## 6.1 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

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**RATIONALE**

Entrepreneurship Development and Management is one of the core competencies of technical human resource. Creating awareness regarding entrepreneurial traits, entrepreneurial support system, opportunity identification, project report preparation and understanding of legal and managerial aspects can be helpful in motivating technical/ vocational stream students to start their own small scale business/enterprise. Based on the broad competencies listed above, following detailed contents are arrived to develop the stated competencies.

**DETAILED CONTENTS**

(1) Entrepreneurship (4 hrs)

- 1.1 Concept/Meaning
- 1.2 Need
- 1.3 Competencies/qualities of an entrepreneur

(2) Entrepreneurial Support System (6 hrs)

- 2.1 District Industry Centres (DICs)
- 2.2 Commercial Banks
- 2.3 State Financial Corporations
- 2.4 Small Industries Service Institutes (SISIs), Small Industries Development Bank of India (SIDBI), National Bank for Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State level

(3) Market Survey and Opportunity Identification (Business Planning) (6 hrs)

- 3.1 How to start a small scale industry
- 3.2 Procedures for registration of small scale industry
- 3.3 List of items reserved for exclusive manufacture in small scale industry
- 3.4 Assessment of demand and supply in potential areas of growth
- 3.5 Understanding business opportunity
- 3.6 Considerations in product selection
- 3.7 Data collection for setting up small ventures

(4) Project Report Preparation (6 hrs)

- 4.1 Preliminary Project Report
- 4.2 Techno-Economic feasibility report
- 4.3 Project Viability

(5) Managerial Aspects of Small Business (8 hrs)

5.1 Principles of Management (Definition, functions of management viz planning, organisation, coordination and control
5.2 Operational Aspects of Production
5.3 Inventory Management
5.4 Basic principles of financial management
5.5 Marketing Techniques
5.6 Personnel Management
5.7 Importance of Communication in business

(6) Legal Aspects of Small Business (6 hrs)

6.1 Elementary knowledge of Income Tax, Sales Tax, Patent Rules, Excise Rules
6.2 Factory Act and Payment of Wages Act

(7) Environmental considerations (6 hrs)

7.1 Concept of ecology and environment
7.2 Factors contributing to Air, Water, Noise pollution
7.3 Air, water and noise pollution standards and control
7.4 Personal Protection Equipment (PPEs) for safety at work places

(8) Miscellaneous (6 hrs)

8.1 Human relations and performance in organization
8.2 Industrial Relations and Disputes
8.3 Relations with subordinates, peers and superiors
8.4 Motivation – Incentives, Rewards, Job Satisfaction
8.5 Leadership
8.6 Labour Welfare
8.7 Workers participation in management

**RECOMMENDED BOOKS**

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
3. Environmental Engineering and Management by Suresh K Dhamija, SK Kataria and Sons, New Delhi

4. Environmental and Pollution Awareness by Sharma BR, Satya Prakashan , New Delhi
5. Thakur Kailash, Environmental Protection Law and policy in India: Deep and Deep Publications, New Delhi
6. Handbook of Small Scale Industry by PM Bhandari
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Total Quality Management by Dr DD Sharma, Sultan Chand and Sons, New Delhi.
9. Principles of Management by Philip Kotler TEE Publication

## 6.2 PROCESS UTILITIES

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**RATIONALE**

This subject is introduced to give the student a thorough knowledge of process utilities such as demineralization of water, stream generation, stream distributing and cooling water etc. which is essentially required for working in any chemical or related industry.

**DETAILED CONTENTS**

1. Demineralization of Water (8 hrs)

   Flow diagram for demineralization, Equipment used: cation and anion exchanger, mixed bed in exchanger. Brief concept of chemistry of cations and anion resins. Regeneration of cation and anion exchanger degasser

   Testing of industrial water after demineralization

2. Steam Generation (10 hrs)

   Saturated and superheated steam, Quality of steam, Steam calculation including internal energy, entropy and enthalpy (using Mollier diagrams and steam tables). Simple numericals relating to the enthalpy changes.

   Classification of Fuels; Solid (coal, rice husk, liquid and gaseous fuel.

3. Steam Distribution (6 hrs)

   Specification of steam pipe, layout of piping, steam trap, steam ejectors

4. Compressors, Blowers, Pressure Regulators (12 hrs)

5. Cooling Water: showers, cooling towers, recycling of water, principles, details of problems like scaling, use of inhibitors like calgon (sodium hexometa-phosphate) STPP (Sodium Tripolyphosphate)
   (12 hrs)

**RECOMMENDED BOOKS**

1. Plant Economics by Peter Timmerhaus, McGraw Hill Publication.
2. Applied Process Design for Chemical and Petrochemical Plant by E. Luduig, Gulf Publishing, Houston, Texas, 1983.
3. Unit Operation of Chemical Engineering., McCabe and Smith, McGraw Hill Publication
4. Standard Test Methods for Water by Apha.

