NSQF ALIGNED CURRICULUM FOR

**THREE YEARDIPLOMA COURSE**

**IN**

# LEATHER TECHNOLOGY (TANNING)

**Prepared by:**

**Curriculum Development Cell**

***Institute of Research Development & Training***

***U. P.,***

***Kanpur-208002***

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# PREFACE

An important issue generally debated amongst the planners and educators world over is how technical education can contribute to sustainable development of the societies struggling hard to come in the same bracket as that of the developed nations. The rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In India, a shift has taken place from the forgettable years of closed economy to knowledge based and opens economy in the last few decades. In order to cope with the challenges of handling new technologies, materials and methods, we have to develop human resources having appropriate professional knowledge, skills and attitude. Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Now it is time to consolidate and infuse quality aspect through developing human resources, in the delivery system. Polytechnics play an important role in meeting the requirements of trained technical manpower for industries and field organizations.

In order to meet the requirements of future technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of diploma programmes. The curricula for diploma programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of diploma programme.

The real success of the diploma programme depends upon its effective implementation. However best the curriculum document is designed, if that is not implemented properly, the output will not be as expected. In addition to acquisition of appropriate physical resources, the availability of motivated, competent and qualified faculty is essential for effective implementation of the curricula.

It is expected of the polytechnics to carry out job market research on a continuous basis to identify the new skill requirements, reduce or remove outdated and redundant courses, develop innovative methods of course offering and thereby infuse the much needed dynamism in the system.

## ACKNOWLEDGEMENTS

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## 1. SALIENT FEATURES OF DIPLOMA PROGRAMME IN LEATHER TECHNOLOGY (TANNING)

| | | | |
|---|---|---|---|
| 1) | Name of the Programme | : | Diploma Programme in Leather Technology (Tanning) |
| 2) | Duration of the Programme | : | Three years (Six Semesters) |
| 3) | Entry Qualification | : | Matriculation or equivalent NSQF Level as Prescribed by State Board of Technical Education, UP |
| 4) | Intake | : | 60 (or as prescribed by the Board) |
| 5) | Pattern of the Programme | : | Semester Pattern |
| 6) | NSQF Level | : | Level - 5 |
| 7) | Ratio between theory and | : | 45 : 55 (Approx.) |

***Practice***

8) Industrial Training:

Four weeks of industrial training is included after IV semester during summer vacation. Total marks allotted to industrial training will be 50.

9) Ecology and Environment :

As per Govt. of India directives, a subject on Environmental Studies has been incorporated in the curriculum.

10) Energy Conservation:

A subject on Energy Conservation has been incorporated in the curriculum.

11) Entrepreneurship Development:

A full subject on Industrial Management and Entrepreneurship Development has been incorporated in the curriculum.

12) Student Centered Activities:

A provision of 3-6 hrs per week has been made for organizing Student Centred Activities for overall personality development of students. Such activities will comprise of co–curricular activities such as expert lectures, self study, games, hobby classes like photography, painting, singing etc. seminars, declamation contests, educational field visits, NCC, NSS and other cultural activities, disaster management and safety etc.

13) Project work

A project work has been included in the curriculum to enable the student get familiarize with the practices and procedures being followed in the industries and provide an opportunity to work on some live projects in the industry.

## 2. EMPLOYMENT OPPORTUNITIES

- **JOB POTENTIAL / JOB OPPORTUNITIES**

The following are the job opportunities for diploma holders in leather technology.

1. As a leather technologist to manufacture various types of heavy and light leathers, sports goods leathers, garment leather etc.
2. As supervisor/production manager in the tanneries/leather and allied industries in the following sections:
   Liming Department, Tanning Department, Dyeing Department, Curing Department, Finishing Department, Testing and Quality control.
3. As research assistant for developing tanning processes for manufacture of various types of leathers.
4. As technical officer/sales officer in chemicals and auxiliary manufacturing companies.
5. As supervisor in quality control and purchases (Finished leather)
6. As an analyst in tanneries.
7. As supervisor or manager in raw hide curing, preservation and flaying centre.
8. As a field officer for procurement of new materials in shoe industry/Tannery
9. As a marketing officer in tanneries and allied industries.
10. As a laboratory assistant in leather test laboratories.
11. 11.As assistant/ Deputy Director leather in Govt. departments.
12. 12.As a design/planning supervisor in leather goods manufacturing and allied industries.
13. As a maintenance supervisor in leather industry.

