

ENTREPRENEURSHIP DEVELOPMENT

L T P
3 0 0

Total Contact Hrs.:45 Total Marks: 100

Theory: 45

Practical: 0

Prerequisite: Nil

Credit: 3

Curri. Ref. No.: G304

Theory:

End Exam :70

P.A.: 30

Practical: 0

End Exam.:0

P.A. :0

RATIONALE / AIM :-

The course intends to provide the fundamental aspects of entrepreneurship as a means for self employment and culminating in economic development of the country. It deals with basic issues like entrepreneurial characteristics and quality, governmental policy support and overall scenario along with opportunities and the facilities available for entrepreneurship development.

COURSE OUTCOME :-	
Module /Unit	After completion of the course, the students will be able to:
1.	Identify different functions and scopes of entrepreneurship.
2.	Distinguish different types of company with registration procedure
3.	Define scope & functions of small scale & ancillary industries.
4.	Identify different characteristic and functions of sales organization.
5.	Identify basic guidelines of pricing of product
6.	Collect basic quarries and information's from different business organizations.
7.	Write preliminary report incorporating feasiellity study finance, time etc.
8	Define different environmental legislation acts and guidelines.

COURSE CONTENTS (THEORY):

UNIT	TOPIC/SUB-TOPIC	Total hrs.
1	INTRODUCTION:	10
	1.1 Definition and functions of Entrepreneur, entrepreneurship quality, entrepreneurial spirit, need for entrepreneurship. 1.2 Individual and social aspects of business – achievement motivation theory 1.3 Social responsibilities of Entrepreneurs	
2	FORMS OF BUSINESS ORGANISATION	4
	2.1 Types of company 2.2 Merits and demerits of different types 2.3 Registration of small scale industries 2.4 Conglomeration.	
3	SMALL SCALE AND ANCILLARY INDUSTRIES	8
	3.1 Definition – scope with special reference to self employment. 3.2 Procedure to start small scale and Ancillary industries 3.3 Pattern on which the Scheme/Project may be prepared 3.4 Sources of finance - Bank, Govt., and other financial institutions. 3.5 Selection of site for factory 3.6 Factors of selection 3.7 N.O.C. from different authorities, e.g., Pollution Control Board, Factories Directorate etc. 3.8 Trade License	
4	SYSTEM OF DISTRIBUTION	1
	4.1 Wholesale Trade 4.2 Retail trade	
5	SALES ORGANISATION	3
	5.1 Market survey, marketing trends, knowledge of competitors, product selection & its basis .	

	5.2 Sales promotion 5.3 Advertisement 5.4 Public relations and selling skills	
6	PRICING THE PRODUCT	1
	6.1 Basic guidelines.	
7	INTRODUCTION TO IMPORT AND EXPORT	6
	7.1 Procedures for export 7.2 Procedures for import 7.3 Technical collaboration – international trade 7.4 Business insurance 7.5 Rail and road transport 7.6 Forwarding formalities, FOR, FOB, CIF, etc.	
8	BUSINESS ENQUIRIES	4
	8.1 Enquiries: From SISI, DIC, SFC Dept. of Industrial Development Banks. 8.2 Offers and Quotations 8.3 Orders	
9	PROJECT REPORT	6
	9.1 Project Report on feasibility studies for small scale industries, proposal for finances from bank and other financial institutions for establishing new industries and its extension, obtaining License enlistment as suppliers, different vetting organizations for Techno Economic feasibility report. 9.2 Breakeven analysis, Breakeven point.	
10		2
	10.1 Air Pollution Act 10.2 Water Pollution Act 10.3 Smoke Nuisance Control Act 10.4 ISO: 14000, OSHA	
	TOTAL:	45

TEXT /REFERENCE BOOKS:

Sl No.	Book Title	Author	Publisher
1	Entrepreneurship Development	CTSC Manila	Tata McGraw Hill Publishing Co. Ltd
2	Small Enterprise Management		ISTE, Mysore
3	Motivation		ISTE, Mysore
4	Entrepreneurship Development	Jose Pauletal	Himalaya Publishing House, 1996
5	A Handbook of Entrepreneurship	Rathore, B.S. and J.S. Saini (Ed)	Panchkula : Aapga, 1997
6	Entrepreneurship Development	Khanka, S.S	S. Chand and Co. New delhi. 2001

MACHINE TOOLS – I

L T P
3 0 0

Total Contact Hrs.:45 **Total Marks:** 150

Theory: 45

Practical: 0

Prerequisite:

Credit: 4

Curri. Ref. No.: ME501

Theory:

End Exam :70

P.A.: 30

Practical: 0

End Exam.:0

P.A. :0

RATIONALE/AIM:

Metal cutting (also called Machining) is by far the most versatile and most used process for giving final shape to most of the engineering materials, to be used either as finished products or as parts for making machines, which will produce finished goods and services. All such metal cutting operations are performed by a host of machines called Machine Tools. Different types of machine tools are used for performing different machining operations for giving different shapes to machined items. No engineering production unit can be imagined without machine tools.

In other words, knowledge of constructional features & use of machine tools is of vital importance to a mechanical engineer.

AIM:

After study of the subject Machine Tools (distributed over two courses viz. Machine tools I and II), a diploma mechanical engineer should have a clear conception about metal cutting process, its importance and about the constructional features, uses and operations of all basic types of machine tools normally used in industry.