## 6.3 STOCK PREPARATION - II

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**RATIONALE**

The treatment of this subject to the students will be pivoted to make them understand that operational processes for making paper are just like that of a kitchen in a household. The change of properties of paper based on mixing and blending of various chemicals and combination of fibers will be stressed upon.

**DETAILED CONTENTS**

| | | |
|---|---|---|
| 1. | Introduction to sizing materials used in paper industry, methods of preparation of resin size by hot and cold processes | (6 hrs) |
| 2. | Alum, methods of preparation of alum solution and concentration measurement procedures, substitutes for alum | (4 hrs) |
| 3. | Different types of loading materials and their specific functions in relation to grades of papers produced | (6 hrs) |
| 4. | Various types of beater additives like starch, guar gum, CMC, retention aids and their effect upon the paper quality, pigments and colouring matter | (6 hrs) |
| 5. | Introduction to different dyes, pigments and colouring matter added to the stock shade matching | (4 hrs) |
| 6. | Fiber recovery systems-flotation type, filtration type and sedimentation type | (6 hrs) |
| 7. | Flow diagrams of various stock systems-illustrating stock chest agitators and other equipments | (8 hrs) |
| 8. | Simple numericals based on consistency and chemicals added to the pulp | (8 hrs) |

**RECOMMENDED BOOKS**

1. Handbook of Pulp and Paper Technologists by G.A. Smook

2. Handbook of Paper Technology by K.W. Britt

3. Handbook of Paper Technology by C. Biermann

4. Pulp and Paper: chemistry and Chemical Technology, Vol. II by J,P. Casey

## 6.4 ENVIRONMENTAL ENGINEERING AND SAFETY

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**RATIONALE**

The subject aims at providing students the knowledge of various pollutants with respect to air, water and particularly emissions. The knowledge of students, mode of treatment and analysis techniques for different pollutants will also be imparted. Industrial safety is gaining importance with time and this subject will also cover chemical hazards

**DETAILED CONTENTS**

1. Introduction (6 hrs)

   Concept of clean environment, different types of effluents (air, water from chemical industries, techniques for measurement of different types of pollutants, effect of chemical pollution on ecology and environment.

2. Liquid Effluents/Water Pollution (14 hrs)

   Types of water pollutants and its sources, liquid discharge, types of sampling (grab and composite), Presentation of samples taken for analysis, BOD, COD Analysis, different treatment methods for effluent (primary, secondary and tertiary), different types of equipments used for treatment of liquid effluent with principles, mechanical details

3. Air Pollution (12 hrs)

   Types of air pollutants and its sources, effect of air pollutants, measurement, collection techniques and devices for gaseous pollutants. Different treatment for containing air pollutants. Various techniques and equipments used for controlling air pollution. For such equipments, basic principles, mechanical details

4. Legislation to Control the Environment (4 hrs)

   Brief introduction to various Acts for water pollution and air pollution and laws framed by Government of India and Law enforcing agencies

5. Solid Waste Management (4 hrs)

Classification of Refuse materials, types, sources and properties of solids wastes, Abatement methods

6. Noise Pollution (4 hrs)

Sound analysis, Units of sound and noise, Effect of thunder and typical sound on human beings

7. Safety (6 hrs)

Importance of safety in chemical industry, knowledge of statutory required for labour and industry.

8. Fire and Prevention (6 hrs)

Fire triangle, classification of fires, flammable and inflammable liquids, various types of fire extinguishers and their applications

9. [Only for diploma in Chemical Engineering (Pulp & Paper)] (8 hrs)

Liquid Pollution and Air Pollution in Paper Industry

Environmental pollution and its control in the pulp and papers industry

OR

[Only for diploma in Chemical Engineering)

Toxic Gases/Chemicals

Threshold Unit Values, hazards from waters and gases/chemicals. Symptoms and their remedial action

**LIST OF PRACTICALS**

1. Estimation of TS, TDS, SS, VSS
2. Estimation of Dissolved Oxygen
3. Estimation of BODs

4. Estimation of COD by titration method
5. Estimation of pH value, carbonate, bicarbonate and hydroxide alkalinity of waste water sample
6. Estimation of acidity and waste water sample
7. To determine sulphate in waste water sample
8. To determine phosphate in waste water sample
9. To determine the turbidity of waste water sample
10. To determine the hardness of water
11. To determine SPM in Ambient Air by high volume sampler
12. Demonstration of isokinetic sampling of SPM in stack

**RECOMMENDED BOOKS**

1. Safety and Accident Prevention in Chemical Operation by Fawelt and Wood, Inter Science Publication
2. Chemical Engineering, Vol I, II, II 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

## 6.5 PAPER MAKING - II

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**RATIONALE**

Some of the operations in the paper making process will be covered in this subject such as multi-ply forming, drying, calendaring etc. Broad ideas of paper defects and trouble shooting measures along with startup and shut down procedures must be emphasized. A snapshot view of finishing house operation will also be covered.