- **JOB ACTIVITIES OF DIPLOMA HOLDERS IN LEATHER TECHNOLOGY**

1. **Activities connected with leather Manufacturing**

- Examines hides and skins for various defects.
- Analyses various chemicals such as water, common salt, lime, sulphides, acids, dyes, vegetable and synthetic used in leather industry.
- Tests tanned and finished leathers at every stage for conformity to prescribed standards and quality.
- Determine correct and economical methods of tanning of hides and skins for various leathers.
- Assessment and assortment of raw hides and skins for processing into different kinds

of leathers.

- Supervises curing beam house, tanning and finishing processes.
- Selection and grading of finished leathers.
- Measurement, weight and yield of leather at various stages of manufactures. Packing of finished leathers.

2. **Activities connected with leather Manufacturing**

- Selects and installs new equipment and machinery
- Maintains and under takes minor repairs of the machinery installed in a tannery. Assists in the selection of site, layout and construction of tanneries.
- Demonstrates correct procedures for operating various machinery.
- Handles and uses various instruments.

**3. Management Activities**

- Plans and schedules production
- Allocates duties to various workers.
- Imparts training to workers engaged in the unit.
- Supervises the work of various sections in the tanneries.
- Estimates the unit cost of leather produced under his charge.
- Supervises the receiving, packing and forwarding of goods.
- Controls inventory of chemicals and raw materials and makes out a schedule of such materials to be kept in stock for continuous production.
- Accounting and maintaining records. Assists in ensuring working conditions in tanneries in accordance with labour and factory laws. Supervises labour welfare schemes. Marketing of leather.
- Assists in conducting techno-economic surveys and preparing project reports for starting tanneries.

4. **Activities connected with research and development**

Assists in research and development in the fields of: Curing and preservation; Leather manufacture; Auxiliaries; Utilization of bye-products Treatment of effluents; utilizing local tanning resources;

## 3. LEARNING OUTCOMES OF DIPLOMA PROGRAMME IN LEATHER TECHNOLGY (TANNING)

| Sr. | Learning Outcomes |
|---|---|
| After undergoing this programme, students will be able to: | |
| 1 | Prepare and interpret drawings of engineering components and plants |
| 2 | Knowledge of history of leather manufacture ,anatomical structure and composition of hides and skins chrome tanning and syntans etc. |
| 3 | Apply concepts of mechanics to solve chemical engineering problems |
| 4 | Apply basic principles of mathematics, science and engineering to solve chemical engineering problems |
| 5 | The scientific study of hides and skins with microscopic observation with knowledge of microscope , bacteriology and moulds etc. |
| 6 | Various method of Tanning technique. |
| 7 | The knowledge of Post Tanning Operations like sammying, setting&drawing, Saw dusting etc. |
| 8 | Knowledge of Processing Technique for heavy and industrial leather. |
| 9 | Recognize the need for and have the ability to engage in life long learning |
| 10 | Conduct experiments, analyze, interpret data and synthesize valid conclusions |
| 11 | Operate conventional machine for machining of components as per Specifications as an aid to function effectively in the process industry. |
| 12 | Use electrical and electronic instruments to measure various engineering parameters |
| 13 | Knowledge of difference type of machinery and machine components that are used in leather industry |
| 14 | Knowledge about selection of site , water and power, drums, peddles, pits ,and tannery machinery . |

| | |
|---|---|
| 15 | Knowledge and skill of treatment of leather for specific purpose book binding, box making, leather of Gloves and garments etc. |
| 16 | Knowledge of Leather goods and footwear manufacturing technique. |
| 17 | Understand different renewable sources of energy and their applications. |
| 18 | Knowledge of different chemical which are used in leather industry. |
| 19 | Use various software tools for automation and process development. |
| 20 | Interpret factory acts, laws and taxes |
| 21 | Develop communication and interpersonal skills for effective functioning in The world of work. |
| 22 | Communicate effectively in English and local language in oral and written form with others |
| 23 | Manage resources effectively at work place |
| 24 | Plan and execute given task/project as a team member or leader |
| 25 | Prepare detailed project proposal and report. |
| 26 | Use computer and IT tools for creating documents, making spread sheet and making presentation |
| 27 | Solve real life problems by application of acquired knowledge and skills |
| 28 | Use energy conservation methods to manage energy efficiency |
| 29 | Use appropriate practices for conservation and prevention of environment Pollution and safety in process industries. |
| 30 | The Knowledge about tannery based treatment and its disposals with reuse . |
| 31 | Knowledge and Skill for maintaining and testing the quality of leather produce in the tanneries . |