COURSE CONTENTS:

THEORY:

UNIT	TOPIC/SUB-TOPIC	Total hrs.
1.0	INTRODUCTION:	2
	Definition of machine tools; metal cutting operation; types of surfaces and profiles produced by machine tools; generation of a surface.	
2.0	BASIC MACHINE TOOLS AND THEIR OPERATIONS :	6
	Lathe, drilling machine, shaper, planer, slotter, broaching machine, milling machine, boring machine, grinding machine, gear hobbing machine.	
	<i>NB. It is essential to see different types of machine tools under operating conditions in the institute workshop or outside workshops during the course of this subject.</i>	
3.0	METAL CUTTING AND CUTTING TOOLS	12
3.1	Metal cutting by chip forming process; orthogonal and oblique cutting; mechanics of chip formation; cutting forces in orthogonal and oblique cutting; cutting velocity; power and work done in cutting.	
3.2	Single point and multi point tool; cutting tool nomenclature (turning tool, different and milling cutter); types of chips (continuous and discontinuous) and factors affecting them; chip breakers.	
3.3	Cutting speed, feed and depth of cut; factors determining speed, feed and depth of cut; cutting tool materials; range of speed and feed for different combinations of metals and tool materials.	
3.4	Tool wear; friction and heat in cutting; factors affecting tool life; cutting fluids: purposes, types and properties.	
4.0	DRIVES AND MECHANISMS IN MACHINE TOOLS	6
4.1	Machine tool motions: Cutting motion, feed motion, auxiliary motions (loading, unloading, clamping, tool approach & withdrawal, indexing, swivelling etc.); source of power; individual vs. group drive; mechanisms for conversion of rotation to translation & vice-versa	

5.0 LATHE	9
5.1 Operations; classification; specifications	
5.2 Parts of a lathe machine: bed, head stock, tail stock, carriage, tool post, drive, speed changing mechanism, all geared head stock, feed drive, apron mechanism.	
5.3 Accessories & Attachments: Centres, catch plate and carriers, chucks, face plate, angle plate, mandrel, steady rest, follower rest, taper turning attachment.	
5.4 Different types of lathe tools and their uses	
6.0 DRILLING MACHINE	4
6.1 Operations; classification; specifications	
6.2 Parts of a pillar drill: pillar, table, drill, drive mechanism; grouped spindle pillar drill.	
6.3 Parts of a radial drill: column, arm, head, screw, elevating screw, drive mechanism	
6.4 Twist drill and reamer; trepanning tools; recommended cutting speed and feed; drilling jigs	
7.0 SHAPER, PLANER, SLOTTER & BROACHING MACHINE	6
7.1 Operations and specifications	
7.2 Parts of a pillar drill: pillar, table, drill, drive mechanism; grouped spindle pillar drill.	
7.3 Parts and drive mechanism of shaper, planer, slotter and broaching machine.	
7.4 Quick return mechanism and feeding mechanism of shaper and planer.	
7.5 Tools used	
8.0 APPURTENANCES IN DISTRIBUTION SYSTEM:	1
8.1 Valves-types, features, uses, purpose-slucice valves, check valves, air valves, scour valves	
8.2 Fire hydrants	
8.3 Water meters- types, uses, fixing	
<i>[Note: detailed study covered under practical. Students may be asked to prepare sketches as home assignment]</i>	

Total: 45

TEXT / REFERENCE BOOKS:

1. S. K. Basu and D. K. Pal : Design of Machine Tools – Oxford & IBH Publishing Co. Pvt. Ltd.
2. S. K. Hajra Choudhury, S. K. Bose, A. K. Hazra Choudhury : Elements of Workshop Technology Vol. : II – Media Promoters & Publishers Pvt. Ltd.
3. W. A. J. Chapman : Workshop Technology, Part 1 & 2 – ELBS.
4. H. Gerling : All about Machine Tools – New Age International (P) Ltd.
5. G. C. Sen and A. Bhattacharyya : Principles of Machine Tools - New Central Book Agency
6. Juneja, Sekhon and Seth: Fundamentals of Metal Cutting and Machine Tools - New Age International Publishers
7. G. Thirupati Reddy: Metal cutting & Machine Tools - Scitech Publications (India) Pvt. Ltd. 2006
8. G. Kuppaswamy: Principles of Metal Cutting - Universities Press

AUTOMOBILE ENGINEERING

L T P
3 0 2

Total Contact Hrs.: **Total Marks: 150**

Theory: 45

Practical: 30

Prerequisite: ME401, ME402

Credit: 4

Curri. Ref. No.: ME504

Theory:

End Term Exam :70

P.A.: 30

Practical: 50

End Term Exam:0

P.A.:50

RATIONALE:

The automobile is one of the principal transport system. Their manufacture maintenance gives a major scope for employment. The technicians who pass out from technical institutes many of them go to automobile companies for production or servicing of vehicles. Moreover, many entrepreneurs go for servicing of automobiles or trading of auto components. Thus the automobile engineering is an important subject to be in the regular curriculum of the technicians.

AIM:

Students will be exposed to construction, function, and working principle of engines, lubrication system, cooling system, electrical system and the power train of different types of automobile vehicles.

COURSE CONTENTS:

THEORY:

UNIT	TOPIC/SUB-TOPIC	Total Hrs.
1.0 INTRODUCTION		4
1.1	Definition of automobile	
1.2	Automobile components: engine, lubrication system, cooling system, fuel system, ignition system, electrical system, frame, suspension system, power train, clutch, transmission, drive shaft, differential axles, wheels, steering system, car body, accessories.	

- 1.3 Different types of chassis layouts
- front engine driving the near wheels, transverse engine driving the front wheels, rear engine driving the rear wheels, four wheel drive.
- 1.4 Classification of vehicles according to the following criteria– requirement, load carrying capacity, type of body, type of derive, number of wheels, fuel used, number of seats, model and make, total piston displacement volume, type of control, number of doors, position of engine.
- 1.5 Garage tools and equipment – basic tool kit and additional tools for a mechanic.

2.0 ENGINE

6

- 2.1 Classification of automobile engines based on: number of cylinders, cylinder arrangement, valve arrangement in cylinder head assembly, cooling methods, fuel used, thermodynamic cycles, mechanical cycles, ignition system, lubrication system.
- 2.2 Components of engine: Cylinder blocks, cylinder liner, crankcase, cylinder head, gaskets, piston, piston rings, piston pin, connecting rod, crankshaft, balance weight, camshaft, valves.
- 2.3 Theoretical heat cycles-otto cycle, diesel cycle, mixed cycle.
- 2.4 Petrol engine – working principle and application of four stroke petrol engine.
- 2.5 Diesel engine-working principle and application of four stroke engine and two stroke engine.
- 2.6 Combustion – exhaust emissions: hydrocarbons, carbon monoxide, oxides of nitrogen; emission control approaches: modification of engine design, modification of fuel, exhaust gas treatment; detonation, pre-ignition, valve timing diagram.
- 2.7 Performance and its measurement – bore and stroke, swept volume and clearance volume, compression ratio; engine torque; mean effective pressure; horse power: BHP, IHP, FHP; engine efficiencies: air standard, mechanical, thermal, indicated thermal, broke thermal, volumetric; specific fuel consumption; performance curves : torque versus engine speed, BHP versus RPM, FHP versus RPM, specific fuel consumption versus RPM.

