

INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

L T P
4 - -

RATIONALE

The knowledge of this subject is required for all engineers/technicians who wish to choose industry/field as their career. This course is designed to develop understanding of various functions of management, role of workers and engineers and providing knowledge about industrial and tax laws.

DETAILED CONTENTS

1. Principles of Management (12 hrs)
 - 1.1 Management, Different Functions: Planning, Organising, Leading, Controlling
 - 1.2 Organizational Structure, Types, Functions of different departments
 - 1.3 Motivation: Factors, characteristics, methods of improving motivation, incentives, pay, promotion, rewards, job satisfaction, job enrichment
 - 1.4 Need for leadership, Functions of a leader, Factors for accomplishing effective leadership, Manager as a leader, promoting team work
 - 1.5 Introduction to operations management and MIS
2. Human Resources Development (03hrs)
 - 2.1 Introduction, objectives and functions of human resource development (HRD) department.
 - 2.2 Recruitment, methods of selection, training strategies and career development
3. Wages and Incentives (03 hrs)
 - 3.1 Definition and factors affecting wages, methods of wage payment.
 - 3.2 Wage incentive – type of incentive, difference in wage, incentive and bonus; incentives to supervisor.
 - 3.3 Job evaluation and merit rating.

4. Human and Industrial Relations (06 hrs)
 - 4.1 Human relations and performance in organization
 - 4.2 Understand self and others for effective behaviour
 - 4.3 Behaviour modification techniques
 - 4.4 Industrial relations and disputes
 - 4.5 Relations with subordinates, peers and superiors
 - 4.6 Characteristics of group behaviour and trade unionism
 - 4.7 Mob psychology
 - 4.8 Grievance, Handling of grievances
 - 4.9 Agitations, strikes, Lockouts, Picketing and Gherao
 - 4.10 Labour welfare schemes
 - 4.11 Workers' participation in management
5. Professional Ethics (03 hrs)
 - 5.1 Concept of professional ethics
 - 5.2 Need for code of professional ethics
 - 5.3 Professional bodies and their role
6. Sales and Marketing management (08 hrs)
 - 6.1 Functions and duties of sales department
 - 6.2 Sales forecasting, sales promotion, advertisement and after sale services.
 - 6.3 Concept of Marketing.
 - 6.4 Problems of Marketing.
 - 6.5 Pricing policy, break even analysis
 - 6.6 Distribution channels and methods of marketing.
7. Labour Legislation Acts (as Ammended on date) (06 hrs)
 - 7.1 Factory Act 1948.
 - 7.2 Workmen's Compensation Act 1923.
 - 7.3 Apprentices Act 1961.
 - 7.4 PF Act, ESI Act
 - 7.5 Industrial Dispute Act 1947
 - 7.6 Employers State Insurance Act 1948
 - 7.7 Payment of Wages Act, 1936

8. Entrepreneurship Development (06 hrs)
- 8.1 Concept of entrepreneur and need of entrepreneurship in the context of prevailing employment conditions.
 - 8.2 Distinction between an entrepreneur and a manager.
 - 8.3 Project identification and selection.
 - 8.4 Project formulation.
 - 8.5 Project appraisal.
 - 8.6 Facilities and incentives to an entrepreneur
9. Environmental Engineering (05 hrs)
- 9.1 Ecology
 - 9.2 Factory causing pollution
 - 9.3 Effects of pollution on Human health
 - 9.4 Air pollution and control
 - 9.5 Water pollution and control
 - 9.6 Solid waste management
 - 9.7 Noise pollution and its control
 - 9.8 Environmental protection Act at State and National level
10. Accidents and Safety (04 hrs)
- 10.1 Classification of accidents based on nature of injuries, event and place.
 - 10.2 Causes and effects of accidents
 - 10.3 Accident-prone workers
 - 10.4 Action to be taken in case of accidents with machines, electric shock, fires and erection and construction accidents.
 - 10.5 Safety consciousness and publicity
 - 10.6 Safety procedures
 - 10.7 Safety measures - Do's and Don'ts and good housing keeping

11. Materials Management (4 hrs)
- Inventory control models, ABC Analysis, Safety stock, Economic ordering quantity, Stores equipment, Stores records, purchasing procedures, Bin card, Cardex, Material handling techniques
12. Financial Management (4 hrs)
- Importance of ledger and cash book, Profit and loss Account, Balance sheet, Interpretation of Statements, Project financing, Project appraisal, return on investments