## 4. DERIVING CURRICULUM AREAS FROM LEARNING OUTCOMES OF THE PROGRAMME

**The following curriculum area subjects have been derived from learning outcomes:**

| Sr. No. | Learning Outcomes | Curriculum Areas/Subjects |
|---|---|---|
| 1. | Prepare and interpret drawings of engineering components and plants | -Engineering Drawing-I |
| 2. | Knowledge of history of leather manufacture , anatomical structure and composition of hides and skins chrome tanning and suntansetc. | -skin protein and pretannages |
| 3. | Apply concepts of mechanics to solve chemical engineering problems | - Applied Mechanics |
| 4. | Apply basic principles of mathematics, science and engineering to solve chemical engineering problems | - Applied Mathematics<br>- Applied Physics<br>- Applied Chemistry<br>- Basics of Mechanical and Civil Engineering<br>- Chemical Engineering Thermodynamics |
| 5. | The scientific study of hides and skins with microscopic observation with knowledge of microscope , bacteriology and moulds etc. | Elementary Microscopy and microbiology |
| 6. | Various Method of Tanning techniques. | - Inorganic and organic tanning |

| | | |
|---|---|---|
| 7. | The knowledge of post tanning operation like sammying , setting & drawing , saw dusting etc. | Post tanning and finishing operations |
| 8. | Knowledge of processing technique for heavy and industrial leather. | Process of heavy and sports leather |
| 9. | Recognize the need for and have the ability to engage in lifelong learning | - Student Centered Activities |
| 10. | Conduct experiments, analyze, interpret data and synthesize valid conclusions | - Applied Chemistry<br>- Chemical Reaction Engineering |
| 11. | Operate conventional machine for machining of components as per specifications as an aid to function effectively in the process industry. | - General Workshop Practice |
| 12. | Use electrical and electronic instruments to measure various engineering parameters | - Basics of Electrical and Electronics Engg. |
| 13. | Knowledge of difference type of machinery and machine components that are used in leather industry . | Leather Trade engineering |
| 14. | Knowledge about selection of site , water and power , drums ,peddles ,pits, and tannery machinery . | Leather Trade engineering |
| 15. | Knowledge and skill of treatment of leather for specific purpose book binding, box making , leather of gloves and garments etc . | - Process of light leather |
| 16. | Knowledge of leather goods and footwear manufacturing technique. | Elements of footwear technolohy and leather goods and garment manufacture. |
| 17. | Understand different renewable sources of Energy and their applications. | - Renewable Energy Sources |
| 18. | Knowledge of difference chemical which are | - Analytical Chemistry of leather |

| | | |
|---|---|---|
| | used in leather industry. | manufacture |

| | | |
|---|---|---|
| 19. | Use various software tools for automation And process development. | - Computer Applications in Petrochemical Engineering |
| 20. | Interpret factory acts, laws and taxes | - Industrial Management and Entrepreneurship Development |
| 21. | Develop communication and interpersonal skills for effective functioning in the world of work. | - Communication Skills<br>- Industrial Management and Entrepreneurship Development |
| 22. | Communicate effectively in English and local language in oral and written form with others | - Communication Skills |
| 23. | Manage resources effectively at work place | - Project Work |
| 24. | Plan and execute given task/project as a team member or leader | - Project Work |
| 25. | Prepare detailed project proposal and report. | - Project Work |
| 26. | Use of computer and IT tools for creating documents, making spread sheet and making presentation | - Basics of Information Technology |
| 27. | Solve real life problems by application of acquired knowledge and skills | - Project Work |
| 28. | Use energy conservation methods to manage energy efficiency | - Energy Conservation |
| 29. | Use appropriate practices for conservation and prevention of environment pollution and Safety in process industries. | - Environmental Studies<br>-Pollution Control and Industrial Safety |
| 30. | The Knowledge about tannery based treatment and its disposal with reuse. | - Tannery waste Management |
| 31. | Knowledge and skills for maintaining and testing the quality of leather produce in the tanneries. | - process of light leathers |

## 5. ABSTRACT OF CURRICULUM AREAS

### a) General Studies

Communication Skills
Environmental Studies
Energy Conservation
Industrial Management and
Entrepreneurship Development