3.0 FUEL SYSTEM

5

- 3.1 Characteristics of fuels for automobile engines.
- 3.2 Requirements of a good fuel – octane rating, cetane rating, sulphur content, gum content.
- 3.3 Carburation and air fuel ratios– factors affecting carburation: temperature, time, quality, engine design; air fuel ratios.
- 3.4 Petrol fuel, layout of petrol fuel system: fuel tank, pipelines, fuel filters, fuel lift pump, carburetor or fuel injection unit, inlet manifold, air filter;
Fuel lift pump: mechanical lift pump, electrical fuel pump;
Carburetor: variable or fixed choke carburetor, mixture correction, air bleed compensation, slow running (idling system), air bleed and idling mixture arrangement, progression jets, cold starting devices, variable choke carburetor, acceleration and mixture enrichment, cold starting, variable venturi carburetor.
- 3.5 Petrol fuel injection system: Limitations of carburetors, definition of petrol fuel injection system, types of petrol fuel injection system: combustion chamber injection, timed or continuous injection, fuel injected into inlet port or inlet manifold or multipoint injection (MPFI).; working principles of petrol fuel injection system: mechanical fuel injection system, electronic fuel injection system.
- 3.6 Fuel injection in CI engines – components of fuel injection system; fuel tank, filters, fuel lift pump, fuel injection pump, injection nozzle, low pressure lines, high pressure lines, leak off lines; air injection system, constant pressure or common rail system, jerk pump injection system, distributor fuel injection system; types of nozzles: single hole nozzle, multiple hole nozzle, pintle nozzle and pintanx nozzle; valve closing orifice nozzle; engine speed governing, governors, distributor fuel injection system.
- 3.7 Supercharging of I.C. engines; Governing system; mechanical, pneumatic and hydraulic.

4.0 COOLING SYSTEM

2

- 4.1 Comparison among different types of cooling systems: water cooling, air cooling.
- 4.2 Parts of air cooling and water cooling systems
- 4.3 Anti-freeze mixtures – characteristics and examples

5.0 LUBRICATION SYSTEM

3

- 5.1 Purpose of lubrication and parts of engine that require lubrication.
- 5.2 Lubricating oil – function of lubricating oil, properties of lubricating oil.
- 5.3 Principles of different types of lubrication system -petroil, splash, semi-pressure, pressure, wet-sump, dry sump.
- 5.4 Parts of lubrication system – oil sump, oil pump, oil relief valve, oil filter, oil dip stick, oil pressure indicating light, oil pressure gauge.

6.0 POWER TRAIN

6

- 6.1 Transmission – Elements of power transmission from crank shaft to rear axle
- 6.2 Clutch – functions of clutch, working principles of different types of clutch: cone, inverted cone, singleplate, multiplate, diaphragm, automatic.
- 6.3 Gear boxes – construction and working principles of different types of gearboxes: sliding, constant mesh, syncromesh, epicycle, automatic; gear box lubrication.
- 6.4 Propeller shaft – functions, construction
- 6.5 Universal joints-working principles of different types of universal joints
- 6.6 Differential – purpose, principle, construction
- 6.7 Drive systems – front wheel drive, four wheel drive
- 6.8 Rear axles – forces on rear axles
- 6.9 Live axles: semi – floating, three-quarter floating, fully floating
- 6.10 Front axles – steering heads
- 6.11 Dead front axle
- 6.12 Fluid coupling: principle, construction, operation, advantages and disadvantages.

7.0 WHEELS AND TYRES

2

- 7.1 Types of wheels and requirements of road wheels, types of commercial vehicle wheels.
- 7.2 Rims – types of rims
- 7.3 Tyres – description of construction of different types of tyres, tyre specification, factors affecting tyre life.

8.0 BRAKING SYSTEM	4		
8.1 Principle of braking and requirements of brake.			
8.2 Construction and working principle of different types of brakes - drum brakes, disc brakes, mechanical brakes, hydraulic brakes, vacuum servo brakes, compressed air brakes, air hydraulic brakes, power brakes.			
9.0 CHASSIS AND BODY	3		
9.1 Functions of chassis frame; types of chassis frames: conventional frame, integral construction.			
9.2 Different types of frames: car frame, truck frame, tubular frame, sub frame.			
9.3 Body – requirements and types.			
10.0 SUSPENSION SYSTEMS	4		
10.1 Functions of suspension system and characteristics of a good suspension system and characteristics.			
10.2 Working principles of different suspension systems: conventional independent front or rear, air, hydroelastic.			
10.3 Working principle of different types of suspension springs: leaf, coil, torsion, air, rubber, hydroelastic			
10.4 Dampers – purpose, function, types.			
10.5 Working principles suspensions – air, hydrogas, hydroelastic.			
11.0 STEERING SYSTEMS	4		
11.1 Functions and requirements of a steering system.			
11.2 Steering mechanisms: Ackerman.			
11.3 Definition of over-steer and under-steer.			
11.4 Arrangement of steering system - steering wheel, steering column, steering shaft, drop arm, drag link.			
11.5 Types of steering gears – worm and sector, rack and pinion, reciprocating ball, worm and roller, cam and lever, screw and nut.			
11.6 Definition of reversibility.			
11.7 Power steering – advantages and principle of working.			
11.8 Concepts on turning radius, steering ratio, centre point steering.			
11.9 Wheel alignment: camber, caster, king pin inclination, toe-in, toe-out drawing turns, wheel alignment-setting.			
		12.0 ELECTRICAL SYSTEMS	4
		12.1 Battery – types, principle of battery charging, capacity, methods of charging.	
		12.2 Dynamo and alternator – purpose, parts, principle of working.	
		12.3 Ignition system – parts of ignition circuit, magneto ignition system.	
		12.4 Starting system – purpose, circuit, and construction.	
		12.5 Lighting and auxiliary equipment - Lighting circuit, components of lighting system, components operated by electricity, head lamp, electric horn wind screen wiper.	
		<u>PRACTICAL</u>	30
	13.0	13.1 Introduction, demonstration and use of various tools, instruments and equipment used in auto shop.	
		13.2 Study of automobile chassis with respect to layout, location and function of various major visible components.	
		13.3 Study of automobile engine.	
		13.4 Study of automobile gear box.	
		13.5 Overhauling of clutch and gear assembly.	
		13.6 Overhauling of units of breaking system.	
		13.7 Overhauling of fuel pump.	
		13.8 Overhauling carburetor.	
		13.9 Servicing air filter/air cleaner.	
		13.10 Phasing and calibration of fuel injection pump.	
		13.11 Charging of battery and measuring cell voltage, specific gravity of electrolyte.	
		13.12 Checking wheel alignment	
		13.13 Measuring compression pressure of an engine.	
		13.14 Cleaning of fuel tank and fuel lines.	
		13.15 Nozzle testing and its adjustment.	
		13.16 Overhauling water pump.	
		13.17 Testing of ignition system of engine.	
		13.18 Overhauling of gear box of a vehicle.	
		13.19 Overhauling of lubricating pump.	
		13.20 Driving practice of a motor vehicle for 6 hours.	
		TOTAL:	75

