

6.1 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

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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

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

6.2 QUALITY CONTROL AND TESTING OF COATINGS

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RATIONALE

This subject converses the student with quality control and performance/testing of end user applications.

DETAILED CONTENTS

1. Objectives of paint testing - quality control procedures, Standard specifications and test methods. Test on liquid paints - density, dispersion, viscosity or consistency, wet opacity and dry hiding, spreading capacity and wet and dry rim thickness, drying time etc.

(24 Periods)

2. Tests of dried coatings - colour and colour measurement of oil , light fastness, gloss, flexibility, adhesion impact test, hardness resistance, abrasion resistance water and moisture resistance, salt spray test, resistance to chemicals, resistance to lubricating oils and solvents, resistance to heat, evaluation of water based paints, biological effects on paint films.

(20 Periods)

3. Analysis of paints and varnishes - volatile and non-volatile matter content on mass and volume basis, pigment content, binder or solid vehicle content, ash content, pigment/ binder and solvent analysis.

(18 Periods)

4. Ageing properties of coatings - weatherometry, natural outdoor durability test, accelerated outdoor weathering, artificial weathering test in a weatherometer. Defects observed in paint film on exposure, concept of quality circles, introduction to ISO.

(18 Periods)

INSTRUCTIONAL STRATEGY

Visit to paint R& D laboratories/ industry may be undertaken

PRACTICALS

1. To check the gloss and drying of paints.
2. Check the abrasion resistant on paint film.
3. To check the drying time and gloss of varnish.
4. To check the flexibility of a paint film.
5. To check the scratch resistance on paint film.
6. To check the impact resistance on paint film.
7. To check the adhesion of paint film by cross hatch cutter.
8. To check the adhesion of a paint on panel by hydraulic adhesion tester.
9. To check the pin holes of a paint film.

RECOMMENDED BOOKS

1. Organic Coating Technology Vol.I and II by H.F. Payne
2. Surface coatings vol. I and II OCCA, Australia
3. Testing of Organic Coating by Norman I Gaynes

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	24	30
2	20	30
3	18	20
4	18	20
Total	80	100

6.3 CORROSION ENGINEERING

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RATIONALE

The basic purpose of coating is to protect the surface from environmental stresses. This subject deals with various types and mechanism of corrosion from which the substrate needs to be protected.

DETAILED CONTENTS

1. **Introduction** - Definition, corrosion damage, functional and economic aspects of corrosion, classification of corrosion process, General chemistry of corrosion . (12 Periods)
2. **Electro-chemistry** - EMF, and emf series, galvanic cells , concentration cells electrolytic cells, passivation, characteristic parameter, mechanism of passivation oxidizing and non-oxidizing anodic inhibitors. (12Periods)
3. **Different form of corrosion** – bimetallic, galvanic, crevice, film, pitting, intergranular, Selective, erosion corrosion, stress corrosion, cracking corrosion their mechanism and remedial measures, hydrogen damage. (12 Periods)
4. **Corrosion under various conditions** – Atmospheric, underground, immersion, marine and liquid metal corrosion, catastrophic oxidation. (10 Periods)
5. **Corrosion in various industries** - Boiler plant, chemical industries, petroleum industries, building industry, fertilizer industry , etc., (10 Periods)
6. **Corrosion testing** - physico chemical methods, electro-chemical methods, corrosion inspection and monitoring, corrosion rate measurements, Advantages and defects of corrosion testing methods,. (12 Periods)
7. **Corrosion control** - Practical and fundamental approach, Selection of materials, modification of metals, change in Design and corrosive environment, corrosion inhibitor surface coating and Electro chemical corrosion protection methods such as cathodic and anodic protections (12 Periods)

INSTRUCTIONAL STRATEGY

Few field visits should be made to different chemical industries so that students can see the various types of corrosion effecting equipment and pipelines. Simple experiment like putting coatings, isolation, passivation can be designed for better understanding of corrosion preventon.

RECOMMENDED BOOKS

1. Corrosion Engineering by MARS-G, FONTANA – Tata McGraw Hill

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	14	20
2	14	20
3	12	20
4	12	20
5	12	20
Total	64	100

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6.4 PROCESS EQUIPMENT DESIGN

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RATIONALE

The topic included in the subject process equipment design are design of machine elements, storage, vessels, pressure vessels with the consideration of stress involved in materials and their protective coating. The students are expected to solve the elementary problems of different equipment used in process industry.

DETAILED CONTENTS

1. Basic Considerations in Process Equipment Design (08 periods)
Introduction, general design procedures, fabrication techniques, equipment Classification, power for rotational motion.
2. Design Considerations (08 periods)
Introduction, materials selections, corrosion prevention, stresses created due to static & dynamic loads, elastic instability, combined stresses and theories of failure, fatigue, brittle, fracture, creep, temperature effect, radiation effects, effects of fabrication methods, economic consideration.
3. Power Requirement of Pumps (10 periods)
Definition of pumps, types of pumps (centrifugal and reciprocating pumps), manometric head of centrifugal pump, efficiency of the centrifugal pumps (manometric efficiency, mechanical efficiency and overall efficiency), problems relating calculations of horse power (H.P.), N.P.S.H., for flow of incompressible fluid, characteristics curves for pumps, specification sheet for pumps.
4. Pressure Vessels (17 periods)
Selection of type of vessels, causes of failure of vessels, methods of fabrication, types of formed heads, stress in thin shells subjected to internal pressure, longitudinal and circumferential stress, joint efficiency and corrosion allowance, crown and knuckle radius, Problems relating calculation of shell thickness of cylindrical and spherical shells under internal and external pressure, thickness of torispherical heads subjected to internal pressure as per I.S. code.
5. Distillation Column (17 periods) Preparation of equilibrium diagram, problems relating calculation of theoretical plates at a given reflux ratio and total reflux,

minimum reflux ratio, feed plate location, by McCabe-thiele methods for separation of ideal binary mixtures, shell diameter calculations.

SUGGESTION

6. Heat Exchanger and Condensers (12 periods)
Problems relating calculation of L.M.T.D., individual and overall heat-transfer coefficients, number of tubes, number of passes, Heat-transfer coefficient for condensing vapors by Wilson's plot.
7. Evaporators (08 periods)
Problems relating calculation of heating area, steam requirement, steam economy for single and double effect evaporators. Methods of feeding evaporators and effect of Boiling Point Rise (B.P.R) and Hydrostatic Head.

INSTRUCTIONAL STRATEGY

The emphasis should be laid on numerical aspects for the design of distillation columns and process vessels. Field visits may help the students to know more about latest types of trays and packings used in distillation absorption columns. Emphasis should also be laid on material selection aspects for the equipment.

RECOMMENDED BOOKS

9. Process Equipment Design by Mane and Rushtom
10. Process Equipment Design by Bronwnell and Young
11. Process Equipment Design by MV Joshi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	08	10
2	08	10
3	10	20
4	17	20
5	17	20
6	12	10
7	08	10
Total	80	100

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_x, NH₃, F, CL, CFC, CO₂, 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^H, 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, Pergamon 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
Total	80	100

6.6 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
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.

SUGGESTION

6.7 EMPLOYABLE SKILLS

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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