### b) Applied Sciences

Applied Mathematics
Applied Physics
Applied Chemistry

### c) Basic Courses in Engineering/Technology

Engineering Drawing
General Workshop Practice
Basics of Mechanical and Civil Engineering
Basics of Electrical and Electronics Engineering
Basics of Information Technology
Measuring instrument and measurement
Financial Cost and Management accounting

### d) Applied Courses in Engineering/Technology Measuring

**Skin protein and pretanning**
Skins proteins and pretannages
Inorganic and organic tanning
Elementary Microscopy and microbiology
Post tanning and finishing operations
Process of heavy and sports leather
Process of light leather
Leather goods and garment manufacturing
Leather Trade Engineering
Analytical chemistry of leather manufacture.
Tannery waste Management
Element of footwear and leather goods manufacture
Renewable Energy Source

### Industrial Training

Project Work

## 6. HORIZONTAL AND VERTICAL ORGANISATION OF THE SUBJECTS

| Sr. No. | Subjects | Distribution in Periods per week in Various Semesters | | | | | |
|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI |
| 1. | Communication Skills | 9 | - | - | 6 | - | - |
| 2. | Applied Mathematics | 6 | 5 | 5 | - | - | - |
| 3. | Applied Physics | 8 | 7 | - | - | - | - |
| 4. | Applied Chemistry | 8 | - | - | - | - | - |
| 5. | Engineering Drawing | 8 | - | - | - | - | - |
| 6. | Skins proteins and pretannages | - | 12 | - | - | - | - |
| 7. | General Workshop Practice-I | 8 | 8 | - | - | - | - |
| 8. | Applied Mechanics | - | 7 | - | - | - | - |
| 9. | Basics of Mechanical and Civil Engineering | - | 7 | - | - | - | - |
| 10. | Elementary Microscopy & Microbiology | - | - | 12 | - | - | - |
| 11. | Environmental Studies | - | - | 5 | - | - | - |
| 12. | Inorganic and organic tanning | - | - | 6 | - | - | - |
| 13. | Post tanning and finishing operations | - | - | 14 | - | - | - |
| 14. | Basics of Electrical and Electronics Engg | - | - | - | 10 | - | - |
| 15. | Basics of Information Technology | - | - | 6 | - | - | - |
| 16. | Process of heavy and sports leather | - | - | - | 12 | - | - |
| 17. | Elements of footwear technology | - | - | - | 10 | - | - |
| 18. | Leather Trade Engineering | - | - | - | 8 | - | - |
| 19. | Financial Costing and Accounting | - | - | - | - | 6 | - |
| 20. | Analytical Chemistry of Leather manufacture | - | - | - | - | 12 | |
| 21. | Energy Conservation | - | - | - | - | - | 6 |
| 22. | Industrial Management and Entrepreneurship Development | - | - | - | - | - | 6 |
| 23. | Renewable Energy Sources | - | - | - | - | 4 | - |
| 24. | Tannery waste Management | - | - | - | - | - | 6 |
| 25. | Pollution Control and Industrial Safety | - | - | - | - | 10 | - |
| 26. | Leather and products merchandising | - | - | - | - | 12 | 6 |
| 27. | Universal Human Values | - | - | - | - | 2 | - |
| 28. | Process of light leathers | - | - | - | - | - | 16 |
| 29. | Project Work | - | - | - | - | - | 6 |
| 30. | Student Centered Activities | 1 | 2 | 3 | 2 | 2 | 2 |
| | **Total** | **48** | **48** | **48** | **48** | **48** | **48** |

