

## 6.1 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

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5 - -

### 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** (23 periods)
  4. Concept /Meaning and its need
  5. Qualities and functions of entrepreneur and barriers in entrepreneurship
  6. Sole proprietorship and partnership forms of business organisations
  7. Schemes of assistance by entrepreneurial support agencies at National, State, District level: NSIC, NRDC, DC:MSME, SIDBI, NABARD, Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubator (TBI) and Science and Technology Entrepreneur Parks (STEP)
  
2. **Market Survey and Opportunity Identification** (17 periods)
  5. Scanning of business environment
  6. Salient features of National and State industrial policies and resultant business opportunities
  7. Types and conduct of market survey
  8. Assessment of demand and supply in potential areas of growth
  9. Identifying business opportunity
  10. Considerations in product selection
  
3. **Project report Preparation** (14 periods)
  6. Preliminary project report
  7. Detailed project report including technical, economic and market feasibility
  8. Common errors in project report preparations
  9. Exercises on preparation of project report

#### SECTION –B MANAGEMENT

4. **Introduction to Management** (06 periods)

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: Line organisation, Line and staff organisation  
Functional Organisation

**5. Leadership and Motivation (05 periods)**

**a) Leadership:**

Definition and Need, Qualities and functions of a leader  
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, McGregor)

**6. Management Scope in Different Areas (10 periods)**

**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 (05 periods)**

**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. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development published by Tata McGraw Hill Publishing Company Ltd., New Delhi
3. Entrepreneurship Development in India by CB Gupta and P Srinivasan; Sultan Chand and Sons, New Delhi
4. Entrepreneurship Development - Small Business Enterprises by Poornima M Charantimath; Pearson Education, New Delhi
5. Entrepreneurship : New Venture Creation by David H Holt; Prentice Hall of India Pvt. Ltd., New Delhi
6. Handbook of Small Scale Industry by PM Bhandari
7. Principles and Practice of Management by L M Prasad; Sultan Chand & Sons, New Delhi.
8. Entrepreneurship Development & management By V.K. Joshi, Jagdamba Publication, New Delhi

## **SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Pds)</b>	<b>Marks Allotted (%)</b>
1	23	30
2	17	20
3	14	15
4	6	10
5	5	05
6	10	15
7	5	05
<b>Total</b>	<b>80</b>	<b>100</b>

## 6.2. ADDITIVES AND COMPOUNDING

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### RATIONALE

Properties of all rubbers and plastics get significantly modified by judicious addition of certain additives and appropriate compounding techniques. This subject aims at giving a detailed exposure on this topic. This subject combined with the subject on Engineering and Speciality Polymers makes the student capable of preparing and formulating the right material for processing

### DETAILED CONTENTS

#### 1. Additives

(30 hrs)

- Antiageing additives, antioxidants, UV and heat stabilizers, fungicides, antitermite additives
- Processing aids, heat stabilizers, plasticizer internal and external lubricants, solvents
- Additives for modification of bulk mechanical properties such as reinforcing, fillers, impact modifiers, nucleating agents, different types of reinforcement materials, additives for cost reduction, diluents and extenders, activators, and accelerators, ionomers
- Surface property modifier; antistatic agent, slip additives, antiblock additives
- Optical properties modifier; pigments and dyes
- Flames/smoke additives; blowing agent and retardants

#### 2. Mixing and Compounding

(18 hrs)

Compounding: introduction, mixing theory, limitation of mixing theory, mixing evaluation, methods of compounding-intensive drymixer, internal intensive batch mixer, continuous mixer, single screw extruder, compounder – twin screw-extruder, compounding line

### INSTRUCTIONAL STRATEGY

As additives and compounds which is done to the polymers is very important since it effects the end product, so the student should be imparted knowledge about this in details with the help of real workplace examples.

### RECOMMENDED BOOKS

1. Plastic Additives by Geoffrey Pritchard; Chapman and Hall Publication

2. Plastic Engineering Handbook by Michael L, Berins; Kluwer Academic Publisher
3. Plastic Processing Technology –Edward A Muccio; ASM International Publishing
4. Plasticizers, Stabilizers and Thickeners compiled by Michael and Irene Ash
5. Additives and Chemicals for Polymer Processing by Polymer Research Centre, Bangalore

**SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	30	60
2	18	40
<b>Total</b>	<b>48</b>	<b>100</b>

### 6.3 . QUALITY CONTROL AND TESTING OF RUBBER & PLASTICS - II

L T P  
4 - 2

#### RATIONALE

It is necessary to test the new materials and the product during various stages of their manufacture to control the quality. The subject provides the essential knowledge and skills for the tests to measure variation and determination of plastic and rubber. This enables the students to take corrective action to be taken in factory to improve the uniformity and serviceability of the finished articles.

