

# MECHANICAL ENGINEERING SECTION

## STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME



DIPLOMA IN

MECHANICAL  
ENGINEERING

PRODUCTION

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	<b>INDUSTRIAL MANAGEMENT:</b> 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. <b>INDUSTRIAL OWNERSHIP:</b> 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	<b>FINANCIAL MANAGEMENT:</b> 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. <b>WAGES AND INCENTIVES:</b> 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	<b>HUMAN RESOURCE MANAGEMENT:</b> Objectives of HRM, Staff development, Training strategies and methods. <b>LABOUR AND INDUSTRIAL LAWS:</b> 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. <b>ACCIDENTS:</b> Introduction, Classification, Causes and Effects of accidents, Types of industrial hazards.	20
IV	<b>ENTREPRENUERSHIP DEVELOPMENT:</b> 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). <b>MOTIVATION AND LEADERSHIP:</b> Definition of motivation, Methods for improving motivation, Definition of leadership, Functions of leadership, Manager as a leader.	20

**Text Book and/or Reference Material**

1. Industrial Engineering and Production Management by Mart andTelsang (S. Chand Pub.)
2. Industrial Engineering and Management by D. Ravi Shankar (Galgotia Pub.)
3. Industrial Engineering and Production Management by M. Mahajan (Dhanpat Rai Pub.)
4. Industrial Engineering by N.J. Manek (Laxmi Pub.)
5. 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.

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BPE-501	Automation & CAM	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	<b>AUTOMATION</b> Introduction to Automation; Reasons for Automating; Automation Principles and strategies; Automation Migration Strategy; Levels of Automation; Types of Automated Manufacturing Systems.	15
II	<b>NUMERICAL CONTROL</b> Introduction to Numerical control of Machines; Computerized Numerical Control (CNC) and Direct Numerical Control (DNC); Advantages and Disadvantages of CNC Machines; Parts suitable for CNC Machines; Basic Components of Numerical Control System; Classification of Numerical Control Machines.	20
III	<b>NUMERICAL CONTROL PART PROGRAMMING</b> Manual Part Programming and Computer Aided Part Programming; Advantages of Computer Aided Part Programming over Manual Part Programming. <b>CNC MACHINES</b> Construction details of CNC Machines; Tooling for CNC Machines; Maintenance of CNC Machines.	20
IV	<b>CAM and FMS: Concept of CAD, CAM, FMS, CIM, Computer Aided Process Planning (CAPP), JIT and Group Technology (GT), and their advantages.</b> <b>ROBOTICS: Definition; Different Types of configuration; Basic robot motions; Degrees of freedom; Main parts of robot; Applications of Robots in different manufacturing processes, Advantages of robots.</b>	20

**Text Book and/or Reference Material**

1. CNC Machines by M. Adithan.
2. Production Automation and C I M by Groover.

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BPE-502	Tool 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	<b>BASICS OF JIGS AND FIXTURES</b> Importance of jigs & fixtures, principles of location, locating devices, v-location, conical location, principle of 6 point location & cylindrical location, support pins and jack pins, locating pins, diamond pin locators, bush locators, purpose of clamping, types of clamps i.e. lever clamp, bridge clamp, edge clamp, screw clamp, latch clamp, hinged clamp, quick acting clamp, and clamping methods, devices.	15
II	<b>DESIGN OF JIGS AND FIXTURES</b> Fundamentals principles or general consideration in the design of drill jig & fixture, location and clamping devices, clip control, bushes, types of drill jig i.e., template, plate type, swinging leaf, box, channel, index, parts/main elements of drill jig, types of bushes, different types of fixtures i.e. turning, milling, boring, grinding, welding etc.	20
III	<b>INTRODUCTION OF POWER PRESS TOOLS</b> Introduction to press cutting operations, cutting action in punch and die operations, die clearance, angular clearance, cutting force, bending force, drawing force, blank development, elements of press tool, die sets, introduction of different types of press tools i.e., blanking, piercing, compound, progressive, combination, drawing, inverted etc., different types of operations. <b>DESIGNING OF POWER PRESS TOOLS</b> Requirement of press tool design, die & punch clearance for different materials, designing of different types of punch, pilots, stripper plate, pressure pads, punch and die mountings, dowel pins, die block & punch, strip layout, methods of reducing cutting force, calculation of blank development, blanking force, bending force, bending methods, bending tools, spring back, bend allowance, forming and drawing force, .	20
IV	<b>MOULDING (PLASTIC DIES)</b> Types of moulds for processing the thermosetting and thermoplastic materials, criteria for selection of processing methods, materials of mould parts, elementary ideas of construction of different types of moulds used for plastic components, layout of product, development of core, cavity, parting line, runner, sprue, gate, cooling of mould, ejector pin system of product. <b>DIE CASTING</b> Know how about die casting, elements of die casting tools and their description, material for die casting tools, designing of parting line, draft, fillet and corner radii shrinkage allowance, die wear allowance, cavities, flash, die inserts, cooling system in tool, ejection system of product.	20