## 7. STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN LEATHER TECHNOLOGY (TANNING)

**FIRST SEMESTER:**

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| 1.1 | *Communication Skills-I | 3 | - | 2 | 5 | 20 | 10 | 30 | 50 | 2.5 | 20 | 3 | 70 | 100 |
| 1.2 | *Applied Mathematics-1 | 5 | - | - | 5 | 20 | - | 20 | 50 | 2.5 | - | - | 50 | 70 |
| 1.3 | *Applied Physics-1 | 5 | - | 2 | 5 | 20 | 10 | 30 | 50 | 2.5 | 20 | 3 | 70 | 100 |
| 1.4 | *Applied Chemistry | 5 | - | 2 | 5 | 20 | 10 | 30 | 50 | 2.5 | 20 | 3 | 70 | 100 |
| 1.5 | *Engineering Drawing-I | - | - | 8 | 3 | - | 40 | 40 | 60 | 3 | - | - | 60 | 100 |
| 1..6 | Measuring Instruments & Measurement | 4 | - | 2 | 4 | 20 | 10 | 30 | 50 | 2.5 | 20 | 3 | 7 0 | 100 |
| 1.7 | General Workshop Practice-I | - | - | 8 | 2 | - | 40 | 40 | - | - | 60 | 4 | 60 | 100 |
| #Student Centered Activities | | - | - | 2 | 1 | - | 30 | 30 | - | - | - | - | - | 30 |
| Total | | 22 | - | 26 | 30 | 100 | 150 | 250 | 310 | - | 140 | - | 450 | 700 |

* Common with other diploma programmes

\# Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

**SECOND SEMESTER:**

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/ Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| 2.1 | *Applied Mathematics-II | 5 | - | - | 5 | 20 | - | 20 | 50 | 2.5 | - | - | 50 | 70 |
| 2.2 | *Applied Physics-II | 5 | - | 2 | 5 | 20 | 10 | 30 | 50 | 2.5 | 20 | 3 | 70 | 100 |
| 2.3 | +Applied Mechanics | 5 | - | 2 | 5 | 20 | 10 | 30 | 50 | 2.5 | 20 | 3 | 70 | 100 |
| 2.4 | **Basics of Mechanical & Civil Engg. | 5 | - | 2 | 5 | 20 | 10 | 30 | 50 | 2.5 | 20 | 3 | 70 | 100 |
| 2.5 | Skins proteins and pretannages | 6 | - | 6 | 7 | 20 | 30 | 50 | 50 | 2.5 | 50 | 6 | 100 | 150 |
| 2.6 | General Workshop Practice II | - | - | 8 | 2 | - | 40 | 40 | - | - | 60 | 4 | 60 | 100 |
| #Student Centered Activities | | - | | 2 | 1 | - | 30 | 30 | - | - | - | - | - | 30 |
| Total | | 26 | - | 22 | 30 | 100 | 130 | 230 | 250 | - | 170 | - | 420 | 650 |

* Common with other diploma programmes

** Common with diploma in Electrical Engg.

\+ Common with diploma in Mechanical Engineering and Civil Engg.

\# Student Centered Activities will comprise of co-curricular activities like extension Lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

**THIRD SEMESTER:**

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| 3.1 | *Environmental Studies | 3 | - | 2 | 3 | 20 | 10 | 30 | 50 | 2.5 | 20 | 3 | 70 | 100 |
| 3.2 | *Applied Mathematics-III | 5 | - | - | 4 | 20 | - | 20 | 50 | 2.5 | - | - | 50 | 70 |
| 3.3 | *Basics of Information Technology | - | - | 6 | 3 | - | 20 | 20 | - | - | 50 | 3 | 50 | 70 |
| 3.4 | Inorganic And Organic Tanning | 6 | - | - | 6 | 20 | - | 20 | 50 | 2.5 | - | - | 50 | 70 |
| 3.5 | Post Tanning and Finishing Operation | 6 | - | 8 | 7 | 20 | 30 | 50 | 50 | 2.5 | 50 | 6 | 100 | 150 |
| 3.6 | Elementary Microscopy & Microbiology | 6 | - | 4 | 6 | 20 | 30 | 50 | 50 | 2.5 | 50 | 6 | 100 | 150 |
| #Student Centered Activities | | - | - | 2 | 1 | - | 30 | 30 | - | - | - | - | - | 30 |
| Total | | 26 | - | 22 | 30 | 100 | 120 | 220 | 250 | - | 170 | - | 420 | 640 |

* Common with other diploma Programmes

\# Student Centred Activities will comprise of co-curricular activities like extension Lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

**FOURTH SEMESTER:**

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| 4.1 | *Communication Skills-II | 4 | - | 2 | 4 | 20 | 10 | 30 | 50 | 2.5 | 20 | 3 | 70 | 100 |
| 4.2 | **Basic of Electrical and Electronics | 6 | - | 4 | 6 | 20 | 30 | 50 | 50 | 2.5 | 50 | 6 | 100 | 150 |
| 4.3 | Process of Heavy and Sports Leather | 6 | - | 6 | 7 | 20 | 30 | 50 | 50 | 2.5 | 50 | 6 | 100 | 150 |
| 4.4 | Elements of Footwear Technology | 6 | - | 4 | 6 | 20 | 30 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 4.5 | Leather Trade Engineering | 6 | - | 2 | 6 | 20 | 10 | 30 | 50 | 2.5 | 20 | 3 | 70 | 100 |
| #Student Centered Activities | | - | - | 2 | 1 | - | 30 | 30 | - | - | - | - | - | 30 |
| Total | | 28 | - | 20 | 30 | 100 | 140 | 240 | 250 | - | 190 | - | 440 | 680 |

Note: Industrial Training for 4 weeks after fourth semester during summer vacation.