RECOMMENDED BOOKS

1. Industrial Engineering and Management by O.P.Khanna; Dhanpat Rai and Sons, Delhi
2. Industrial Organization and Management by Tara Chand; Nem Chand and Brothers; Roorkee.
3. Marketing Management by Phillip Kotler; Prentice Hall of India, New Delhi
4. Environmental and Pollution Awareness by BR Sharma; Satya Prakashan, New Delhi.
5. Industrial Organisation and Engineering Economics by Banga and Sharma; Khanna Publishers, Delhi.
6. Industrial Management by C.L. Mahajan; Saluja Parkashan, New Delhi.
7. Management by Jams A Stoner, R Edward Freeman and Daniel R. Gilbrat, JR, Sixth Edition, Pearson Education, New Delhi
8. Industrial Management by VK Sharma, OP Harkut
9. Thakur Kailash, Environment Protection Law & Policy in India: Deep & Deep publication, New Delhi.
10. Handbook of Small Scale Industry by P.M. Bhandari.
11. Principles of Management by Philip Kotler, TEE Publication.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	12	20
2	3	5
3	3	5
4	6	10
5	3	5
6	8	12
7	6	10
8	6	10
9	5	8
10	4	5
11	4	5
12	4	5
Total	64	100

MAINTENANCE ENGINEERING

L	T	P
4	-	2

RATIONALE

A diploma engineer comes across installation, maintenance, testing of various machines and equipment in industries. The layout of different machines, their foundation is in an important phenomenon of an industry. He should know the various methods of testing and maintenance. This subject will enable diploma holders to deal with such aspects.

DETAILED CONTENTS

1. Introduction

- 1.1 Necessity and advantages of testing, repair and maintenance
- 1.2 Economic aspects, manpower planning and materials management
- 1.3 Fits and tolerances – common fits and tolerances used for various machine parts

2. Erection and Commissioning of Machines (Installation)

- 2.1 Location, layout and positioning of machines
- 2.2 Foundation – types of foundation, foundation plan, erection and leveling, grouting, vibration damping, vibration isolation – methods of isolation, anti vibration mounts.

3. Testing of Machines

- 3.1 Testing equipment – dial gauge, mandrel, spirit level, straight edge, auto collimator
- 3.2 Testing methods – geometrical/alignment test, performance test, testing under load, run test, vibrations, noise

4. Lubrication Systems

- 4.1 Lubrication methods and periodical lubrication chart for various machines (daily, weekly, monthly)
- 4.2 Handling and storage of lubricants
- 4.3 Lubricants conditioning and disposal
- 4.4 Lubricant needed for specific components such as gears, bearings, and chains
- 4.5 Purpose and procedure of changing oil periodically (like gear box oil)

5. Repairing

- 5.1 Common parts which are prone to failure, reasons of failure
- 5.2 Repair schedule
- 5.3 Parts that commonly need repair such as belts, couplings, nuts, and bolts

6. Maintenance

- 6.1 Definition, advantages, limitations and types of maintenance viz. preventive, breakdown, predictive
- 6.2 Organization of maintenance
- 6.3 Introduction to computerized maintenance record
- 6.4 ISO standards for maintenance documentation
- 6.5 Introduction to machine history card – purpose and advantages
- 6.6 Preparation of yearly plan for preventive maintenance
- 6.7 Need of frequently needed spare parts inventory

LIST OF PRACTICALS

- 1. Preparation of prevention maintenance check.
- 2. Condition monitoring by non destructive testing.
- 3. Case study on trouble free maintenance.
- 4. Project on maintenance of utility equipment like compressors, pumps, driers, valves (actuator type valves).
- 5. Equipment/machine leveling and alignment.
- 6. Maintenance of material handling equipment – pulley blocks, hand operated cranes, fork lifts, hydraulic jacks, mobile cranes, winches.
- 7. Use of lubrication equipment like oil gun, grease gun.
- 8. Removing old lubricant, cleaning and replenishing the machine with fresh lubricant.
- 9. Case study on computerized maintenance schedule.
- 10. Reconditioning of machine parts.
- 11. Replacing gear.
- 12. Replacing bearings (all types).
- 13. Practically making different types of fits.

INSTRUCTIONAL STRATEGY

- 1. Lay greater emphasis on practical aspects of maintenance.
- 2. Make use of transparencies, video films and CD's.
- 3. Expose the students to real life situation.
- 4. Promote continued learning through properly planned assignments.
- 5. Demonstrate sample of all types of gear and bearings.