NOTE:

1. Students should perform the experiments 13.1, 13.2, 13.3 & 13.4 and any five from the rest.
2. The experiments should be chosen in such a manner that they cover major subassemblies of an automobile.
3. Students should work in a group the size of which should not be more than ten.

REFERENCE BOOKS:

1. Harbans Singh Reyat : The Automobile – S. Chand & Company Ltd., New Delhi
2. Kirpal Singh : Automobile Engineering Vol. I & II– Standard Publishers Distributors, Delhi.
3. K. Newton, W. Steeds and T. K. Garrett : The Motor Vehicle – English Language Book Society / Butterworths.
4. R. B. Gupta : Automobile Engineering – Satya Prakashan, New Delhi
5. Joseph Heitner: Automotive Mechanics, Principles and Practices – CBS Publishers & Distributors.
6. William H. Crouse and Donald L. Anglin: Automotive Mechanics – Tata Mc-Graw-Hill Publishing Company Ltd., New Delhi.
7. G. B. S. Narang: Automobile Engineering – Khanna Publishers
8. T. R. Banga and Nather Singh – A text Book of Automobile - Khanna Publishers
9. H. M. Sethi : Automotive Technology – Tata Mc Graw Hill Publishing Company
10. S. Srinivasan : Automotive Mechanics- Tata Mc Graw – Hill Publishing Company Ltd.
11. K.K. Ramalingam: Automobile Engineering – Scitech Publications (India) Pvt. Ltd, Chennai.
12. K.K. Jain and R.B. Asthana: Automobile Engineering –Tata McGraw – Hill Publishing Company Limited, New Delhi
13. Kamaraju Ramkrishna: Automobile Engineering - Practice Hall of India, Delhi.
14. W. H. Course: Automotive Engine - McGraw Hill
15. W. H. Course: Automotive Transmission & Power Train - McGraw Hill
16. C. P.Nakra: Basic Automobile Engineering – Dhanpat Rai Publishing Co. Pvt. Ltd.

PRODUCTION MANAGEMENT

L	T	P
3	0	0

Total Contact Hrs.: Total Marks: 100

Theory: 45

Practical: 0

Prerequisite: Nil

Credit: 4**Curri. Ref. No.: ME505****Theory:**

End Term Exam :70

P.A.: 30

Practical: 0

P.A.:0

RATIONALE:

Main objective of Mechanical Engineering and Technology is to produce goods and services for benefit of mankind. Resources like material, men and machines are absolutely essential for any production activity. However, to make such a production system operable and self-sustaining, questions like “how”, “how-much”, “when” etc. needs to be properly answered. How a particular production should be made by using which process in what machine etc. is the subject matter of “production technology”. Answers to host of other questions like how much quantity to be produced, when to be produced and similar questions pertaining to various factors of production like availability of raw materials, product quality, material handling, productivity, optimum utilisation of resources etc. are also of vital importance for viability of the production system. All these aspects of production system are the subject matter of “Production Management”, and hence important for study by the mechanical engineers.

AIM:

A fresh mechanical diploma engineer will be conversant with the concept of production system and management and its ramifications in the areas of plant location and layout, material handling, demand forecasting, production planning and control measures, product inspection and quality control, raw materials management, work study, principles of mass production and operations research.

COURSE CONTENTS:

UNIT	TOPIC/SUB-TOPIC	Contact Hrs.
1.0	Production & Production Management	2
	1.1 Meaning of the terms: production and production management; factors of production; production system; productivity (labour, material capital); types of production: mass, batch, job-shop, projects.	
	1.2 Objectives of production management; scope of production management	
2.0	Plant Location, Layout And Materials Handling	6
	2.1 Factors affecting plant location; necessity of plant layout; process and product layout; work station design; procedural steps for making a plant layout; undertake plant layout exercise.	
	2.2 Functions and principles of material handling; different types of material handling equipment like crane, hoist, conveyor, truck & trolley, lift and elevator, chute, vibratory feeder, pneumatic conveying, handling by robot	
3.0	Sale Forecasting	4
	Concept and purpose of forecasting; forecasting techniques: historic, sales force, trend line, market survey; simple average; moving average; weighted moving average.	
4.0	Production Planning & Control	8
	4.1 Concept of process planning; process planning procedure: selection of process, materials, jigs & fixtures, tools & gauges, standard set up and process timings; economic batch quantity.	
	4.2 Concept of scheduling; scheduling techniques: master schedule, perpetual scheduling (load analysis sheet and Gantt load chart).	
	4.3 Concept and procedure for: dispatching, routing, progress control.	
5.0	Inspection And Quality Control	6
	5.1 Purpose of inspection; types of inspection: moving, fixed, key-point, final.	
	5.2 Difference between inspection and quality control; benefits of quality control; basic concepts of statistical quality control (SQC); sampling inspection; C-control chart and simple problems.	
6.0	Materials Management And Inventory Control	5
	6.1 Functions and objectives of materials management; objective and functions of purchase department.	
	6.2 Methods and steps in purchasing: purchase requisition, floating enquiry, tender or quotation, comparative statement, acceptance of quotation, earnest money, security deposit, purchase order.	
	6.3 Objectives and functions of stores management; location and layout of stores; receipt and issue of materials.	
	6.4 Store records; stores ledger, bin cards; physical verification of stores; codification of stores; ABC analysis.	
	6.5 Meaning and classification of inventory; objective of inventory control; economic order quantity (EOQ)- deduction of formula $Q = \sqrt{2UP/C}$ and solve simple problems.	
7.0	Work Study	4
	7.1 Concept and objectives of work study; method study procedure: flow process chart, flow diagram	
	7.2 Purpose of time and motion study; therbligs; time study data by stop watch; calculation of standard time (considering performance rating factor and various allowances).	
8.0	Principles Of Product Design For Mass Production	4
	8.1 Standardization; simplification; specialization; interchangeability: fits and tolerance.	
9.0	Introduction To Operations Research	6
	Understanding the term Operations Research through various examples on problems like resource allocation. linear programming, transportation, inventory control, queuing etc.; graphical method of solving linear programming; Vogel's approximation method of solving transportation problem; introduction to critical path method (CPM).	
Total Hrs		45

REFERENCE BOOKS:

1. B. Kumar : *Industrial Engineering* – Khanna Publishers
2. O.P. Khanna : *Industrial Engineering and Management* –Dhanpat Rai & Sons
3. Jain and Agarwal : *Production Management* – Khanna Publishers
4. C.K. Mustafi : *Operations Research Methods and Practice* – New Age International
5. Elwood S. Buffa and Rakesh K. Sarin: *Modern Production/Operation Management* - John Wiley & Sons
6. N. G. Nair: *Production and Operation Management* - Tata McGraw-Hill Publishing Company Limited New Delhi

MACHINE DESIGN

L T P
3 0 2

Total Contact Hrs.:**Total Marks: 150**

Theory: 45

Practical: 30

Prerequisite: Nil

Credit: 4**Curri. Ref. No.: ME506****Theory:**

End Term Exam :70

P.A.: 30

Practical: 25

P.A.:25

RATIONALE:

Design is the formulation of a plan, a scheme, or a method to translate a need into a satisfactorily functioning device that satisfies the original need. Machine design is art of planning or devising new or improved machines to accomplish specific purposes. All engineering courses are tools in the process of design. The idea of design is helpful in the specification and selection of machine components in any activity of an industrial organization. Hence all students should acquaint with machine design to be a successful engineer technician.

AIM:

The student should be acquainted with the methods of calculation to attempt to predict the stress of deformation in the part in order that it may safely carry the loads, which will be imposed upon it, and that it may last for the expected life of the machine. Consideration should be given not only to the cost of design, manufacture, sale, and installation, but also to the cost of servicing.

COURSE CONTENT:**THEORY:**

UNIT	TOPIC/SUB-TOPIC	Contact Hrs.
1.0	INTRODUCTION TO MACHINE DESIGN	6
	1.1 Definition of machine design, phases of design process, design considerations	

	1.2	Introduction to Indian Standards, IS codes related to preferred numbers (IS: 1076) and standard sizes.	
	1.3	Limits, Fits and Tolerances – Basic Hole System, Basic Shaft System, reading of tables from IS 919, 2709; Use in engineering drawing, selection of standard limits and fits from Indian Standard.	
	1.4	Surface Roughness: Definitions, symbols	
	1.5	Indian Standard on Steels, their physical properties (IS: 1570)	
	1.6	Types of loads, stress concentration and factor of safety	
2.0	SCREW THREADS AND JOINTS		20
	2.1	Design of screwed joints; Internal stresses due to screwing up forces, stresses due to external forces, stresses due to combined load, design of bolts or studs for cylinder cover, bolts of uniform strength, design of nut, bolted joints under eccentric loading.	
	2.2	Power Screw: Force analysis of power screw, design of power screw and nut.	
	2.3	Drawing of screwed joints and power screws.	
	2.4	Design of Cotter and Knuckle joints	
	2.5	Design of Pipe joints	
3.0	SHAFTS AND SHAFT COUPLING		12
	3.1	Design of shafts on the basis of strength and rigidity - solid shaft, hollow shaft.	
	3.2	Design of axles.	
	3.3	Design of shafts subjected to a) fluctuating loads b) axial load in addition to combined torsion and bending load.	
	3.4	Design of shaft and shaft coupling for a specified duty.	
4.0	BEARINGS		12
	4.1	Simple loaded shafts mounted on bearings, calculations (shaft diameter and bearing loads)	
	4.2	Types of bearings, bearing materials, bearing lubrication (IS: 10260, IS 11473)	
	4.3	Design and drawing of journal bearing (simple type)	

	4.4	Rolling Contact Bearing – types, standard dimensions and designations of bearings, selection of rolling element bearing from catalogues / handbooks	
	4.5	Design and drawing of shaft mounted on anti-friction bearings.	
5.0	DRIVES		15
	5.1	Pulleys – design of hub rims, arm, key and key ways	
	5.2	Drawing on related problems on pulleys	
	5.3	Spur Gears – calculation of number of teeth, gear ratio, forces acting between gear wheels, selection of gear dimensions.	
	5.4	Drawing of simple gear drives and pulley drives	
<u>PRACTICAL:</u>			
6.0	COMPUTER AIDED DRAFTING		25
	Use of AutoCAD or any other drafting package to make as Isometric and perspective and assembly drawings of any of the above components.		
			Total: 90

NOTE:

Students will draw detail and assembly drawings, from design drawing or from given problems considering the assembly difficulties, manufacturing requirements, material, standard parts, standard fits and tolerance. They are to use design calculation only to check the dimensions of the relevant parts.

