comfort and comfort air conditioning.	20
IV	Load Calculations, HVAC and Air-distribution Systems. Air conditioning load calculations; Cooling and heating load calculations. Description of various types of loads – sensible and latent heat loads, sensible heat factor, Apparatus dew point. HVAC classification of air conditioning systems. Air distribution systems; Simple description of filters, dampers, fans, blowers, air resisters (Grilles).	20

Text Book and/or Reference Material

1. Anathanarayan, "Basic Refrigeration and Air Conditioning", Tata McGraw Hill.
2. R. K. Rajput, "A Textbook of Refrigeration and Air Conditioning", S. K. Kataria and Sons.
3. Arora & Domkundwar, "Refrigeration & Air Conditioning", Dhanpat Rai & Sons P.S.

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-505	Production Technology-III	Compulsory	Theory	4	-	-

Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

UNIT	Topics Covered	Marks
I	GRINDING MACHINES Introduction; Classification of Abrasives; Basic concept of Bond, Grit, Structure and Grade of Abrasives; Selection of grinding wheel; Trueing and Dressing of Grinding wheel; Specification of grinding wheels; Grinding Machines: Brief description of Cylindrical grinder, Centre-less grinder; Surface grinder, Tool and Cutter grinder.	15
II	JIGS AND FIXTURES: Introduction; Difference between a jig and a fixture; Important considerations in jig and fixture design; Main elements of jigs and fixtures. Clamping & locating devices types of jigs. Brief idea of milling & grinding fixture CAPSTAN AND TURRET LATHES Introduction; Principal Parts of Capstan and Turret lathes; Differences between a Turret and a Capstan Lathe; Tool layout. BROACHING AND BROACHING MACHINES Introduction; Classification of Broaches; Principle of Broaching; Methods of Broaching; Classification of Broaching machines; Broaching versus other machining operations; Applications of Broaching.	20
III	NUMERICAL CONTROL MACHINE TOOLS: Introduction; Elements of NC machine tool system; Brief description and classification of NC systems; Basic concept of manual and computer assisted part-programming. ROBOTS: Introduction; Main components of a robot; Applications of robot.	20
IV	UNCONVENTIONAL METHODS OF MACHINING Introduction; Classification of unconventional machining methods; Common unconventional machining methods; Brief description of Electro-Discharge machining (EDM) and Electro-Chemical machining. POWDER METALLURGY: Brief description; Applications, advantages and disadvantages of powder metallurgy	20

Text Book and/or Reference Material

1. Workshop Technology Vol-II: By S. K. Hajra Chaudhry.
2. Production Engg Sciences: By P.C. Panday & C. K. Singh
3. Mfg. Engg & Technology: By Kalpakjian
4. Mfg. Engg: By P.C. Sharma
5. CNC machines: By M. Adithan
6. Production, Automation and computer integrated manufacturing: By Groover.

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-591	Workshop Practice-V	Compulsory	Practical	-	-	6

Course Assessment Method

1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

Topics Covered**MACHINE SHOP**

Demonstration and study of lathe and shaper.

1. Step turning, parallel Turning, Taper turning and Grooving.

WELDING SHOP

1. Study of various Gas cutting and welding equipment: -Welding transformer, Generator/rectifier, Gas cylinder, Gas cutting machines, Cutting torches etc., various electrodes and filler metals and fluxes.
2. TIG Welding practice of Non-Ferrous metals, like Copper, Brass and Aluminium.
3. Practice of Gas cutting manually.
4. Practice of MIG welding
5. Practice of stud welding
6. Practice of gas welding.
7. Practice of Arc cutting.

Note: Any three jobs to be completed

FOUNDRY SHOP

1. **Making sands moulds** of different forms with different types of pattern using- (i) Floor Moulding. (ii) Three Box (or more) Moulding.
2. Making and setting of cores of different types.
3. Casting practice of Nonferrous metals.

CNC MACHINE TOOLS LAB

1. Study and sketch of CNC lathe and milling machine.
2. Study of G codes and M codes.
3. Part programming, for different operations.