RECOMMENDED BOOKS

- 1. Industrial Maintenance by HP Garg; S. Chand and Company, Delhi.
- 2. Plant Maintenance Engineering by RK Jain; Khanna Publishers, Delhi.
- 3. Installation, Servicing and Maintenance by SN Bhattacharya; S Chand and Company, Delhi.
- 4. Maintenance Engineering and Management by RC Mishra and K Pathak; Prentice Hall of India Pvt. Ltd., New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

S.No.	Time Allotted (Hrs)	Marks Allotted (%)
1	8	12
2	10	15
3	12	20
4	12	20
5	10	15
6	12	18
Total	64	100

PRODUCTION TECHNOLOGY

L	T	P
3	-	6

RATIONALE

This subject provides knowledge of various metal forming processes viz. press working, forging, rolling, modern machining processes, jig and fixtures, plastic processes, coating processes and finishing processes which is required for mechanical diploma holders to work in manufacturing industries.

DETAILED CONTENTS

1. Metal Forming Processes

1.1 Press Working

- 1.1.1 Press working –
Types of presses, type of dies, selection of press die, die material
- 1.1.2 Press Operations-
Shearing, piercing, trimming, punching, notching, shaving,
gearing, embossing, stamping

1.2 Forging

- 1.2.1 Open die forging, closed die forging
- 1.2.2 Press forging, upset forging, swaging, up setters, roll forging
- 1.2.3 Cold and hot forging

1.3 Rolling

- 1.3.1 Elementary theory of rolling
- 1.3.2 Types of rolling mills
- 1.3.3 Thread rolling, roll passes
- 1.3.4 Rolling defects and remedies

1.4 Extrusion and Drawing

- 1.4.1 Type of extrusion- Hot and Cold, Direct and indirect
- 1.4.2 Pipe drawing, tube drawing

2. Modern Machining Processes

2.1 Mechanical Process

- 2.1.1 Ultrasonic machining (USM): Introduction, principle,
process, advantages and limitations, applications

- 2.2 Electro Chemical Processes
 - 2.2.1 Electro chemical machining (ECM) – Fundamental principle, process, applications
 - 2.2.2 Electro chemical Grinding (ECG) – Fundamental principle, process, application
- 2.3 Electrical Discharge Machining (EDM)
 - 2.3.1 Introduction, basic EDM circuit
 - 2.3.2 Principle, metal removing rate, dielectric fluid, applications
- 2.4 Laser beam machining (LBM) – Introduction, machining process and applications
- 2.5 Electro beam machining (EBM)- Introduction, principle, process and applications
- 2.6 Plasma arc machining (PAM) and welding – Introduction, principle process and applications

3. Jigs and Fixtures

- 3.1 Importance and use of jigs and fixture
- 3.2 Principle of location
- 3.3 Locating devices
- 3.4 Clamping devices
- 3.5 Types of Jigs – Drilling jigs, bushes, template jigs, plate jig, channel jig, leaf jig.
- 3.6 Fixture for milling
- 3.7 Advantages of jigs and fixtures

4. Plastic Processes

- 4.1 Injection moulding – working principle, advantages and limitations
- 4.2 Blow moulding – working principle, advantages and limitations
- 4.3 Compression moulding – Working principle, advantages and limitations

5. Metallic and Non Metallic Coating Processes

- 5.1 Metal spraying – Wire process, powder process, applications
- 5.2 Electro plating, anodizing and galvanizing
- 5.3 Organic coatings- oil base paint, rubber base coating
- 5.4 Properties and uses of varnishes, paints including primers and enamels

6. Metal Finishing Processes

- 6.1 Purpose of finishing surfaces.
- 6.2 Surface roughness-Definition and units
- 6.3 Honing Process, its applications
- 6.4 Description of hones.
- 6.5 Brief idea of honing machines.
- 6.6 Lapping process, its applications.

- 6.7 Description of lapping compounds and tools.
- 6.8 Brief idea of lapping machines.
- 6.9 Super finishing process, its applications.
- 6.10 Use of super finishing attachment on center lathe.
- 6.11 Polishing
- 6.12 Buffing.

7. Power Metallurgy

- 7.1 Introduction, principle, scope of process
- 7.2 Production of metal powders, sintering and finishing operations and extrusion
- 7.3 Advantages, limitations and applications of powder metallurgy

PRACTICAL EXERCISES

- 1. Preparation of chisel from round rod.
- 2. To forge squares on both ends of a circular rod.
- 3. Exercise on EDM Machine.
- 4. Exercise on electro plating.
- 5. Preparation of a drilling jig.
- 6. Preparation of a milling fixture.