#### DETAILED CONTENTS

1. Physical Testing of Plastics:  
Hardness: Shore & Rockwell hardness, Abrasion resistance, Impact Tests. And types of impact test. **(08 hrs)**
2. Electrical properties: Resistivity, Dielectric constant, Arc resistance, Insulation resistance, volume and surface resistivity. **(10 hrs)**
- 3 Thermal Properties : Melting point, Vicat Softening Point, Heat Distortion Temperature, Softening temperature tests, Melt flow Index. **(10 hrs)**
4. Optical Properties: Light Transmission haze, glass, refractive index. **(08 hrs)**
- 5 Flow Properties: MFI, Polymer rheology, Apparent viscosity, Power law, Measurement of flow or rheological properties of fluids, Capillary rheometer, Cone and plate viscometer. **(08 hrs)**
- 6 Polymer viscoelasticity: Definition, various mechanical models or Visco-elasticity. derive the formula for the calculation of Maxwell and Kelvin model. **(04 hrs)**

#### LIST OF PRACTICALS

1. To study the Rockwell hardness test.
2. To study heat distortion temperature or penetration resistance.

3. To study refractive index and melt flow index test.
4. To study cone and plate viscometer .
5. To study izod and charpy impact test.
6. To determine the tensile strength, flexural strength of given rubber sample
7. To study volume and surface resistivity.

## INSTRUCTIONAL STRATEGY

It is a practically minded subject which should be taught along with practical like those for mechanical properties and physical characteristics.

## RECOMMENDED BOOKS

1. Testing of Plastic by Roger Brown
2. Plastics Testing: Vishu Shah
3. Rubber Technology & Alexander S. Craig, liver & boyd Publshers
4. Rubber Technology and Manufacture by G.P. Maurya SBP Publishers
5. Polymer Science and Technology, Premamoy Ghosh (2<sup>nd</sup> Ed.), Tata McGraw
6. Saundra K.T., Identification of Plastics & Rubber, Chapman P. Hall, London
7. Crompton T.R., the Analysis of Plastics , Pergaman Press, Oxford 1984
8. Haston I. & H.A. Wills, Identification & Analysis of Plastics, Illefe,London,

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	15
2	10	20
3	10	20
4	08	10
5	08	20
6	04	15
<b>Total</b>	<b>48</b>	<b>100</b>

## 6.4. MOULD DESIGN

L T P  
4 - 2

### RATIONALE

The diploma holders with specialization in plastic technology are engaged in manufacturing plastic components for which design of moulds and dies is essential. This subject will impart them requisite knowledge and skill in design and fabrication of moulds and dies.

### DETAILED CONTENTS

1. Basic Concepts of design **(06 hrs)**  
  
Selection of material, morphology, texture, finish, accuracy, shrinkage, flash lines, under cuts, wall thickness, taper and draft, ribs, holes, molded thread.
2. Design Details **(10 hrs.)**  
  
Feed System  
Sprue, runner and gate, runner layout, balancing of runners, various types of runner. uses for runners.  
  
Ejection  
Various types of ejection systems, blade, pin, stripper, and hydraulic air ejection system.
3. Mould Design  
  - 3.1. Injection mould types of mould-single impression and multi impression moulds:
    - Three plate mould
    - Hand injection mould
    - Hot runners mould
    - Two plate mould**(10 hrs)**
  - 3.2. Compression Mould  
Various types of compression moulds, positive moulds, flash moulds, semi positive and landed positive mould, calculation of clamp pressure. **(08 hrs)**



3.3. Transfer Mould: Principles of transfer moulding, types of transfer mould-pot and plunger type transfer mould. Calculation of pot capacity. **(05 hrs)**

3.4. Blow Moulding principle of blow moulding machine, parameter and application of blow Moulds. **(05 hrs)**

3.5. Extrusion dies: Fundamental of extrusion process, design and construction, die design for tubes, pipes and wire coating. **(10 hrs)**

4. Mould Fabrication **(10 hrs)**

4.1. Selection material for mould making

4.2. Conventional machines, grinding machines, lathe machine, CNC machine, cutting machines, milling machines.

## **LIST OF PRACTICALS**

### **Design Exercises**

1. Study and design of Two plate mould design
2. Study and design of Compression mould design
3. Study and design of Three plate mould design
4. Study and design of Hot runner moulds
5. Study and design of Transfer mould design
6. Study and design of blow moulds
7. Study and design of extrusion dies

## **INSTRUCTIONAL STRATEGY**

Field visit is a must as the students need to be aware of process of mould design and fabrication in the related industries.

