6.1 INDUSTRIAL MANAGEMENT

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RATIONALE

The knowledge of this subject is required of all diploma holders who wish to choose industry/field as this career. This course is designed to develop understanding of various functions of management, role of workers and engineers and providing knowledge about safety and labour, industrial laws and management in different areas.

DETAILED CONTENTS

1. Principles of Management (2 hrs)

   - Management, different functions of management: Planning, organizing, coordination and control.
   - Structure of an industrial organization.
   - Functions of different departments. Relationship between individual departments.

2. Human and Industrial Relations (4 hrs)

   - Human relations and performance in organization.
   - Understand self and others for effective behaviour.
   - Behaviour modification techniques.
   - Industrial relations and disputes.
   - Relations with subordinates, peers and superiors.
   - Characteristics of group behaviour and trade unionism.
   - Mob psychology
   - Grievance, handling of grievances.
   - Agitations, strikes, lockouts, picketting and gherao
   - Labour welfare.
   - Workers' participation in management.

3. Professional Ethics (4 hrs)

   - Concept of ethics.
   - Concept of professionalism.
   - Need for professional ethics.
   - Code of professional ethics.
   - Typical problems of professional engineers.
   - Professional bodies and their role.

4. Motivation (4 hrs)

- Factors determining motivation
- Characteristics of motivation.
- Methods for improving motivation.
- Incentives, pay, promotion, rewards.
- Job satisfaction and job enrichment.

5. Leadership (4 hrs)

- Need for leadership.
- Functions of a leader.
- Factors for accomplishing effective leadership.
- Manager as a leader.

6. Human Resource Development (4 hrs)

- Introduction.
- Staff development and career development.
- Training strategies and methods

7. Wage Payment (4 hrs)

- Introduction
- Classification of wage payment scheme.

8. Labour, Industrial and Tax Laws (4 hrs)

- Importance and necessity of industrial legislation.
- Types of labour laws and disputes.
- Brief description of the following Acts: The Factory Act 1948; Payment of Wages Act 1936; Workmen Compensation Act 1923; Industrial Dispute Act 1947; Employee' State Insurance Act, 1948; Provident Fund Act.
- Various types of Taxes-Production Tax, Local Tax, Sales Tax, Excise Duty, Income Tax.
- Labour Welfare schemes.

9. Accidents and Safety (4 hrs)

- Classification of accidents; according to nature of injuries i.e. fatal, temporary; according to event and according to place.
- Causes of accidents-psychological, physiological and other industrial hazards.
- Effects of accidents.
- Accidents-prone workers.
- Action to be taken in case of accident with machines, electric shock, road accident, fires and erection and construction accidents.

- Safety consciousness & publicity.
- Safety procedures.
- Safety measures-Do's and don'ts & good housekeeping (5S).
- Safety measures during executions of Electrical Engineering works.

10. Environmental Management (4 hrs)

Basics of environmental pollution, various management techniques for control of environmental pollution, various control acts for air, water, solid waste and noise.

11. Materials Management (4 hrs)

Material in industry, inventory control model, ABC Analysis, Safety stock, Re-order, level, Economic ordering quantity, Stores equipment, Stores records, purchasing procedures, purchase records, Bin card, Cardex, Material handling, Manual lifting, Hoist, Cranes, conveyors, trucks, fork trucks.

12. Financial Management (3 hrs)

Important, ledger, Journal, Profit and Loss Account, Balance Sheet, Interpretation of Statements, Ration Analysis, Project financing, Project appraisal, return on investments.

13. Marketing and Sales (3 hrs)

Sellers and Buyers markets, Marketing, Sales, Market conditions, monopoly, oligraphy, perfect competition, Cost Elements of Cost, Contribution, Break even analysis, Budgets, Pricing Policies.

RECOMMENDED BOOKS

1. Industrial Engineering and Management by TR Banga.
2. Industrial Engineering and Management by OP Khanna, Dhanpat Rai Publications, Delhi.
3. Industrial Management by VK Sharma, OP Harkut.
4. Sharma BR, Environmental and Pollution Awareness: Satya Prakashan, New Delhi.
5. Thakur Kailash, Environment Protection Law & Policy in India: Deep & Deep publication, New Delhi.
6. Handbook of Small Scale Industry by P.M. Bhandari.
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Principles of Management by Philip Kotler, TEE Publication.
9. Industrial Organisation and Management by Tara Chand, Nem Chand and Brothers, Roorkee

6.2 FORGING AND DIE CASTING DIES - DESIGN & DRAWING

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RATIONALE

A diploma holder should be able to conceive, design and draw assembly drawings and detailed part drawings of die casting dies and forging dies with proper dimensioning and calculations. Hence this subject.