INSTRUCTIONAL STRATEGY

- 1. Teachers should lay special emphasis in making the students conversant with concepts, principles, procedures and practices related to various manufacturing processes.
- 2. Focus should be laid on preparing jobs using various machines/equipment in the workshop.
- 3. Use of audiovisual aids/video films should be made to show specialized operations.

RECOMMENDED BOOKS

- 1. Manufacturing Technology by Rao; Tata McGraw Hill Publishers, New Delhi.
- 2. Manufacturing Technology by M. Adithan and A.B. Gupta; New Age International (P) Ltd., New Delhi.
- 3. Workshop Technology Vol. I, II, III by Chapman; Standard Publishers Distributors, New Delhi.
- 4. Practical Handbook for Mechanical Engineers by Dr. AB Gupta; Galgotia Publications, New Delhi.
- 5. Production Technology by HMT; Tata McGraw Publishers, New Delhi.

6. Principle of Metal Cutting by Bhattacharya; Standard Publishers Distributors, New Delhi.
7. Production Engineering and Science by Pandey and Singh; Standard Publishers Distributors, New Delhi.
8. Modern Machining Process by Pandey; Tata McGraw Publishers, New Delhi.
9. Jigs and Fixtures by P.H. Joshi, Tata McGraw Hill Publishers, New Delhi.
10. A text Book of Production Engineering by P.C. Sharma; S. Chand and Company Ltd., New Delhi.
11. Fundamentals of Metal Cutting and Machine Tools by Juneja and Sekhon; Wiley Eastern Limited, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	10	22
2.	10	22
3.	8	16
4.	4	8
5.	4	8
6.	8	16
7.	4	8
Total	48	100

POWER PLANT ENGINEERING

L	T	P
4	-	-

RATIONALE

A diploma holder in mechanical engineering is supposed to manage the power generating plant. In Uttarakhand state, hydropower potential is supposed to be very large. Therefore, he must have relevant knowledge and skills about various power plants e.g. steam power plant, nuclear power plant, hydro power plant, diesel engine power plant and gas turbine power plant. Hence this subject is offered.

DETAILED CONTENTS

1. Introduction

Sources of energy fuels, flowing stream of water, solar rays, wind, terrestrial heat, ocean tides and waves

Concept of power station, central and industrial power station, captive power station, classification of power station with respect to prime mover steam, IC engine, gas turbine and hydro power station, scope in Uttarakhand state

2. Steam Power Plant

2.1 Parameters of power cycle- thermal efficiency, work ratio, specific steam consumption

Rankine cycle flow diagram, representation on thermodynamic planes, thermal efficiency, effect on change of condenser pressure, boiler pressure, degree of super heat on thermal efficiency

Reheat cycle, simple regenerative cycle, (No numerical)

2.2 Steam prime movers

Concept of a prime mover, steam turbine- advantages as a prime mover, principle elements of a steam turbine and functions – nozzles, blades, rotor, shaft, casing, shaft seals, diaphragm, bearings, steam control, oil system

Governing of steam turbines- classification of steam turbines

Starting and stopping procedures for turbines, precautions during running

Performance of steam turbine, Thermal efficiency, efficiency ratio, mechanical efficiency, steam rate

2.3 Steam Condensing Equipment

Functions of condensers, classification, surface condenser components and their functions

Condenser auxiliaries- hot well, condensate pump, vacuum pump, air ejector, circulating pump, atmospheric relief valve

Requirement of a good condensing system

Cooling towers- purpose and types

2.4 Steam power station control

Effect of load variation of various parameters, types of control systems- area and centralized, basic components of a control system, compressed air and electrical control systems, controls and instruments in a modern central station control room

Working of feed water control system and steam temperature control system

Records maintained in a steam power station and their purpose

3. Nuclear Power Plant

Equivalence between mass and energy- Atomic structure of matter, atomic nomenclature, nuclear reactions- fission, fusion, mass defect, binding energy, chain reaction, methods of control of rate of fusion reaction, types of nuclear materials, fissile and fertile materials

Nuclear reactors- elements and functions of different elements, classification on the basis of different criteria

Nuclear power stations employing boiling water reactor, candu type reactor- system components, advantages and disadvantages

Comparison of nuclear power station with a steam power station

Health hazards, safety precautions

4. Diesel Engine Power Plant

Advantages and disadvantages of diesel engine. Essential elements of diesel power plant. Fuel injection system performance, testing of diesel engine power plant