**Text Book and/or Reference Material**

1. Production Engg. Science: by PC Pandey & C.K. Singh
2. Tool Design: by Cyril Donaldson
3. Jigs & Fixture: by P.H. Joshi

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	<b>GRINDING MACHINES</b> 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	<b>JIGS AND FIXTURES:</b> 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 <b>CAPSTAN AND TURRET LATHES</b> Introduction; Principal Parts of Capstan and Turret lathes; Differences between a Turret and a Capstan Lathe; Tool layout. <b>BROACHING AND BROACHING MACHINES</b> Introduction; Classification of Broaches; Principle of Broaching; Methods of Broaching; Classification of Broaching machines; Broaching versus other machining operations; Applications of Broaching.	20
III	<b>NUMERICAL CONTROL MACHINE TOOLS:</b> Introduction; Elements of NC machine tool system; Brief description and classification of NC systems; Basic concept of manual and computer assisted part-programming. <b>ROBOTS:</b> Introduction; Main components of a robot; Applications of robot.	20
IV	<b>UNCONVENTIONAL METHODS OF MACHINING</b> Introduction; Classification of unconventional machining methods; Common unconventional machining methods; Brief description of Electro-Discharge machining (EDM) and Electro-Chemical machining. <b>POWDER METALLURGY:</b> 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	BPE-591	Industrial Engineering 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.

**List of Experiments**

1. To verify that when random samples are taken from a universe with a certain percentage of defectives, the same percentage of defectives tend to appear in the random samples (by using a lot of glass balls having certain percentage of defectives).
2. To construct - R chart for the given data of variables & conclude your results.
3. To construct p-chart for attribute for constant sample size & state your conclusion.
4. To construct c-chart for attributes for a given data & conclude your results.
5. To construct left hand & right hand process chart for an assembly of Nut & Bolt with two washers.
6. To draw flow process Chart for an activity of your own choice & hence, draw the flow diagram using suitable scale.
7. To carry out time study (T-S) for a simple job on a lathe machine for at least 10 cycles & compute the standard time.
8. To draw "Frequency Distribution/Normal Distribution Curve" for a mass production item & to compare the area with standard data (using Normal Distribution Curve).

Case-I: To draw a chart of man working on a single machine for an activity of your choice.

Case-II: To draw a chart of man working on two machines simultaneously for an activity of your choice.

Note: Number of Experiments depend upon the availability of equipment and time

**Text Book and/or Reference Material**



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-595	Hydraulics 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. 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.

Note:

1. Number of Experiments depend upon the availability of equipment and time.
2. Any eight experiments to be completed in Production/ R.A.C / Plastic Tech