DETAILED CONTENT

Section - A

1. **Introduction to Die casting process** (6 hrs)
   Gravity die-casting, pressure die casting, examples of the component, machines used, various casting processes, i.e. investment casting, centrifugal casting. Furnace and its types used for melting the metal.

2. **Die casting machines** (6 hrs)

   Classification & specification, parts and their functions, locking unit, injection unit, ejection unit.

3. **Die casting dies** (12 hrs)

   Gravity die casting: main parts, top gating, side gating, bottom gating, risers, book type mould, rack and pinion mould, draft angle.
   Pressure die casting: Types, main parts- parting line, runner layout, gates, gating formula, location of gates, vents, core shrinkage, cooling methods, overflow, sprue, ejectors, ejector return mechanism, die lubricants and basic calculations, mould release agents.

4. **Introduction to Forging** (4 hrs)

   Various processes of forging, examples of components produced by forging processes, forging equipments and forging die features.

5. **Forging machines** (6 hrs)

   Types of machines, specification and various parts of machines, and their function.

6. **Forging dies** (8 hrs)

Types of forging dies
Closed die hammer forging, closed die press forging, upsetting die forging, cold forging, open dies, extrusion dies, design of component drawing. Design consideration of forging tools such as fuller, edger, bender, blocker, finisher.

7. **Maintenance and storage** (6 hrs)

Maintenance, safety and storage of forging die tools and material, handling of dies.

Section - B

1. Making drawing of relevant topics. Design and drawing of forging and die casting dies for simple components.

Note* Question paper will consist of section A and B.
Section A will contain theory contents up to 40%. Section B will contain design and drawing up to 60% marks.

At least, 2 Industrial visits to the concerned industry involved in forging and die casting dies should be arranged.

RECOMMENDED BOOKS

1. Forging handbook-forging methods by A. Thomas, Drop Forging Research Association, Sheffield Street, Sheffield.
2. Forgine die design and practice by R. Sharam, S.N. Parsad, N.P. Saxena; S. Chand and Company. New Delhi.
3. Die, Mould and Jigs by V. Vladimi Rov, MIR. Publisher.
4. Forging and Forming metal by S.E. Rusinoff, S. Chand and Company, New Delhi.
5. Forging handbook by T.E. Byrer, American Society for metal.
6. Handbook of Die Design by Ivana Suchy; Mc Graw Hill.

6.3 Computer Integrated Manufacturing

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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. Commuter Aided Designing (CAD), Computer Aided Manufacturing (CAM), Numerical Control Machine Tools, Commuter 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** (3 hrs)

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 (5 hrs)

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 (3 hrs)

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

4. NC Production System (5 hrs)

Introduction to Numerical Control, NC machine Tools, NC control unit, Tooling for NC machine, NC part Programming, Computer automated part programming, CNC/DNC and adaptive control, Components of a DNC system, Categories of adaptive control-adaptive control with optimization (ACO), adaptive control with constraints (ACC), Geometric adaptive control (GAC), benefits of adaptive control.

5. Computer Aided Process Planning (CAPP) (5 hrs)

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 (6 hrs)

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) (5 hrs)

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

PRACTICAL EXERCISES

1. **Creating part**s

Sketching, selection of sketch plane, creating feature on work plane, extrude, dimensioning sketches, constraining sketches.

- Create Rectangle, Circle, and Polygons. Extrude these to make box, cylinder & prism and dimension the above part, change size by editing dimensions & using constraints.

2. **Creating Drawing Views**

Planning and setting of drawings, creating drawing views, Hiding extraneous dimensions.

- Create various drawing views of the 3-D parts.

3. **Advanced Modeling Techniques**

Extrudes to face/plane, intersect, face draft, 3D rounds, 3D fillets & 3D chamfers, setting & modifying feature dimensions, history based part modification.

- Use extrude commands to make holes through the above objects. Also face drafts a part on another part.