5. Gas Turbine Power Plant

Brayton cycle- schematic diagram, thermal efficiency. Advantages of gas turbines over diesel engines. Classification of gas turbines, advantages and disadvantages, methods of improving thermal efficiency, Important parts and their functions, Essential auxiliaries and controls for gas turbine power plant. Fuel for gas turbines

6. Hydro Power

Advantages, basic elements, dams, head works, water turbines, classification of water turbines, speed and pressure control, plant auxiliaries, plant operation, potential in Uttarakhand state, detailed working

INSTRUCTIONAL STRATEGY

Treatment of the subject will be subjected to analysis and examples. One visit to Power plant station is compulsory.

RECOMMENDED BOOKS

1. A course in Power Plant Engineering by S. Domkundwar & Arora; Dhanpat Rai and sons
2. Power Plant Engineering by G.B.S Narang
3. Power plant engineering by G.R. Nagpal; S.K. Khanna Publishers, Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	4	5
2.	19	30
3.	13	20
4.	6	10
5.	6	10
6.	16	25
Total	64	100

MECHATRONICS

L	T	P
4	-	-

RATIONALE

The mechatronics, the integration of electronic, of electrical engineering, computer technology and control engineering with mechanical engineering is increasingly forming a crucial part in design, manufacture and maintenance of wide range of engineering products and processes. The diploma holders need skills and knowledge that are not confined to a single subject area. They need to be capable of operating and communicating across a range of engineering disciplines and linking those having more specialized skills. So it is important to introduce this subject.

DETAILED CONTENTS

1. Introduction

- 1.1 Introduction to Mechatronics
- 1.2 Mechatronic system
- 1.3 Measurement systems
- 1.4 Control system-open Loop, Close loop and sequential
- 1.5 Microprocessor based controllers
- 1.6 The Mechatronics approach

2. Sensors and Transducers

- 2.1 Sensors and transducers
- 2.2 Performance terminology
- 2.3 Displacement, position and motion sensors
- 2.4 Electromechanical sensors and transducers
- 2.5 Force sensors
- 2.6 Liquid flow sensors
- 2.7 Liquid level sensors
- 2.8 Temperature sensors
- 2.9 Light sensors
- 2.10 Selection of sensors
- 2.11 Simple problems

3. Data Presentation Systems

- 3.1 Displays
- 3.2 Data presentation elements
- 3.3 Magnetic recording
- 3.4 Data acquisition systems
- 3.5 Measurement systems
- 3.6 Testing and calibration
- 3.7 Simple problems

4. Pneumatic and Hydraulic Systems

- 4.1 Actuation systems
- 4.2 Pneumatic and hydraulic systems
- 4.3 Directional control valves
- 4.4 Pressure control valves
- 4.5 Cylinders
- 4.6 Process control valves
- 4.7 Rotary actuators
- 4.8 Simple problems

5. Mechanical Actuation Systems

- 5.1 Mechanical systems
- 5.2 Types of motion
- 5.3 Kinematic chains
- 5.4 Cams
- 5.5 Gear trains
- 5.6 Ratchet and pawl
- 5.7 Belt and chain drives
- 5.8 Bearing
- 5.9 Mechanical aspects of motor selection
- 5.10 Simple problems

6. Electrical Actuation System

- 6.1 Electrical systems
- 6.2 Mechanical switches
- 6.3 Solid-state switches
- 6.4 Solenoids
- 6.5 D.C. motors
- 6.6 A.C. motors
- 6.7 Stepper motors
- 6.8 Problems

7. Basic System Models

- 7.1 Mathematical models
- 7.2 Mechanical systems building blocks
- 7.3 Electrical system building blocks
- 7.4 Fluid system building blocks
- 7.5 Thermal system building blocks
- 7.6 Simple Problems

8. Digital Logic

- 8.1 Digital logic
- 8.2 Number systems
- 8.3 Logic gates

- 8.4 Boolean algebra
- 8.5 Karnaugh maps
- 8.6 Applications of logic gates
- 8.7 Sequential logic
- 8.8 Simple Problems

9. Microprocessors

- 9.1 Control
- 9.2 Microcomputer structure
- 9.3 Microcontrollers
- 9.4 Applications
- 9.5 Programming problems

10. Input/output Systems

- 10.1 Interfacing
- 10.2 Input/output ports
- 10.3 Interface requirements
- 10.4 Peripheral interface adapters
- 10.5 Serial communications interface
- 10.6 Examples of interfacing
- 10.7 Simple problems