## **RECOMMENDED BOOKS**

1. Injection Mould Design by R.C.W. Pye; Longman Scientific and Technical
2. Plastic Mould Engineering Hand Book by J. Harry Don Bose and Mayne I pribble, Van Nostrand Reinhold Company
3. Injection Moulding Handbook by Dominick V. Rosato and Donald V. Rosato
4. Plastic Engineering Handbook by Joel Frados; Van Nostrand Reinhold Company
5. Plastic Engineering by RJ Crawford: Marwell Macmillan International editions

**SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	06	05
2	10	10
3	38	75
4	10	10
<b>Total</b>	<b>64</b>	<b>100</b>

SUGGESTION

## 6.5 Pollution Control & Industrial Safety

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### RATIONALE

This course is related with the cleaning of environment. This subject provides the knowledge of how to keep our environment free from any type of pollution, what are laws related to environment. In this subject, study of industrial safety and fire are also included.

### DETAILED CONTENTS

#### 1. Introduction:

(07 Periods)

What is environment? Environment keeps changing, component of the environment, factors affecting environment & types of environment. What is pollution? Classification of pollution & types of pollution, classification of pollutants.

#### 2. Air Pollution

(12 Periods)

Definition of air pollution, types of air pollutants, properties of air pollutants, various sources of air pollution like SPM, SO<sub>x</sub>, NH<sub>3</sub>, F, CL, CFC, CO<sub>2</sub>, and their effects, Acid rain, Green house effects, Ozone layer.

##### Air pollution control equipment's:-

- (I) Settling chambers
- (II) Cyclones
- (III) Scrubber (dry & wet)
- (IV) Cyclones & multiclones
- (V) Electrostatic precipitator
- (VI) Bag filters.

- Ambient air quality measurement & their standards.

#### 3- Water pollution:-

(12 Periods)

Origin of waste water, different types of water pollutants, their sources & effects. Water pollution, standards for drinking water, domestic waste water &

industrial waste water. Methods of measurement of various parameters like BOD, SS, P<sup>H</sup>, COD, TDS etc. methods of treatment of industrial waste water like.

- I) Chemical treatment
- II) Physio - chemical treatment
- III) Bio- chemical treatment
- IV) Any other advanced treatment

#### 4- Pollution and factory acts:

(12 Periods)

Water pollution control act 1974, air pollution act 1981, environment protection act 1986, hazardous chemical manufacturing, storage and impact rule 1989 and hazardous waste

management and handling rule 1989, elementary knowledge of factory act 1948 and payment of wage act 1936.

**5. Fire & prevention: -**

**(8 Periods)**

Fire triangle, classification of fires, flammable and Inflammable liquids, various types of fire extinguishers and their applications. Fire hazards and their prevention.

**6. Industrial safety: -**

**(12 Periods)**

Receiving, storing, transportation of flammable liquids, gases and toxic Materials and wastes, Safety in chemical reaction, pipelines in chemical factories, Precautions in the case of processes in operations involving explosives and inflammable Dusts, gases, vapours etc. codes of practice and specification for safety equipment/ Alarms/signals (reference should be made from I.S. Codes).

**7. Elements of safety-**

**(09 Periods)**

Safety aspects related to site, plant layout, process development And design stages, identification of hazards and its estimation risk, risk analysis and Assessment methods, fault free method, event free method, scope of risk assessment, Controlling toxic chemicals and flammable materials

**8. Toxic substances and degree of toxicity-**

**(08 Periods)**

Its estimation, their entry routes into human System, their doses and responses, control techniques for toxic substances exposure, Use of respirators, ventilation systems.

**LIST OF PRACTICALS**

1. Estimation of TS, TDS
2. Estimation of BOD
3. Estimation of COD by titration methods
4. Estimation of PH value, carbonate, bicarbonate and hydroxide alkalinity of waste water sample
5. To determine the turbidity of waste water sample
6. To determine the hardness of water
7. Demonstration of various types of fire extinguishers

**INSTRUCTIONAL STRATEGY**

In this subject, it is essential to instruct to students about the environment and pollution due to industry and how it may be minimized It must be essential to students to visit industry for pollution related problems.