- Create 3-D rounds and fillets on box corners and Use history to modify above feature and their dimensions.

4. Assembly of Parts

Basic concepts, starting assembly design, creating part instances, assembling the parts, checking for interference.

- Make cylinder and piston and assemble them.

Recommended Books

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.

6.4 WORKSHOP PRACTICE-IV

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RATIONALE

After having studied workshop Technology I, II, III & workshop Practice I, II, III. The students have developed competency to fabricate. Students should be provided opportunities to make machine tools parts, press tools, jigs & fixture, moulds and die casting dies as per market requirement. Therefore this subject is essentially required for fabrication practice.

DETAILED CONTENTS

1. Fabrication of machine tools parts-lead screw and nut, of vice, milling arbor & nut, clapper box of shaper, splined shaft, bevel gears.
2. Fabrication of machine pres tool – washer cutting progressive die, stamping die, air cooler cover die.
3. Fabrication of machine jigs & fixtures – drilling jig & fixture for round pieces, milling fixture.
4. Fabrication of machine moulds – for single ended spanner.
5. Fabrication of machine die-casting dies for aluminum parts, and cast iron parts like water tap, wing nut, brake shoe die.

6.5 INDUSTRIAL ENGINEERING

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RATIONALE

A diploma holder will have to conduct time and motion study to improve the methods/system. This subject impart valuable skills to plan and understand plant layout, and production planning and control.

DETAILED CONTENT

1. **Production and Productivity** (6 hrs)

   Production, production functions, productivity, factors affecting productivity, measurement of productivity, causes of decrease in productivity, difference between production and productivity.

2. **Plant Location, Layout and Material Handling** (8 hrs)

   Plant location, factors affecting plant location, concept of plant layout, types of layout, their characteristics, factors affecting plant layout, work station design, factors considered while designing a work station, introduction, need and objective of material handling, factors considered while selecting a material handling device, safety concept of material handling equipment.

3. **Work Study** (12 hrs)

   Definition and scope of work study; areas of application of work study in industry, Role of work study in improving productivity, Objectives, needs and methods of method study, information collection, recording techniques, process symbols, charts and diagrams, critical examination, development, installation and maintenance of improved methods, work measurement objectives, needs and methods of work measurement, time study, various allowances, calculation of time, work sampling, standard data and its use. Application of engineered time standards and work sampling Ergonomics, concept and advantages.

4. **Job Evaluation and Incentives** (12 hrs)

Introduction, objectives, needs of job evaluation, job definition, job analysis, data source, job evaluation methods such as ranking method, grade description method, point system and factor comparison method, hybrid system.
Incentive-definition and concept, incentive and productivity relation, types of incentives such as financial, non financial. Individual and group incentives, pre requisites for incentives, characteristics of a good incentives plan

5. **Production Planning and Control** (14 hrs)

Introduction, objectives and components (functions) of P.P.C, Advantages of production planning and Production Control, stages of P.P.C, process planning, routing, scheduling, dispatching and follow up, routing purpose, route sheets, scheduling – purpose, machine loading chart, Gantt chart, dispatching – purpose, and procedure, follow up – purpose and procedure. CPM/PERT technique, drawing of simple networks and critical time calculation. Production Control in job order, batch type and continuous type of productions. Difference between these controls.

6. **Estimation and Costing** (12 hrs)

Introduction, purpose/functions of estimating, costing concept, ladder and elements of cost, difference between estimation and costing. Overheads and their types, estimation of material cost, estimation of cost for machining processes, numerical problems.

RECOMMENDED BOOKS

1. Industrial Engineering by O.P. Khanna; Dhanpat Rai and Sons, New Delhi.
2. Industrial Engineering by S.C. Sharma; Khanna Publisher.
3. Industrial Engineering and Management by T.R. Banga.
4. Elements of work study by Suresh Dalela.
5. Production Management by Jain and Aggarwal.

6.6 PROJECT WORK

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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 5-6 students.

- Projects related to designing new dies, moulds, jigs and fixtures
- Projects related to increasing productivity
- Projects related to quality assurance
- Projects related to estimation and economics of production
- Projects connected with repair and maintenance of plant and equipment
- Projects related to identification of raw material thereby reducing the wastage
- Any other related problems of interest of host industry

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.