11. Programmable Logic Controllers

- 11.1 Programmable logic controllers- Applications
- 11.2 Basic structure
- 11.3 Input/output processing
- 11.4 Programming- ladder diagrams
- 11.5 Mnemonics
- 11.6 Timers, internet relays and counter
- 11.7 Shift registers
- 11.8 Master and jump controls
- 11.9 Data handling
- 11.10 Analogue input/output
- 11.11 Selection of a PLC
- 11.12 Simple problems

INSTRUCTIONAL STRATEGY

- 1. Use computer based learning aids for effective teaching learning.
- 2. Students should be taken to various industrial units for clear conception of various topics.
- 3. Efforts should be made to relate the process of teaching with direct experiences in the industry.

RECOMMENDED BOOKS

1. Mechatronics by HMT, Tata McGraw Hill, New Delhi
2. Mechatronics: Electronic Control System in Mechanical Engineering by W. Bolton; Pearson Education, Singapore.
3. Fundamentals of Electrical Engineering and Electronics by BL Thareja; S. Chand and Company, New Delhi.
4. Basic Electronics by Gupta, NN Bhargava, Kulshreshtha, TTTI, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	4	6
2.	6	10
3.	4	6
4.	8	12
5.	6	10
6.	8	12
7.	4	6
8.	4	6
9.	8	12
10.	4	6
11	8	14
Total	64	100

COMPUTER INTEGRATED MANUFACTURING

L	T	P
4	-	-

RATIONALE

Manufacturing of this century belongs to computerized equipment & machine tools to manufacture a variety of components with high quality, high precision & low cost at a faster rate. Computer Aided Designing (CAD), Computer Aided Manufacturing (CAM), Numerical Control Machine Tools, Computer Aided Process Planning (CAPP), Automated Guided Vehicles (AGVs) & Flexible Manufacturing Systems-all are the part of Computer Integrated Manufacturing (CIM) which help to achieve the desired goals in manufacturing. After studying the subject, the students will be able to know about these integrated techniques which help a manufacturer to achieve his goal with in stipulated time.

DETAILED CONTENTS

1. Introduction

Fundamental of manufacturing, CAD-CAM Meaning, Activities of a CAD/CAM system, Manufacturing components of CAD/CAM integration, system approach in manufacturing, Introduction of Automation and Computer Integrated manufacturing, Concept of CIM.

2. Automation

Automation in manufacturing, Basic concepts of automation, Hard automation, Soft automation, comparison of manual operation, hard automation and flexible (Soft) automation, Trends in manufacturing automation, composition of work force in conventional and automated manufacturing system.

3. Computer System for CAD/CAM/CIM/FMS

Selection of a computer, CAD/CAM Hardware, CAD/CAM system components, computer languages and CIM/FMS, software selection.

4. Robotics

Introduction to robot, robot configuration, degrees of freedom and robotic motions, robot applications.

5. Computer Aided Process Planning (CAPP)

Concepts of group Technology, approaches to process planning-manual approach, variant process planning, Generative process planning; economic regions for different process planning system, role of process planning in computer integrated manufacturing, integrated process planning system, advantages of CAPP.

6. Automated Material Handling

Introduction to material handling, Objectives of material handling, Types of materials to be moved, Integrated material handling, handling system selection, Introduction to Automated Guided Vehicles (AGV), Types of AGV-Wire Guided Vehicles, Painted Guided Vehicle, Free ranging AGVs; Different AGVs guidance system, components of an AGV, AGV's basic function, Advantages of using AGVs, Industrial application of AGVs; Automated storage/retrieval systems, Industrial applications.

7. Flexible Manufacturing System (FMS)

Introduction to FMS, manufacturing flexibility, FMS elements, FMS data Files, Software for FMS, Design aspects of flexible manufacturing, Sequencing & Scheduling in FMS,

8. Introduction to Rapid prototyping and Re engineering

Rapid Prototyping (RP) definition, various RP technologies. Advantages of RP.

Reverse engineering- definition, reverse engineering tools: CMM (CoOrdinate Measuring Machine), white light scanners, laser scanners.

INSTRUCTIONAL STRATEGY

1. Use computer based learning aids for effective teaching learning
2. Students should be motivated to use internet and relevant journals to acquaint them with latest development in automated manufacturing.