**RECOMMENDED BOOKS**

1. Safety and Accident Prevention in Chemical Operation by Fawcett and Wood, Inter

- Science Publication
2. Chemical Engineering, Vol. 1, II, III and IV by Coulson and Richardson, Pergammon Press Publication
  3. Air Pollution by Perkins, McGraw Hill Publication
  4. Fundamentals of Air Pollution by Williamson, Addison Wesley Publication
  5. Liquid Wastes of Industries by Nemerow, Addison Wesley Publication
  6. Waste Water Engineering by Metcalf and Eddy, McGraw Hill Publication

#### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	07	10
2	12	15
3	12	15
4	12	15
5	08	10
6	12	15
7	09	10
8	08	10
<b>Total</b>	<b>80</b>	<b>100</b>

## 6.6. AutoCAD

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### RATIONALE

This subject enables the students to make drawings using computer software, take prints/plots

### DETAILED CONTENTS

#### Introduction to AutoCAD

1. Starting up, practice on – how to create a new drawing file, setting drawing limits and saving a file, drawing lines in different ways using absolute co-ordinates, user co-ordinates, WCS, UCS, drawing lines, circles, arcs, ellipses, polygons, splines, polylines, zoom commands
2. Practice on Edit commands such as erase, copy, mirror, array, offset, rotate, oops, undo, redo, scale, stretch, trim, break, extend, chamfer, fillet
3. Practice on text commands, single line text, paragraph text, editing text, text size, text styles, changing properties commands
4. Practice on layer commands, creating layer, freeze, layer on/off colour assigning, making a layer, current layer, load line type, lock and unlock layer, move from one layer to other.
5. Practice on Hatching-Hatch pattern selection
6. Practice on dimensioning – linear dimensioning, angular dimensioning radius/diameter dimensioning, O-snap command, aligned dimensioning, editing of dimensioning, tolerances in dimensioning
7. Blocks and X-refs - How to make a block, how to insert a block, using block in any drawing, working with x-refs, x-ref options
8. Practice on print/plot commands. Export/import commands
9. Practice on making complete drawings of components by doing exercises

10. 3D view point, resin, 3d modeling; wire frame, solids, surface modeling; evaluation command, creating surfaces, union, subtraction, extrude commands; 3D array, mirror, rotate, align etc.

Note: Stress should be given on the practical application of AutoCAD on mould design therefore students should be asked to design sample mould in AutoCAD.

### **RECOMMENDED BOOKS**

1. AutoCad by RW Leigh, Galcotia, N.D.
2. Engineering Drawing with AutoCAD 2000 by T. Jaypooran, Vikas Publishing House
3. Auto CAD – 2004, Umesh Shethigan, Abdul Khader, Janatha Publishers
4. Auto CAD reference manuals by Autodesk

SUGGESTION

## 6.7 MAJOR PROJECT WORK

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### RATIONALE

Every diploma holder has to do a project work before going to the world of work so that he may have sufficient knowledge to face the various problems involved in solving the project. Chemical engineering technician must be well aware of these too. So the projection the design of pressure vessel, storage tanks, heat exchanger, distillation column and evaporator are included in the subject.

Project work aims at developing skills in the students whereby they apply the knowledge and skills gained through the course in totality to solve a 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. The project assignments may consist of:

- Design of pressure vessel
- Design of heat exchanger
- Design of distillation column
- Design of evaporator
- Development of prototypes
- Study of the process of manufacturing of paints, detergents etc.
- Fabrication of components/equipments
- Fault diagnosis and rectification experiences
- Bringing improvements in the existing system/equipment
- Calibration and testing of equipment or any other innovative project which can develop creative skills in the 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
<b>Total marks</b>		<b>100</b>	<b>100</b>	<b>80</b>	<b>60</b>	<b>40</b>	<b>20</b>

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.

SUGGESTION

## 6.8 EMPLOYABLE SKILLS

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Periods per week - - 4

### RATIONALE

Diploma holders are required to not only possess subject related knowledge but also soft skills to get good jobs and to rise steadily at their workplace. This subject is included to develop employability skills amongst the students.

### DETAILED CONTENTS

1. Industrial Scenario Engineering Education and expectations of competences from an engineer by employer (04 period)
2. Personality types, characteristic and features for a successful engineer (04 period)
3. Professional Engineer desirable values and ethics and their development. Relation between engineering profession, society and environment (04 period)
4. Managing project (16 period)
  - Leadership
  - Motivation
  - Time management
  - Resource management
  - Computer Software
  - Interpersonal relationship
  - Engineer economics and fundamentals
5. Effective Communication (08 period)
  - Listening
  - Speaking
  - Writing
  - Presentation Technique/Seminar
  - Group discussion
6. Preparing for Employment (08 period)
  - Searching for job/job hunting
  - Resume Writing
  - Interview technique in personal interview telephonic interview, panel interview, group interview, video conference
7. Managing Self (06 period)
  - Managers body, mind, emotion and spirit

- Stress Management
  - Conflict resolution
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8. Continuing professional development (04 period)
    - Organising learning and knowledge
    - Use of computer for organising knowledge resource
  
  9. Creativity, Innovation and Intellectual property right (06 period)
    - Concept and need in present time for an engineer
  
  10. Basic rules, laws and norms to be adhered by engineers during their working (04 period)

SUGGESTION