6.1 FORGING AND CASTING DIES - DESIGN & DRAWING

L	T	P
3	-	4

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, vacuum 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, runner & 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, 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 50%. Section B will contain design and drawing up to 50% 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. Forging 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.

SUGGESTED DISTRIBUTION MARKS

Topic No.	Allotted Time	Allotted Marks
1	6	12
2	6	12
3	12	28
4	4	8
5	6	12
6	8	16
7	6	12
Total	**48**	**100**

6.2 INSPECTION AND QUALITY CONTROL

L	T	P
4	-	2

RATIONALE

Diploma holders in this course are required to measure and inspect for ensuring quality of product. For this purpose, knowledge and skills about standards of measurement, limits, fits and tolerances, types of inspection and various measuring instruments, SQC & quality standards are necessary. Hence this subject.

DETAILED CONTENT

1. Inspection (09 hrs)

- Introduction, units of measurement, standards for measurement and interchangeability.
- International, national and company standard, line and wavelength standards.
- Planning of inspection: what to inspect? When to inspect? Who should inspect? Where to inspect?
- Types of inspection: remedial, preventive and operative inspection, incoming, in-process and final inspection.
- Study of factors influencing the quality of manufacture.

2. Measurement and Gauging (22 hrs)

- Basic principles used in measurement and gauging, mechanical, optical, electrical and electronic.
- Study of various measuring instruments like: calipers, micrometers, dial indicators, surface plate, straight edge, try square, protectors, sine bar, clinometer, comparators – mechanical, electrical and pneumatic. Slip gauges, tool room microscope, profile projector.
  Limit gauges: plug, ring, snap, taper, thread, height, depth, form, feeler, wire and their applications for linear, angular, surface, thread and gear measurements, gauge tolerances.
- Geometrical parameters and errors:
  Errors & their effect on quality, concept of errors, measurement of geometrical parameter such as straightness, flatness and parallelism.
- Study of procedure for alignment tests on lathes, drilling and milling machines.
- Testing and maintenance of measuring instruments.

3. Statistical Quality Control (16 hrs)

- Basic statistical concepts, empirical distribution and histograms, frequency, mean, mode, standard deviation, normal distribution, binomial and Poisson, Simple examples.

- Introduction to control charts, namely X, R, P and C charts and their applications.
- Sampling plans, selection of sample size, method of taking samples, frequency of samples.
- Inspection plan format and test reports

4. Modern Quality Concepts (09 hrs)

- Concept of total quality management (TQM)
- National and International Codes.
- ISO-9000, concept and its evolution
- QC tools
- Introduction to Kaizen, 5S

5. Instrumentation (08 hrs)

Measurement of mechanical quantities such as displacement, vibration, frequency, pressure temperature by electro mechanical transducers of resistance, capacitance & inductance type.

LIST OF PRACTICALS

1 Use of dial indicator for measuring taper.

2 Use of combination set, bevel protector and sine bar for measuring taper.

3 Measurement of thread characteristic using vernier and gauges.

4 Use of slip gauge in measurement of center distance between two pins.

5 Use of tool maker's microscope and comparator.

6 Plot frequency distribution for 50 turned components.

7 With the help of given data, plot X, R, P and C charts

RECOMMENDED BOOKS

1. Statistical Quality Control by M.Mahajan; Dhanpat Rai and Sons, Delhi

2. Engineering Metrology by RK Jain

3. Engineering Metrology by RK Rajput; SK Kataria and Sons

4. Production Planning Control and Management by KC Jain & Aggarwal; Khanna Publishers, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	09	14
2	22	34
3	16	24
4	09	14
5	08	14
Total	**64**	**100**

6.3 INDUSTRIAL ENGINEERING

L	T	P
4	-	-

RATIONALE

A diploma holder in this course will have to conduct time and motion study to improve the methods/system. For this, knowledge and related skills in method study and work measurement are essential. In addition, knowledge of production planning and control and estimating and costing is required. Hence this subject.