INSTRUCTIONAL STRATEGY

1. "Computer Aided Manufacturing" By Surinder Kumar, Aditya Shah; Satya Parkashan, New Delhi
2. "Numerical Control & Computer Aided Manufacturing" By T.K. Kundra, P.N. Rao & N.K.Tewari; Tata McGraw Hills Pub. Co. New Delhi.

3. “Sysetm Apporach to Computer Integrated Design & Manufacturing” By N.Singh; John Willey & Sons Inc.
4. “Computer Integrated Manufacturing Hand Book” By Teicholz, Orr; McGrawHill Book Co.
5. CAD/ CAM by Michael Groover, Zimmers: Prentice hall of India (P) Ltd., New Delhi.
6. Robotics by Yorem Korem, McGraw Hill Publishers, Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	8	12
2.	10	16
3.	8	12
4.	8	12
5.	8	12
6.	9	16
7.	8	12
8.	5	6
Total	64	100

AUTOMOBILE ENGINEERING

L	T	P
4	-	-

RATIONALE

The development of automobile industry and direct and indirect dependence of the present day society on the services of its products has made the knowledge of the technology imperative, this subject deals with automotive needs.

DETAILED CONTENTS

1. Introduction

- 1.1 Automobile and its development
- 1.2 Components of an automobile
- 1.3 Classification of automobiles
- 1.4 Layout of chassis
- 1.5 Types of drives-front wheel, rear wheel, four wheel, left hand, right hand

2. Transmission System

- 2.1 Clutch
 - 2.1.1 Function
 - 2.1.2 Constructional details of single plate and multi plate friction clutches
 - 2.1.3 Centrifugal and semi centrifugal clutch
 - 2.1.4 Hydraulic clutch
- 2.2 Gear Box
 - 2.2.1 Function
 - 2.2.2 Working of sliding mesh, constant mesh and synchromesh gear box
 - 2.2.3 Torque converter and overdrive
- 2.3 Propeller shaft and rear axle
 - 2.3.1 Function
 - 2.3.2 Universal joint
 - 2.3.3 Differential
 - 2.3.4 Rear axle drives and different types of rear axles
- 2.4 Hydraulic clutch
- 2.5 Wheels and Tyres
 - 2.5.1 Types of wheels - disc wheel and wire wheel
 - 2.5.2 Types of tyres used in Indian vehicles
 - 2.5.3 Toe in, toe out, camber, caster, kingpin inclination
 - 2.5.4 Tubeless tyres

3. Steering System

- 3.1 Function and principle
- 3.2 Ackerman and Davis steering gears
- 3.3 Types of steering gears - worm and nut, worm and wheel, worm and roller, rack and pinion type
- 3.4 Power steering
- 3.5 Wheel balancing

4. Braking system

- 4.1 Constructional details and working of mechanical, hydraulic and vacuum brake
- 4.2 Details of master cylinder, wheel cylinder
- 4.3 Concept of brake drum, brake lining and brake adjustment
- 4.4 Air brake

5. Suspension System

- 5.1 Function
- 5.2 Types
- 5.3 Working of coil spring, leaf spring
- 5.4 Shock absorber – Telescopic type
- 5.5 Air suspension

6. Battery

- 6.1 Constructional details of lead acid cell battery
- 6.2 Specific gravity of electrolyte - effect of temperature on specific gravity
- 6.3 Capacity and efficiency of battery
- 6.4 Battery charging, chemical reactions during charge and discharge.
- 6.5 Maintenance of batteries
- 6.6 Checking of batteries for voltage and specific gravity

7. Dynamo and Alternator

- 7.1 Dynamo
 - 7.1.1 Function and details
 - 7.1.2 Regulators - voltage current and compensated type
 - 7.1.3 Cutout - construction, working and their adjustment
- 7.2 Alternator
 - 7.2.1 Construction and working
 - 7.2.2 Charging of battery from alternator

8. Lighting System and Accessories

- 8.1 Lighting system
- 8.2 Wiring circuit
- 8.3 Headlight, aiming of headlights
- 8.4 Lighting switches
- 8.5 Direction indicators
- 8.6 Windscreen wiper
- 8.7 Horn
- 8.8 Speedometer
- 8.9 Heater
- 8.10 Air conditioning

INSTRUCTIONAL STRATEGY

1. Use computer based learning aids for effective teaching learning.
2. Expose the students to real life problems.
3. Plan assignments so as to promote problem-solving abilities and develop continued learning skills.