Programme editing & simulation on CNC lathe and milling machine.

Text Book and/or Reference Material

1. Workshop Technology Vol-II: By S. K. Hajra Chaudhry.
2. Production Engg Sciences: By P.C. Panday & C. K. Singh
3. CNC machines: By M. Adithan

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-592	CAD Lab-II	Compulsory	Practical	-	-	2

Course Assessment Method

1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

Topics Covered

This course is aiming to provide hands on training in AutoCAD/CREO/Solid Edge/NX(Solid Edge/NX-Combined or Optionally Available)

AUTOCAD: 2D Drawing, Isometric and 3D Drawing. / CREO: Sketcher, Part and Surface Modeling, Assembly and Sheet Metal Design, Drafting and Detailing. / SOLID EDGE: Sketcher, Part Modeling, Surface Modeling, Sheet Metal Design, Assembly, Drafting and Detailing. /NX: Sketcher, Part Modeling, Surface Modeling, Sheet Metal Design, Assembly, Drafting and Detailing.

Text Book and/or Reference Material

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-593	Applied Thermodynamics Lab	Compulsory	Practical	-	-	2

Course Assessment Method

1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

Course Objective

This course is designed to introduce a basic study of the phenomena of heat and mass transfer, to develop methodologies for solving a wide variety of practical engineering problems, and to provide useful information concerning the performance and design of particular systems and processes.

Course Outcomes

Upon successful completion of this course, the student will be able to:

1. Understand the basic laws of heat transfer.
2. Account for the consequence of heat transfer in thermal analyses of engineering systems.
3. Analyze problems involving steady state heat conduction in simple geometries.
4. Develop solutions for transient heat conduction in simple geometries.
5. Obtain numerical solutions for conduction and radiation heat transfer problems.
6. Understand the fundamentals of convective heat transfer process.
7. Evaluate heat transfer coefficients for natural convection.
8. Evaluate heat transfer coefficients for forced convection inside ducts.
9. Evaluate heat transfer coefficients for forced convection over exterior surfaces.
10. Analyze heat exchanger performance by using the method of log mean temperature difference.
11. Analyze heat exchanger performance by using the method of heat exchanger effectiveness.
12. Calculate radiation heat transfer between black body surfaces.
13. Calculate radiation heat exchange between gray body surfaces.

Topics Covered**Practical Exercises on the following**

1. Ruston Diesel Engine / Harvest Diesel Engine.
2. Morse test on Petrol Engine.
3. Energy Balance sheet on Petrol Engine.
4. Reciprocating Air Compressor
5. Mechanical Heat Pump
6. Refrigeration Tutor
7. Air Conditioning Tutor
8. Vapour Absorption System
9. Ice Plant Tutor

Text Book and/or Reference Material

1. Onkar Singh, Applied Thermodynamics, New Age International Publishers, New Delhi
2. R. Joel, Basic Engineering Thermodynamics, Pearson's Education, New Delhi.
3. D. S. Kumar, Engineering Thermodynamics, S. K. Kataria and Sons Publishers, New Delhi.
4. R. Basu, Thermal Engineering- Heat Power, Dhanpat Rai & Co. Pvt. Ltd., New Delhi.
5. T. Roy Choudhary, Basic Engineering Thermodynamics, Tata McGraw Hill Publishing Company Limited, New Delhi.

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-594	Project	Compulsory	Practical	-	-	3

Course Assessment Method

1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

Topics Covered

GUIDELINES

- i. Project will have to be done by a group comprising of maximum ten students only in their area of interest.
- ii. Each group has to select a contemporary topic that will use the technical knowledge of their program of specialization.
- iii. Allocation of the guides preferably in accordance with the expertise of the faculty.
- iv. The student will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the IV semester.
- v. The number of projects that a faculty can guide would be limited to two groups.
- vi. The project can be carried out on-campus or in an industry or an organization with prior approval from the Principal through Section Incharge.
- vii. The project shall be finalized by the students before the start of the V semester and shall be completed and submitted at least one month before the last teaching day of the VI semester, date of which shall be notified in the academic calendar.
- viii. The assessment of performance of students should be made at least twice in each semester i.e. V and VI and each internal assessment shall be for 80 marks. The student shall present the final project live as also using overheads project or power point presentation on LCD to the internal examiners as also the external examiner.
- ix. The evaluation committee shall consist of faculty members constituted by the college which would comprise of at-least three members comprising of the student's guide, one internal examiner & one external examiner passed by Board of studies. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately to the controller of examinations in a sealed envelope.