DETALIED CONTENTS

1. Productivity (06 hrs)

   Introduction to productivity, factors affecting productivity, Measurement of productivity, causes of low productivity and methods to improve productivity.

2. Work Study (14 hrs)

   Definition and scope of work study; Inter-relation between method study and work measurement; Human aspects of work study; Role of work study in improving productivity.

3. Method Study (08 hrs)

   Objectives and procedure for Method analysis; Information collection and recording techniques.

4. Motion Analysis (06 hrs)

   Principles of Motion analysis; Therbligs and SIMO charts; Normal work area and design of work places. ergonomics

5. Work Measurement (10 hrs)

   Objectives; work measurement techniques, stop watch time study; principle, equipment used and procedure; systems of performance rating; calculation of basic times; various allowances; calculation of standard time, work sampling, standard data and its usage.

6. Wages and Incentive Schemes (04 hrs)

   Introduction to wages, Wage payment for direct and indirect labour, wage payment plans and incentives, various incentive plans, incentives for indirect labour.

7. Production Planning and Control (10 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.

8. Estimating and Costing (6 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.

LIST OF PRACTICALS

1. Stop watch time study on any machine like lathe, drilling machine or milling machine
2. Method improvement - Assembly of bolt, nut and 3 washers
3. Determination of standard time for assembly of electrical switch
4. Preparation of flow process chart
5. Preparation of SIMO chart
6. Preparation of flow diagram

INSTRUCTIONAL STRATEGY

1. Teacher should use models and encourage students to develop some other suitable model.
2. The teacher should observe and redress the difficulties faced by students in performing the work while working on ergonomically good and poorly designed workstation.

RECOMMENDED BOOKS

1. Work Study and Ergonomics by S Dalela and Sourabh
2. Industrial Engineering and Management by O.P. Khanna Dhanpat Rai and Sons, Delhi.

3. Industrial Engineering and Management by M. Mahajan; Dhanpat Rai and Sons, New Delhi.
4. Introduction to Work Study, ILO Publication

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	10
2	14	20
3	08	12
4	06	10
5	10	16
6	4	6
7	10	16
8	6	10
Total	**64**	**100**

6.4 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

L	T	P
3	-	-

RATIONALE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. This subject focuses on imparting the necessary competencies and skills of enterprise set up and its management.

DETAILED CONTENTS

SECTION – A ENTREPRENEURSHIP

1. Introduction (14 hrs)

- Concept /Meaning and its need
- Qualities and functions of entrepreneur and barriers in entrepreneurship
- Sole proprietorship and partnership forms of business organisations
- Schemes of assistance by entrepreneurial support agencies at National, State, District –level, organisation: NSIC, NRDC, DC, MSME, SIDBI, NABARD, Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks

2. Market Survey and Opportunity Identification (10 hrs)

- Scanning of the business environment
- Salient features of National and State industrial policies and resultant business opportunities
- Types and conduct of market survey
- Assessment of demand and supply in potential areas of growth
- Identifying business opportunity
- Considerations in product selection

3. Project report Preparation (8 hrs)

- Preliminary project report
- Detailed project report including technical, economic and market feasibility
- Common errors in project report preparations
- Exercises on preparation of project report

SECTION –B MANAGEMENT

4. Introduction to Management (04 hrs)

- Definitions and importance of management
- Functions of management: Importance and process of planning, organising, staffing, directing and controlling
- Principles of management (Henri Fayol, F.W. Taylor)
- Concept and structure of an organisation
- Types of industrial organisations
  a) Line organisation
  b) Line and staff organisation
  c) Functional Organisation

5. Leadership and Motivation (03 hrs)

a) Leadership

- Definition and Need
- Qualities and functions of a leader
- Manager Vs leader
- Types of leadership

b) Motivation

- Definitions and characteristics
- Factors affecting motivation
- Theories of motivation (Maslow, Herzberg, Douglas, McGregor)