RECOMMENDED BOOKS

1. Automobile Engineering Vol. I by Dr. Kirpal Singh; Standard Publishers and Distributors, Delhi.
2. Automobile Engineering Vol. I by GBS Narang; Khanna Publishers, Delhi.
3. Automobile Mechanic by Joseph, Heitner; CBS Publishers and Distributors, Delhi.
4. Automobile Mechanics: William Crouse: Tata McGraw Hill
5. Automobile Engineering by R.B Gupta, Satya Parkashan, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	4	6
2.	16	25
3.	8	12
4.	8	12
5.	6	8
6.	8	14
7.	8	14
8.	6	9
Total	64	100

PROJECT WORK

L T P
- - 12

Project work aims at developing skills in the students whereby they apply the totality of knowledge and skills gained through the course in the solution of particular problem or undertaking a project. The students have various aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given for a group. The students should identify or given project assignment at least two to three months in advance. The project work identified in collaboration with industry may be preferred.

Each teacher is expected to guide the project work of 4-5 students.

A suggestive criteria for assessing student performance by the external (personnel from industry) and internal (teacher) examiner is given in table below:

Sr. No.	Performance criteria	Max. marks	Rating Scale				
			Excellent	Very good	Good	Fair	Poor
1.	Selection of project assignment	10	10	8	6	4	2
2.	Planning and execution of considerations	10	10	8	6	4	2
3.	Quality of performance	20	20	16	12	8	4
4.	Providing solution of the problems or production of final product	20	20	16	12	8	4
5.	Sense of responsibility	10	10	8	6	4	2
6.	Self expression/ communication skills	5	5	4	3	2	1
7.	Interpersonal skills/human relations	5	5	4	3	2	1
8.	Report writing skills	10	10	8	6	4	2
9.	Viva voce	10	10	8	6	4	2
Total marks		100	100	80	60	40	20

The overall grading of the practical training shall be made as per following table

	Range of maximum marks	Overall grade
i)	More than 80	Excellent
ii)	79 < 65	Very good
iii)	64 < 50	Good
iv)	49 < 40	Fair
v)	Less than 40	Poor

In order to qualify for the diploma, students must get “Overall Good grade” failing which the students may be given one more chance of undergoing 8 -10 weeks of project oriented professional training in the same industry and re-evaluated before being disqualified and declared “not eligible to receive diploma ”. It is also important to note that the students must get more than six “goods” or above “good” grade in different performance criteria items in order to get “Overall Good” grade.

Important Notes

- 1. This criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.**
- 2. The criteria for evaluation of the students have been worked out for 100 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.**
- 3. The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria.**
- 4. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific nearby industries are approached for instituting such awards.**

The teachers are free to evolve another criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations in such an exhibition. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific industries are approached for instituting such awards.

GENERIC SKILL DEVELOPMENT CAMP – II

As per general feedback received from the employers regarding Technician Engineers during formal interactions, the pass outs of polytechnics are labeled of falling short of employable skills which comprises of Communication, inter-personal relationship, leadership qualities, team work, problem solving, managing task, managing self etc. in addition to technical knowledge and skills. We have, therefore, added papers such as English and Communication Skills and Entrepreneurship Development and Management in the curriculum in addition to proposed camps of 3-4 days to be conducted in polytechnics on common and vital issues e.g. Environmental Awareness, Entrepreneurship Development and Generic Skill Development.

It is proposed that a camp of 3-4 days duration on Generic Skills Development (GSD) during 6th semester be organized by arranging expert lectures/discussion sessions either by polytechnic teachers or by eminent educationists from the neighborhood to deal with the following topics. Few students may also be encouraged to prepare on some of these topics and make presentation during the camp. Expert lectures must be followed by distribution of relevant handouts for further study. The attendance of students should be compulsory and marks be awarded under provision of Student Centred Activities.

It is envisaged that such camps will bring in a significant improvement in confidence level and personality of the pass outs from polytechnics.

Suggested list of topics for arranging lectures/discussion sessions:

1. Ethics and Values
 - 1.1 Introduction and importance
 - 1.2 Ethics and values in profession and society
 - 1.3 Dignity of labour
 - 1.4 Net etiquettes
2. Group Dynamics
 - 2.1 Introduction
 - 2.2 Leadership
 - 2.3 Communication in group
 - 2.4 Team work
3. Personality Development
 - 3.1 PR technique
 - 3.2 Positive attitude
 - 3.3 Self-esteem
 - 3.4 Creativity
4. SWOT Analysis
 - 4.1 Importance
 - 4.2 Introduction to SWOT analysis steps
 - 4.3 SWOT analysis parameters