Text Book and/or Reference Material

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-601	Industrial Management & Entrepreneur Development	Compulsory	Theory	4	-	-

Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

UNIT	Topics Covered	Marks
I	<p>Introduction to Industrial Engg.: Definition, Application and Industry Classification. Production and Productivity: Definition, Production system, its characteristics, Product Life Cycle, Factors influencing productivity and measurement of productivity.</p> <p>Plant Location: Introduction, Factors affecting plant location.</p> <p>Plant Layout: Definition, Types of layouts, advantages and disadvantages of different layouts.</p> <p>Material Handling: Introduction, Material handling equipment, their types, functions and selection.</p>	15
II	<p>Work Study Method Study: Definition, objectives and need of method study, Role of method study in improving productivity, Procedure of conducting method study, Process charts and diagrams, Process chart symbols, (Flow process chart, Multi-activity chart, Right and Left-hand chart and flow diagram), Examples. Introduction to Therbligs.</p> <p>Time Study: Definition, Objectives and procedure of conducting time study, System of performance rating, various allowances, Calculation of standard time.</p> <p>Ergonomics: Definition, objectives and applications, Design of workplace layout, Man-Machine system, Role of work environment on human performance.</p>	20
III	<p>Planning and Control: An introduction to production, planning and control, its need and objectives, comparison between production planning and production control, Concept of Scheduling, Routing, Dispatching and Expediting, Techniques/methods of PPC like CPM and PERT, terminology related with CPM and PERT, Simple problems on them.</p> <p>Break Even Analysis: Introduction, Break-even chart, Break-even point, Margin of safety, Simple problems on them.</p>	20
IV	<p>Forecasting: Introduction to sales forecasting, definition, types, applications, need and limitations.</p> <p>Inventory Control: Introduction, types, objectives, need, terminology used in inventory control, Economic Order Quantity (EOQ), Lot size of production for minimum cost, simple problems on EOQ.</p>	20

Text Book and/or Reference Material

1. Industrial Engineering and Management by D. Ravi Shankar (Galgotia Pub.)
2. Industrial Engineering and Production Management by M. Mahajan (Dhanpat Rai Pub.)
3. Industrial Engineering and Management by O.P. Khanna (Dhanpat Rai Pub.).
4. Industrial Management by H.S. Bawa
5. Industrial Management by Mittal

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-602	Machine Design	Compulsory	Theory	4	-	-

Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

UNIT	Topics Covered	Marks
I	<p>INTRODUCTION Design: Definition, type of designs, necessary of design Design procedure. Practical Examples related with design procedure. Characteristics of a good designer. Design terminology: Stress, strain, factor of safety, factors affecting factor of safety, stress concentration, methods to reduce stress concentration, fatigue, endurance limit. General design considerations, codes and standards. Selection of materials</p>	15
II	<p>DESIGN OF SHAFT Design of shaft: Types of shaft materials, types of loading, effect of keyway on shaft strength, design of shaft under various types of loading. DESIGN OF KEYS AND COUPLINGS Design of keys: Types, Materials, function and design of keys. Necessity, advantages and types of couplings, design of Oldham and flanged couplings (Protected and unprotected)</p>	20
III	<p>DESIGN OF JOINTS Types of joints, Temporary and permanent, utility of joints, design of simple cotter and Knuckle joint. Welded Joints: Types of welded joints, strength of parallel and transverse fillet welds, strength of combined parallel and transverse welds under axial loading. Riveted Joints: Leak proofing of riveted joints caulking and fullering Different modes of failure of riveted joint. Design of riveted joints: lap and butt joints. Design of boiler joints .i.e circumferential and longitudinal joints</p>	20
IV	<p>SPRINGS Introduction, Types of spring, Material for helical spring, standard size of spring wire, Terms used in compression spring, end connection for compression helical springs, end connection for tension helical springs, stresses in helical springs of circular wire, energy stored in helical string of circular wire, stress & deflection in helical spring of non-circular wire, construction of leaf spring, equalval stresses in spring levers (Nipping) length of leaf spring leaves, simple problems</p>	20