6. Management Scope in Different Areas (06 hrs)

a) Human Resource Management

- Introduction and objective
- Introduction to Man power planning, recruitment and selection
- Introduction to performance appraisal methods

b) Material and Store Management

- Introduction functions, and objectives
- ABC Analysis and EOQ

c) Marketing and sales

- Introduction, importance, and its functions
- Physical distribution

- Introduction to promotion mix
- Sales promotion

d) Financial Management

- Introductions, importance and its functions
- Elementary knowledge of income tax, sales tax, excise duty, custom duty and VAT

7. Miscellaneous Topics (03 hrs)

a) Customer Relation Management (CRM)

- Definition and need
- Types of CRM

b) Total Quality Management (TQM)

- Statistical process control
- Total employees Involvement
- Just in time (JIT)

c) Intellectual Property Right (IPR)

- Introductions, definition and its importance
- Infringement related to patents, copy right, trade mark

Note: In addition, different activities like conduct of entrepreneurship awareness camp extension lecturers by outside experts, interactions sessions with entrepreneurs and industrial visits may also be organised.

INSTRUCTIONAL STRATEGY

Some of the topics may be taught using question/answer, assignment or seminar method. The teacher will discuss stories and case studies with students, which in turn will develop appropriate managerial and entrepreneurial qualities in the students. In addition, expert lecturers may also be arranged from outside experts and students may be taken to nearby industrial organisations on visit. Approach extracted reading and handouts may be provided.

RECOMMENDED BOOKS

1. Soft Skills for Interpersonal Communication by S.Balasubramaniam; Published by Orient BlackSwan, New Delhi
2. Generic skill Development Manual, MSBTE, Mumbai.
3. Lifelong learning, Policy Brief (www.oecd.orf)
4. Lifelong learning in Global Knowledge Economy, Challenge for Developing Countries – World Bank Publication
5. Towards Knowledge Society, UNESCO Paris Publication

6. Your Personal Pinnacle of Success by DD Sharma, Sultan Chand and Sons, New Delhi
7. Human Learning, Ormrod
8. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
9. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
10. Handbook of Small Scale Industry by PM Bhandari

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	14	28
2	10	20
3	08	16
4	04	10
5	03	06
6	06	14
7	03	06
Total	**48**	**100**

6.5 EMPLOYABILITY SKILLS – II

L	T	P
-	-	2

RATIONALE

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. Our diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject to prepare students for employability in job market and survive in cut throat competition among professionals.

DETAILED CONTENTS

1. Oral Practice

i)	Mock interview	(05 hrs)
ii)	Preparing for meeting	(05 hrs)
iii)	Group discussion	(05 hrs)
iv)	Seminar presentation	(05 hrs)
v)	Making a presentation	(12 hrs)

a) Elements of good presentation
b) Structure and tools of presentation
c) Paper reading
d) Power point presentation

6.6 TOOL ROOM PRACTICE

L	T	P
-	-	4

Rationale

The diploma holders are expected to have the competency to fabricate. The students should be provided opportunities to make machine tools, jigs & fixtures, moulds and casting dies as per market requirement. Therefore, this subject is essentially required for fabrication practice.

At least one complete project must be accomplished from the given detailed contents.

DETAILED CONTENTS

1) Fabrication of Press Tool:- Washer, Hinge etc.

2) Fabrication of Jigs & Fixture:- Drilling Jig and Milling Fixture.

3) Fabrication of Machine moulds:- Coaster Cover and Carom board Striker.

4) Fabrication of Die casting die for Aluminium parts.

Note:- Visit to industries/ Tool Room Organisation should be planned to demonstrate operation of following machines:-

- Wire cut EDM
- Jig Boring
- Jig Grinding
- Profile Grinding
- Injection moulding machines
- Compression moulding machines
- Blow moulding machines
- Press shop

6.7 PROJECT WORK

L	T	P
-	-	8

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. The students should identify the project 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 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	Satis-factory	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)	65-80	Very good
iii)	50-64	Good
iv)	41-49	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 organizations 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.