**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. Hydraulic and Pneumatic- A Technician's and Engineer's Guide by Andrew Parr, (Jaico Publication House).
6. Hydraulic & Hydraulic Machines by Bansal.
7. 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-601	Industrial Management & Entrepreneur Development	Compulsory	Theory	4	-	-
<b>Course Assessment Method</b>							
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	<b>Introduction to Industrial Engg.:</b> Definition, Application and Industry Classification. <b>Production and Productivity:</b> Definition, Production system, its characteristics, Product Life Cycle, Factors influencing productivity and measurement of productivity. <b>Plant Location:</b> Introduction, Factors affecting plant location. <b>Plant Layout:</b> Definition, Types of layouts, advantages and disadvantages of different layouts. <b>Material Handling:</b> Introduction, Material handling equipment, their types, functions and selection.						15
II	<b>Work Study</b> <b>Method Study:</b> 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. <b>Time Study:</b> Definition, Objectives and procedure of conducting time study, System of performance rating, various allowances, Calculation of standard time. <b>Ergonomics:</b> Definition, objectives and applications, Design of workplace layout, Man-Machine system, Role of work environment on human performance.						20
III	<b>Planning and Control:</b> 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. <b>Break Even Analysis:</b> Introduction, Break-even chart, Break-even point, Margin of safety, Simple problems on them.						20
IV	<b>Forecasting:</b> Introduction to sales forecasting, definition, types, applications, need and limitations. <b>Inventory Control:</b> Introduction, types, objectives, need, terminology used in inventory control, Economic Order Quantity (EOQ), Lot size of production for minimum cost, simple problems on EOQ.						20
<b>Text Book and/or Reference Material</b>							
0. Industrial Engineering and Management by D. Ravi Shankar (Galgotia Pub.) 1. Industrial Engineering and Production Management by M. Mahajan (Dhanpat Rai Pub.) 2. Industrial Engineering and Management by O.P. Khanna (Dhanpat Rai Pub.) 3. Industrial Management by H.S. Bawa 4. 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><b>INTRODUCTION</b> 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><b>DESIGN OF SHAFT</b> Design of shaft: Types of shaft materials, types of loading, effect of keyway on shaft strength, design of shaft under various types of loading.</p> <p><b>DESIGN OF KEYS AND COUPLINGS</b> 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><b>DESIGN OF JOINTS</b> 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><b>SPRINGS</b> 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 &amp; deflection in helical spring of non-circular wire, construction of leaf spring, eqvalved 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	BPE-601	Manufacturing Technology	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: Metal working as a metal shaping method-its advantage and scope, Recrystallization process (Brief idea) Rolling: Elementary theory of Rolling: - Flat rolling, roll force and power requirement (without derivation), Materials for rolling and rolls. Characteristics of Rolling: Draught and reduction, contact area, contact angle (without derivation) hot rolling and cold rolling, Pack rolling, defects in roll plates and sheets rolling Mills: Types of rolling mills, lubricants in rolling, thread rolling: flow chart of rolled stock production. Drawing: Wire drawing process, wire drawing dies, die materials, rod drawing, tube drawing lubricants, defects and remedies in drawing process.	15
II	Extrusion: Introduction, types of extrusion: direct, Indirect, hydrostatic & tube extrusion (only brief idea) extrusion forces (without derivation), hot and cold extrusion, impact extrusion, die design (without derivation) die materials and lubrication, Principle, merits and demerits of hydrostatic extrusion defects, Extrusion equipment: - Presses die. Forging: Introduction, types of forging: open die forging, closed die forging, precision forging, coining, forging force (without derivation). Related forging operations: Heading Piercing hobbling forging die design and geometry (without derivation) die materials and lubrication, forging defects.	20
III	Foundry Technology: Introduction, Solidifications of metals, effects of cooling rates, solidification time, introduction to moulding tools. Types of moulds:- Expandable moulds, Permanent moulds, composite moulds, major components of sand moulds. Pattern Making: Introduction to cores, core boxes, and core materials, core prints and positioning of cores, Mechanism of pattern withdrawal, elements of gating system. Rising: Risers and its uses, types of riders.	20
IV	Special Moulding / Casting Process: Carbon dioxide (Co <sub>2</sub> ) moulding: - Principle, working and application, advantages, and Limitations of CO <sub>2</sub> moulding. Investment casting: - Principle, Working and Application Advantages, Working Principle, application and advantages. Shell Moulding: - Principle, working applications, advantages and limitations Centrifugal Casting: Methods, advantage and its applications. Die-Casting: Hot and cold chamber die casting (Principles and working only), advantages and applications. Welding Technology: Introduction, types of welding processes, advantages of welding, Gas cutting process, Thermo it welding and its applications. Resistance welding: working principle, seam and projection welding and their applications, Plasma arc welding, Electron beam welding, Electros lag welding, TIG and MIG welding, Atomic hydrogen welding. Ultrasonic Welding, Explosive welding, Laser beam welding, Elementary idea of underwater welding and cutting	20

**Text Book and/or Reference Material**

1. Materials and Manufacturing Technology. by Kalpakjian
2. Workshop and Technology Vol-I: by S.K Hajara

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-604	Machine Tools & Maintenance	Compulsory	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	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	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-605 (B)	Non-Conventional Energy Source	Elective	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	<b>Energy and its Sources</b> 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	<b>Nuclear Power Reactors and MHD Systems</b> 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	<b>Solar Energy and Geothermal Energy</b> 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	<b>Geothermal Energy and MHD Systems</b> Introduction and estimation of Geothermal Energy. Nature of geothermal fields and applications of geothermal energy Principles of MHD power generation. MHD systems and their applications. Materials for MHD systems.	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-602 (C)	Total quality management	Elective	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	BPE-691	Tool Engg. 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 production of the following:

1. Drill Jigs.
2. Welding Fixture.
3. Milling Fixture.
4. Grinding Fixture.

Note: Type of Jigs and Fixtures will be decided by the teachers as per availability of materials in the workshop.

**Text Book and/or Reference Material**

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**

Department	Course No.	Course Title	Course Designation	Course Type	Contact Hours		
					L	T	P
MES, University Polytechnic	BME-695	CAD Lab-II	Compulsory	Practical	-	-	2

**Course Assessment Method**

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

UNIT	Topics Covered	Marks
	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.	
<b>Text Book and/or Reference Material</b>		