Text Book and/or Reference Material

1. Machine Design by S.K. Bhandari
2. Machine Design by R.S. Khurmi

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-603	Automobile Engineering	Compulsory	Theory	4	-	-

Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

UNIT	Topics Covered	Marks
I	INTRODUCTION: Detailed description of main units of an automobile, Frame- Necessity and construction, automobile engines and their classification, Components of an engine, their materials and functions. Description of V-type, radial, transverse and OHC engines. Suspension system, its classification. Function and working of shock absorber, Air suspension and independent suspension.	15
II	ELECTRICAL SYSTEM: Concept of ignition, working of condenser, ignition coil, distributor, spark plug, C.B. point, principle of firing order, construction and function of storage battery, battery charging and testing, starter motor, Bendix drive (brief description), Function of magneto-ignition system, dynamo, alternator, cut-out and control of voltage and current. Common electrical faults.	20
III	TRANSMISSION AND BRAKING SYSTEM: Clutches and their classifications, Types of gear box, working of sliding mesh, constant mesh, synchromesh gear box. Working of propeller shaft, universal joint, differential and rear axle. Function and requirements of wheel, Type of tyres. Wheel Alignment for checking camber, caster angle, toe-in and toe out. Steering gears- types and working, power steering. Concept and requirement of brakes. Classification of brakes, working of mechanical, hydraulic, vacuum assisted brakes, disc brakes. Bleeding of brakes.	20
IV	Petrol engine fuel feed system: Description of mechanical fuel pump, S.U. electric fuel pump, types of carburetor. Working of simple carburetor. Multi-point fuel injection (MPFI) and Gasoline Direct Injection (GDI). Diesel engine fuel feed system: Description of mechanical fuel pump, injector and fuel filter. Description of common rail injection systems. Emission Control System: Automobile pollution and controls such as Catalytic converters, Exhaust Gas Recirculation (EGR) and Positive Crankcase ventilation Cooling System: Necessity of engine cooling system and its types. Radiator, water jacket, water pump, fan, thermostat (brief description). Coolants used in modern cars. Lubrication: Engine lubricated parts, factors affecting lubrication, oil pump, oil filters, grade of lubricating oil, car lubrication system. Modern Vehicles: Hybrid vehicles, Stratified charged/learn burn engines, battery vehicles and Magnetic track vehicles.	20

Text Book and/or Reference Material

1. P.S. Gill, "A Textbook of Automobile Engineering Vol. I, II & III", S.K. Kataria & Sons.
2. William H. Crouse and Donald L. Anglin, "Automotive Mechanics", Tata McGraw Hill.
3. Joseph Heitner, "Automobile Mechanics: Principles and Practices", Van Nostrand Publishers.
4. T. R. Banga and Nathu Singh, "A Text Book on Automobile Engineering", Khanna Publishers.
5. Kirpal Singh, "Automobile Engineering Vol. I and II", Standard Publishers.

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-604	Machine Tools & Maintenance	Compulsory	Theory	4	-	-

Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

UNIT	Topics Covered	Marks
I	MILLING MACHINE Introduction, classification and specifications. Description of main parts of column & Knee type, Horizontal and vertical spindle milling machines. Milling cutters: types and specifications. Operations performed on milling machines.	15
II	INDEXING Dividing Head, common methods of indexing. Simple, compound and differential indexing giving suitable examples. Manufacture of Gears: Application of milling, hobbling, hot rolling hot forging and casting. Micro Finishing Processes: Principle and application of lapping and honing. Polishing, Superfinishing, Burnishing, Galvanizing, Anodizing and Tin Plating.	20
III	INSTALLATION AND TESTING OF MACHINES Introduction, reading of information manual, Location, Foundation for machine tools, Different types of machine foundations, Factors affecting the type and size of foundation, Foundation plan (Erection drawing), Preparing the foundation, Damping and isolation of vibration, Erection and transportation, Levelling and aligning. Introduction, Sites for testing, Measuring instruments used for alignment test, Alignment test on lathe machine, drilling machine and milling machine.	20
IV	RELIABILITY ENGINEERING Basic concept and importance of reliability, failure rate, mean time to failure (MTTF), mean time between failures (MTBF), System reliability, Reliability analysis, Reliability improvement, availability and maintainability of mechanical system; Types and causes of failure. Failure analysis MAINTENANCE Maintenance objectives and types, Role of maintenance engineer, Maintenance procedure, need of planned maintenance, recent developments in maintenance engineering, maintenance of various machine parts (belt drive, chain drive, gear drive and shaft coupling). Maintenance stages of Pipes and pipe joints, pumps and lathe machine, Maintenance records, Computerization of maintenance. Reasons of equipment replacement, group replacement, replacement in anticipation of failure. Guidelines in replacement studies and methods of replacement studies.	20

Text Book and/or Reference Material

1. B. S. Raghuwanshi, A Course in Workshop Technology Vol. II Machine Tools, Dhanpat Rai and Co. (P) Ltd., Delhi.
2. M. Y. Khan, Installation, Testing and Maintenance, S. K. Kataria and Sons Publishers, New Delhi.

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BCE-605 (a)	Environmental Science and Management	Elective (a)	Theory	3	-	-

Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

UNIT	Topics Covered	Marks
I		15
II		20
III		20
IV		20

Text Book and/or Reference Material

- 1.

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-605	Non-Conventional Energy Sources	Elective (b)	Theory	4	-	-

Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

UNIT	Topics Covered	Marks
I	Energy and its Sources Introduction to the Energy and present energy crises. Conventional Energy Sources and limitations of using these sources. The need of Non-Conventional Energy Sources (NCES). Introduction to various non-conventional i.e. renewable energy sources. Comparison of NCES with the conventional source. Advancements made in recent time.	15
II	Nuclear Power Reactors and MHD Systems Introduction to Nuclear Energy. Nuclear Reactions – Fission and Fusion. Chain reactions. Nuclear power reactor. Various components of a nuclear power reactor. Detail classification of nuclear power reactors. Description of Pressurized water reactor and boiling water reactor. Principles of MHD power generation. MHD systems and their applications. Materials for MHD systems.	20
III	Solar Energy and Geothermal Energy Introduction to solar energy and solar radiation. Solar radiation at the earth's surface beam and diffused radiation. Measurement of solar radiation. Physical principles of the conversion of solar radiation into heat. Solar thermal collectors – Flat Plate and Concentrator. Applications of solar energy.	20
IV	Introduction and estimation of Geothermal Energy. Nature of geothermal fields and applications of geothermal energy of tidal power generation.	20

Text Book and/or Reference Material

1. "Non-conventional energy sources", G. D. RAI, Khanna Publisher, New Delhi.
2. "Non-conventional resources of energy", G. S. SAWHNEY, PHI Learning Pvt. Ltd.
3. "Solar energy", S P Sukhatme, J K Nayak, Tata Mc Graw-Hill Education.
4. "Solar Energy: Fundamentals and Applications", H. P. Garg, J. Prakash, Tata McGraw-Hill

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-605 (c)	Total Quality Management	Elective (c)	Theory	3	-	-

Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

UNIT	Topics Covered	Marks
I		15
II		20
III		20
IV		20

Text Book and/or Reference Material

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-691	Workshop Practice-VI	Compulsory	Practical	-	-	6

Course Assessment Method

1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

Topics Covered**MACHINE SHOP**

1. Threading, Drilling & Knurling on lathe machine
2. Angular machining on Shaper.
3. Key Way Cutting boring on slotting machine
4. To Grind Lathe Tools (All Angles), Shaper/Planer Tools and drill bit.
5. Spur Gear Cutting on milling machine.