REFERENCE BOOKS:

1. P. C. Sharma and D. K. Aggarwal : *Machine Design* - S. K. Kataria & Sons, Delhi
2. R. L. Khurmi and J. K. Gupta: *Machine Design* – Eurasia Publishing House Ltd.
3. R. B. Gupta: *Machine Design* – Satya Prakashan, New Delhi
4. J. E. Shigley and Charles R. Mischke : *Mechanical Engineering Design* - Mc Graw-Hill Book Company.
5. N. C. Pandya and C. S. Shah: *Elements of Machine Design* - Charotar Publishing House, Anand.
6. Allen S. Hall, Alfred R. Holowenko and Herman G. Laughlin: *Schaum's Outline of theory and Problems of Machine Design* - Mc Graw – Hill Book Company.
7. Sham Tickoo, Santosh Tickoo and Renu Muthoo : *Auto CAD – 14 For Windows Bible* – Galgotia Publications Pvt. Ltd.
8. M. F. Spotts : *Design of Machine Elements* – Prentice Hall of India Limited
9. Aaron D. Deutschman, Walter J. Michels and Charles E. Wilson: *Machine Design: Theory and Practice* – Macmillan Publishing Co.Inc
10. P.Kannaiah: *Machine Design*- Scitech Publications (India) Pvt. Ltd., Chennai-600 017.
11. S. G. Kulkarni *Machine Design* - Tata McGraw-Hill Publishing Company Limited
12. S. N. Trikha *Machine Design Exercises* - Khanna Publishers
13. Siraj Ahmed: *Mechanical Engineering Design: Principles and Concepts* – PHI Learning Pvt. Ltd., Delhi.
14. IS: 1076 (Part 1 and 2): 1985 Bureau of Indian Standards
15. IS: 919 (Part 1 and 2): 1993 Bureau of Indian Standards
16. IS: 10260 (Part 1, 2, 3): 1982 Bureau of Indian Standards
17. IS : 14478 : 1997 Bureau of Indian Standards

INDUSTRIAL FLUID POWER (Elective-I)

L T P
3 0 2

Total Contact Hrs.:**Total Marks: 150**

Theory: 45

Practical: 30

Prerequisite: Nil

Credit: 4**Curri. Ref. No.: ME601****Theory:**

End Term Exam :70

P.A.: 30

Practical: 25

P.A.:25

RATIONALE:

Use of oil hydraulics systems and pneumatic systems all fields of engineering as clean source of motive power and low cost automation with the use of pneumatic systems.

AIM:

The students should be able to identify various hydraulic and pneumatic components, know working principles and detect fault in hydraulic and pneumatic circuits.

COURSE CONTENT:**THEORY:**

UNIT	TOPIC/SUB-TOPIC	Lecture hrs.
1.	Introduction To Fluid Power And Its Applications	2
	History of fluid power, Definition of fluid power, Advantage of fluid power, application of fluid power.	
2.	Classification Of Fluid Power	2
	Various types of fluid powered systems.	
3.	Energy And Power In Hydraulic Systems	3
	Application of Pascal's law, Conservation of energy, the continuity equation, hydraulic horse power, Bernoulli's equation, energy, power and flow rate in the SI Metric System.	

4.	The Source Of Hydraulic Power: Pumps	6
	Pumping theory, pump classification – Gear, vane, piston, pump performance, pump noise, pump selection.	
5.	Linear Actuator (Hydraulic Cylinder)	4
	Overall operating features, cylinder mountings and mechanical linkages, cylinder force, velocity and power, cylinder cushions, mechanics of hydraulic cylinder loadings, telescopic cylinder.	
6.	Rotary Actuator (Hydraulic Motor)	2
	Classification: Gear, Vane, Piston; hydraulic motor theoretical torque, power and flow rate, hydraulic motor performance.	
7.	Valves And Other Control Components In Hydraulic Systems	6
	Direction control valves, pressure control valves, flow control valves, cartridge valves, pressure and temperature switches, hydraulic accumulators, pressure intensifiers, servo valves.	
8.	Hydraulic Conductors And Fittings	2
	Conductor sizing, pressure ratings of conductors, steel pipes, steel tubing, plastic tubing, flexible hoses, quick disconnect couplings, metric size tubing.	
9.	Hydraulic Circuits And Applications	5
	Symbols of hydraulic components, single acting and double acting hydraulic circuits, hydraulic circuits – hydraulic press, traverse and feed circuit applied to machine tool	
10.	Components Of Pneumatic Systems	5
	Properties of air, the perfect gas laws, compressors, fluid conditioners, air control valves, pneumatic actuators.	
11.	Pneumatics: Circuit And Applications	5
	Symbols of pneumatic components, Pneumatic circuits with air pressure losses in pipelines, simple multicylinder circuits, application of pneumatic systems.	
12.	Troubleshooting Aspects Of Hydraulic And Pneumatic Circuits.	3
	Maintainability aspects of hydraulic and pneumatic systems.	
	TOTAL:	45

13.0	PRACTICAL	30 Hours
	<ul style="list-style-type: none"> i. Study of operating principle of Gear pump, Vane pump, Piston pump ii. Study of operating principle of two stage reciprocating compressor iii. Assembly and study of different types of hydraulic circuits iv. Assembly and study of different types of pneumatic circuits v. Drawing study and drawing of the hydraulic circuits of various types of machine tools and laboratory equipment. vi. Fault diagnosis of hydraulic and pneumatic circuits 	
	TOTAL:	45

REFERENCE BOOKS:

1. Anthony Esposito: *Fluid power with applications* - Prentice Hall International, Inc
2. S.R. Majumdar: *Oil Hydraulics* - Tata Mc Graw Hill
3. S.R. Majumdar: *Pneumatic System: Principles and Maintenance* - Tata Mc Graw Hill
4. D.D. Banks, D.S.Banks: *Industrial Hydraulics* - Prentice Hall
5. A.B.Goodwin: *Power Hydraulics* - B.I. Publications
6. Chris Stacey: *Practical Pneumatics* - Arnold Publications

WORKSHOP PRACTICE – V

L T P
0 0 4

Total Contact Hrs.: **Total Marks: 50**

Theory: 0

Practical: 60

Pre-requisite: Nil

Credit :2

Curri. Ref. No.: mE508

Practical:

End Term Exam: 0

P.A.: 0

Practical:

End Term Exam: 0

P.A.: 50

Rationale

The wealth of a community is measured by the variety and quality of the articles it possesses for its use and consumption. All the materials we possess are made from substances won from the earth, or from nature. Our property depends upon our ability to convert these raw materials into useful articles for consumption, and to distribute these articles equitably amongst the various members of our community. The production of our engineering workshops is important since a large proportion of our industries is of an engineering nature. Our ability, therefore, to maintain a high standard of skill in our engineering workshops is an important factor.

Aim

To use and describe the tools, materials and working principles of various processes for pattern making shops, foundry shops, and electric shops.

COURSE CONTENTS

UNIT	TOPIC/SUB-TOPIC	Contact Hrs.
1.0	MACHINE SHOP	30
	1.1 Shop Talk	
	1.1.1 Description of the various methods of taper turning with demonstration on a centre lathe.	
	1.1.2 Description of the various job holding devices like face plate, angle plate, collet, seady rest, follower rest of a center lathe.	

	1.1.3	Description of cutting of L.H. threads, multiple start threads with demonstration.
	1.1.4	Study of turret & capstas lathe, common tools and attachments used on turret/capstan lathe, and demonstration of making some simple parts using various tools. Specification of a capstan/turret lathe.
	1.1.5	Study of various types of milling machines, functions of different components and accessories and their care and maintenance. Specification of a milling machine.
	1.1.6	Study of different types of milling cutters, their specification and method of cutter sharpening.
	1.1.7	Demonstration of job and tool setting on a milling machine
	1.1.8	Study of radial drilling machine, their specification and uses
	1.1.9	Demonstration of boring and reaming, operations of a single point H.S.S. cutting tool
	1.1.10	Study of a cylindrical grinder, etc. specific uses and demonstration of operation. Selection of grinding wheel for a job.
	1.1.11	Study of Capstan and Turret, introduction to semi-automatic lathe
	1.1.12	Study of a CNC lathe
	1.2	Shop practice
	1.2.1	Facing operation by holding a job in a four jaw chuck.
	1.2.2	Plain turning operation through setting a graduated collar on a cross-slide.
	1.2.3	Right hand (R.H.) left hand (L.H.) square and V-thread cutting (external and internal) including,drilling and boring.
	1.2.4	Step turning by using a R.H. knife tool, Aligning, lathe centres by visual alignment, aligning lathe,centre using tail stock graduation, aligning lathe, centres using trial cut method, aligning lathe,centres using test bar & dial indicator.
	1.2.5	Preparation flat, inclined surface, slots, key way on a M. S. / C.I. in milling machine.
	1.2.6	Making of spur gear of a given D. P. on CI/MS blank on a milling machine.
	1.3	Tests and Viva-Voce

2.0	ADVANCED FITTING SHOP		30
2.1	Shop Talk		
	2.1.1	Vernier caliper graduations and reading of vernier caliper and measurement of drilled angles.	
	2.1.2	Standard tapers, special purpose files and constructional features of a micrometer.	
	2.1.3	Description and use of slip gauges, sine bar and centre gauges	
	2.1.4	Demonstration and use of dial test indicator	
	2.1.5	Running and routine maintenance of tools and machineries, breakdown maintenance of machines.	
2.2	Shop Practice		
	2.2.1	Selection and determination of slip gauges for different sizes.	
	2.2.2	Determination of taper using sine bar and step Gauges.	
	2.2.3	Determination of internal dovetail angle using rotters and slip gauges.	
	2.2.4	Measurement of effective diameter and minor diameter of a screw thread.	
	2.2.5	Calculation of internal and external diameter using rollers and slip gauges	
		Total Hours	60

REFERENCE BOOKS :

1. Fitter – Trade practical (1st year and 2nd year), Central Instructional Media Institute, Madras, Directorate General of Employment & Training, Ministry of Labour, Govt. of India.
2. Machinist – Trade practical (1st year and 2nd year), Central Instructional Media Institute, Madras, Directorate General of Employment & Training, Ministry of Labour, Govt. of India.
3. P. L. Jain.: *Principles of Foundry Technology* - Tata McGraw Hill Publishing Company Limited
4. Serope Kalpakjian: *Manufacturing Engineering and Technology* - Addison Wesley Publishing Company.
5. P. N. Rao: *Manufacturing Technology: Foundry, Forming and Welding* - Tata McGraw Hill Publishing Company Limited.
6. R. S. Khurmi Gupta & J. K. Gupta: *A Textbook of Workshop Technology (Manufacturing Process)* – S. Chand & Company Limited.
7. P, Kannaiah & K. L. Narayana: *Workshop Manual* – Scitech Publications (India) Pvt. Ltd.
8. S.K. Hajra Choudhury: *Workshop Technology Vol 1 &2* - Media Promoters of Publishers
9. O.P. Khanna: *Workshop Technology* - Dhanpat Rai & Sons Publications
10. Chapman *Workshop Technology Parts 1 & 2, 4th Edition* - Viva Books P. Ltd., New Delhi
11. Kenyon Pitman *Basic Fabrication & Welding* - Pitman Pub. Ltd.

PROFESSIONAL PRACTICE – IV

L T P
0 0 3

Curri. Ref. No.: ME514

Total Contact Hrs.: Total Marks: 50

Practical:

Theory: 0

P.A.: 50

Practical: 45

Pre-requisite: Nil

Credit :2

RATIONALE :

To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through Industrial visits, expert lectures, seminars on technical topics and group discussion.