**DETAILED CONTENTS**

| | | |
|---|---|---|
| 1. | General practicals for paper machine safety and recommended safety reminders | (3 hrs) |
| 2. | Fundamentals of multi-ply forming, general description of twin-wire former, multi-ply paper board and paper products | (5 hrs) |
| 3. | Basic Theory of drying, arrangement and operation of conventional cylinder drying, steam and condensate system, evaporation, dryer ventilation systems, pocket ventilation system, hoods and hood exhaust, dryer felts | (14 hrs) |
| 4. | Theory, mechanism and principles of yankee dryers, the creeping process | (4 hrs) |
| 5. | Operations of calendars, operating variables for calendar stacks | (3 hrs) |
| 6. | Working and operation of super-calendars, effect of paper properties on super-calendaring embossing | (5 hrs) |
| 7. | Purpose of finishing section, general description of finishing house winders and rewinders | (6 hrs) |
| 8. | Simple numerical problems based on paper moisture after presses and dryers, steam requirement in dryer part, to calculate the number of dryers required in dryer part, to calculate the speed of dryer, calculation of paper production etc | (8 hrs) |

**LIST OF PRACTICALS**

1. To determine bulk density of given sample of paper
2. To determine tensile strength, breaking strength and tensile index of paper sample
3. To determine bursting strength and burst factor of paper sample
4. To determine tearing strength of paper samples
5. To determine stiffness of paper sample
6. To determine the caliper of paper
7. Preparation of hand sheets of given basis weight on lab sheet format and measurement of drainage time
8. To carry out the colour matching of paper sample

**RECOMMENDED BOOKS**

1. Handbook of Paper Technology by K,W. Britt.
2. Handbook for Pulp and Paper Technologists by GA Smook
3. Paper Making and Paper Board Making, Volume-III by MacDonald
4. Pulp and Paper Manufacture, Volume-7 by Benjamin A. Thorp, Michael J. Kocured
5. Paper Machine Manual for Operators by J. Mordon
6. Handbook of Paper Technology by C. Biermann

## 6.6 PAPER PROPERTIES AND CONVERSION

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**RATIONALE**

Major stress will be given on paper properties, testing and quality control of various types of paper and paper boards. Students will be geared to understand with clarity the distinction between various kinds of products keeping in view their end use. Preliminary idea about the testing procedures and specifications based on BIS, Tappi and SCAN will also be given.

**DETAILED CONTENTS**

1. Introduction (5 hrs)

   The orientation of fibers in paper machine, effect of wire side and felt side, cross-direction and machine direction

2. Physical Properties (20 hrs)

   Basic weight, thickness (caliper), density. Burst and bursting strength, formation, porosity, smoothness, dirt, sheet strength, stiffness, tensile strength, breaking length, tearing resistance, folding endurance, hardness, dimensional stability, curt and cocking, stress-strain curve of paper.

3. Optical Properties (5 hrs)

   Brightness, gloss and opacity

4. Chemical Properties (2 hrs)

   Moisture content, ash content, pH

5. Coating of Paper (10 hrs)

   Pigment coating,process and methods (on machine and off machine), coating mixture preparation, different types of coaters used in industry (air-knife, trailing blade coater)

6. Introductory side about Specialty papers and their important properties. Currency paper, Photographic paper, Toilet and Wax paper (6 hrs)

**LIST OF PRACTICALS**

1. To find out the porosity of a given paper sample
2. To find out the smoothness of a given paper sample
3. To find out the was pickup test no. of a paper sample
4. To find out the oil absorption test of a paper sample
5. To find out the brightness of a given paper sample
6. To determine opacity of paper sample
7. To find out the gloss of paper sample
8. To compare the strength and properties of various grades of paper
9. To compare the optical properties of coated and uncoated paper
10. To determine smoothness, porosity & stiffness and opacity after calendaring of paper sheet

**RECOMMENDED BOOKS**

1. Manufacturing of Pulp and Paper by Quark, Vol. 1 – 10
2. Pulp and Paper Chemistry and Chemical Technology, Vol. I by J.P. Casey
3. Textbook of Pulp and Paper making by Libbey
4. Handbook of Pulp and Paper Technologies by G.A. Smook

## 6.7 MAJOR 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. The project assignments may consist of:

- Development of prototypes
- Study of the process of manufacturing in pulp, paper and allied industries
- 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.