WELDING SHOP

1. Practice of Welding pipe joints, Pipes
2. Study of Welding defects.
3. Inspection and Tests of welded joints.

FOUNDRY SHOP

1. Moulding and casting practice
2. Cleaning, inspection and non-destructive testing:
 - Dye penetration test for casting
 - Magnetic flaw detection test/Ultra sound flaw detection test for castings.

CNC MACHINE TOOLS LAB

Program feeding, editing, Simulation and execution for different operations.

1. Linear interpolation and circular interpolation on milling machine.
2. Point to point drilling process on milling.
3. Grooving and threading on CNC lathe machine.

Text Book and/or Reference Material

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-692	Automobile Lab	Compulsory	Practical	-	-	2

Course Assessment Method

1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

Topics Covered**Practical Exercises on the following**

1. Electrical System of a Patrol Car
2. Synchromesh Gear Box
3. Carburetor
4. Differential Gear Box
5. Ignition system of Petrol Engine
6. Fuel system of Diesel Engine
7. Mechanical Fuel Pump
8. Chassis of Diesel Engine
9. Chassis of Petrol Car Engine
10. Hydraulics Brake System & Disc Brake System

Text Book and/or Reference Material

1. P.S. Gill, "A Textbook of Automobile Engineering Vol. I, II & III", S.K. Kataria & Sons.
2. William H. Crouse and Donald L. Anglin, "Automotive Mechanics", Tata McGraw Hill.
3. Joseph Heitner, "Automobile Mechanics: Principles and Practices", Van Nostrand Publishers.
4. T. R. Banga and Nathu Singh, "A Text Book on Automobile Engineering", Khanna Publishers.
5. Kirpal Singh, "Automobile Engineering Vol. I and II", Standard Publishers.

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-693	Hydraulics & Pneumatics Lab	Compulsory	Practical	-	-	4

Course Assessment Method

1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

Topics Covered**Practical Exercises on the following**

1. Bernoulli's Theorem
2. Orifice Meter / Venturi Meter.
3. Sudden Expansion & Contraction.
4. Coefficient friction of Pipe Line.
5. Reynolds Experiments.
6. Mouth piece.
7. Easy & Sharp bend.
8. Rectangular / Triangular Notch.
9. Impact of Jet.
10. Pelton Turbine.
11. Francis Turbine.
12. Centrifugal Pumps.
13. Reciprocating Pump.
14. Hydraulic Ram.
15. Pneumatic Bench.

Text Book and/or Reference Material

1. Fluid Mechanics by Frank M White (McGraw Hill Publication).
2. Introduction to Fluid Mechanics and Fluid Machines by S K Som and Gautam Biswas (McGraw Hill Publication).
3. A text book of Fluid Mechanics and Hydraulic Machines by R. K Rajput (S. Chand Publishers).
4. Fluid Mechanics and Hydraulic Machines by S.S. Rattan, (Khanna Publishers).
5. Pneumatic Systems Principles and maintenance by S.R Majumar. (McGraw Hill Publications.)
6. Hydraulic and Pneumatic- A Technician's and Engineer's Guide by Andrew Parr, (Jaico Publication House).
7. Hydraulic & Hydraulic Machines by Bansal.
8. A text book of Hydraulics by Bawa

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-694	Project	Compulsory	Practical	-	-	3

Course Assessment Method

1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

Topics Covered

1. Students shall complete the project work as they have allotted in V semester.
2. The project shall be completed and submitted at least one month before the last teaching day of the VI semester, date of which shall be notified in the academic calendar.
3. The assessment of performance of students should be made in VI semester and shall be of 80 marks. The student shall present the final project live as also using overheads project or power point presentation on LCD to the internal examiners as also the external examiner.
4. The evaluation committee shall consist of faculty members constituted by the college, which would comprise of at-least three members, the student's guide, one internal examiner & one external examiner passed by Board of studies. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately to the controller of examinations in a sealed envelope.

Text Book and/or Reference Material