AIM:

- Student will be able to:
- Acquire information from different sources.
- Prepare notes for given topic.
- Present given topic in a seminar.
- Interact with peers to share thoughts.
- Prepare a report on industrial visit, expert lecture

CONTENTS	ACTIVITIES	Hrs.
1. Industrial Visits		8
Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work. (2 visits) Following are the suggested types of Industries/ Fields –		
1) Automobile manufacturing / auto component manufacturing units to observe the working of SPM.		
2) Refrigeration and air conditioning manufacturing / servicing units / industries / workshops.		
3) Automobile service stations for four wheelers.		

4)	Co-ordinate measuring machine to observe its construction working specifications and applications.
5)	Auto Engine Testing unit to gather details regarding the testing procedures/parameters etc.
6)	Wheel Balancing unit for light and / or heavy motor vehicles.
7)	Food processing unit.
8)	Textile industry machinery manufacturing / servicing units.
9)	Hydro electric and Thermal power plants.
10)	Automotive Research Association of India, Pune, Central Institute of Road Transport, Pune, Vehicle Research and Development establishment , Ahmednagar.
11)	Engine testing, exhaust gas analysis and vehicle testing.
12)	PWD workshop.
13)	Safety museum at Central Labour Institute, Sion, Mumbai.
2	The Guest Lectures
	From field/industry experts, professionals to be arranged (2 Hrs duration), minimum 4 nos. from the following or alike topics. The brief report to be submitted on the guest lecture by each student as a part of Term work
	a) Electronic fuel injection systems
	b) Exhaust gas analysis.
	c) Vehicle testing.
	d) Transducer application in automobiles.
	e) Environmental pollution & control.
	f) Vehicle aerodynamics & design.
	g) Earth moving machines.
	h) Automobile pollution, norms of pollution control.
	i) Biotechnology
	j) Nanotechnology
	k) Rapid prototyping
	l) Programmable logic controllers
	m) TQM
	n) MPFI
	o) Hybrid motor vehicles

	<p>p) Packaging technology q) Appropriate technology r) Six sigma systems s) LPG / CNG conversion kit.</p>	
3	Group Discussion:	4
	<p>The students should discuss in group of six to eight students and write a brief report on the same, as a part of term work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are (any one) –</p> <ol style="list-style-type: none"> i. CNG versus LPG as a fuel. ii. Petrol versus Diesel as a fuel for cars. iii. Trends in automobile market. iv. Load shading and remedial measures. v. Rain water harvesting. vi. Trends in refrigeration Technology. vii. Disaster management. viii. Safety in day to day life. ix. Energy Saving in Institute. x. Nano technology. 	
4	Seminar: (Any 2 Topics)	8
	<p>Seminar topic should be related to the subjects of fifth semester / topics from guest lectures. Students shall submit a report of at least 10 pages and deliver a seminar (Presentation time - 10 minutes for a group of 2 students)</p>	
5	Mini Projects: (In A Group Of 4-5 Students)	6
	<ol style="list-style-type: none"> 1. Design / drawing of simple jigs, fixtures. 2. Thermocouple based temperature controller. 3. Pump on / off timer. 4. Models of jigs / fixtures. 5. Layout design of SSI units / factory / workshop of the institute. 	
6	Models Of Material Handling Route Systems Or Modular Course On Any One Of The Suggested Or Alike Relevant Topic Be Undertaken By A Group Of Students (Min 10):	9
	a) LPG/CNG conversion of vehicles	

	<p>b) Advance features in CAD - CAM c) basics of PLC programming d) die design e) JIT techniques f) Nontraditional manufacturing methods g) jigs and fixture design h) 3D Modeling i) finite element method j) Mechatronics k) Advanced computer programming l) maintenance of home appliances m) value stream mapping n) Piping technology</p>	
7	Student Activities:	5
	<p>Students in a group of 3 to 4 shall perform any two of the following activities (Other similar activities may be considered) and write a report as a part of term work.</p> <p>ACTIVITIES:-</p> <ol style="list-style-type: none"> 1. Collection of data regarding loan facilities or other facilities available through different organizations / banks to budding entrepreneurs 2. Survey and interviews of successful entrepreneurs in nearby areas 3. Survey of opportunities available in thrust areas identified by Government or DIC. 4. Measuring Screw thread parameters on floating carriage dial micrometre and select the optimum diameter of wire. 5. Survey of data regarding different types of pumps with specifications from manufacturers catalogue, local markets, end users (any other engineering products may be considered for survey) 6. Survey of farm implements used by farmers 	

TEXT BOOKS:

1. Mark Ratner and Daniel Ratner: *Nanotechnology* - Pearson Educatuion, New Delhi
2. YoramKorem: *Computer Control of Manufacturing System* - Mcgraw Hill Publication
3. Sunil Chopra, Peter Meindl: *Supply Chain Management* - Pearson Educatuion, New Delhi.

Sample path for Term V in Mechanical Engineering.

S l. N o	Code	Course	Study Scheme			Evaluation Scheme							Total Marks	Credit		
			Pre-requisite	Contact Hours / Week			Theory			Practical						
				L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment				
								Class Test	Assign ment	Attend ance		Sessi onal			Viva voce	
1	G304	Soft Core-II (Entrepreneurship development)		3	0	0	70	15	10	5	0	0	0	100	3	
2	ME501	Machine Tools - I		3	0	0	70	15	10	5	0	0	0	100	3	
3	ME504	Automobile Engineering		3	0	2	70	15	10	5	0	25	25	150	4	
4	ME601	Industrial Fluid Power		3	0	2	70	15	10	5	25	25	0	150	4	
5	ME505	Production Management		3	0	0	70	15	10	5	0	0	0	100	3	
6	ME506	Machine Design		3	0	2	70	15	10	5	25	25	0	150	4	
7	ME508	Workshop Practice-V		0	0	4	0	0	0	0	0	25	25	50	2	
8	ME514	Professional Practice-IV		0	0	3	0	0	0	0	0	50	0	50	2	
TOTAL					18	0	13	420	90	60	30	50	150	50	850	25