* Common with other diploma Programmes

** Common with diploma in Computer Science and Engineering

# Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self-study etc.

**FIFTH SEMESTER:**

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/ Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| - | Industrial Training | - | - | - | 2 | - | - | - | - | - | 50 | 3 | 50 | 50 |
| 5.1 | Financial Costing and Accounting | 5 | - | - | 6 | 20 | - | 20 | 50 | 2.5 | - | - | 50 | 70 |
| 5.2 | Pollution Control and Industrial Safety | 5 | - | 6 | 6 | 20 | 30 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 5.3 | Analytical Chemistry of Leather Manufacture | 5 | - | 6 | 6 | 20 | 30 | 50 | 50 | 2.5 | 50 | 6 | 100 | 150 |
| 5.4 | Renewable Energy Sources | 4 | - | - | 3 | 20 | - | 20 | 50 | 2.5 | - | - | 50 | 70 |
| 5.5 | Leather Goods and Garment manufacturing | 6 | - | 6 | 6 | 20 | 30 | 50 | 50 | 2.5 | 50 | 6 | 100 | 150 |
| 5.6 | *Universal Human Values | 2 | - | 1 | 1 | - | 20 | 20 | - | - | 30 | 3 | 30 | 50 |
| #Student Centered Activities | | - | - | 2 | 1 | - | 30 | 30 | - | - | - | - | - | 30 |
| TOTAL | | 27 | - | 21 | 30 | 100 | 140 | 240 | 250 | - | 230 | - | 480 | 720 |

# Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

**SIXTH SEMESTER:**

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| 6.1 | *Energy Conservation | 3 | - | 2 | 4 | 20 | 10 | 30 | 50 | 2.5 | 20 | 3 | 70 | 100 |
| 6.2 | Industrial Management and Entrepreneurship Development | 5 | - | - | 4 | 20 | - | 20 | 50 | 2.5 | - | - | 50 | 70 |
| 6.3 | Leather and Products Merchandising | 6 | - | - | 4 | 20 | - | 20 | 50 | 2.5 | - | - | 50 | 70 |
| 6.4 | Tannery Waste Management | 6 | - | - | 6 | 20 | - | 20 | 50 | 2.5 | - | - | 50 | 70 |
| 6.5 | Process of Light Leathers | 6 | - | 10 | 6 | 20 | 30 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 6.6 | Project work | - | - | 8 | 5 | - | 50 | 50 | - | - | 100 | 3 | 100 | 150 |
| #Student Centered Activities | | - | - | 2 | 1 | - | 30 | 30 | - | - | - | - | - | 30 |
| Total | | 26 | - | 22 | 30 | 100 | 120 | 220 | 250 | - | 170 | - | 420 | 640 |

* Common with other diploma Programmes

\# Student Centered Activities will comprise of co-curricular activities like extension Lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, Educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

## GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 30 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

i. 10 Marks for general behavior and discipline

(by HODs in consultation with all the teachers of the department)

ii. 5 Marks for attendance as per following:

(by HODs in consultation with all the teachers of the department)

| | | |
|---|---|---|
| a) | 75 - 80% | 2 Marks |
| b) | 80 - 85% | 4 Marks |
| c) | Above 85% | 5 Marks |

iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/ NSS activities as per following:

(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)

| | | | |
|---|---|---|---|
| a) | 15 | - | State/National Level participation |
| b) | 10 | - | Participation in two of above activities |
| c) | 5 | - | Inter-Polytechnic level participation |

Note: There should be no marks for attendance in the internal sessional of different subjects.

## 1.1 COMMUNICATION SKILLS – I

**L T P**
**4 - 2**

**RATIONALE**

Knowledge of English Language plays an important role in career development. This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills as parts of Communication Skill.

**LEARNING OUTCOMES**

After undergoing the subject, the students will be able to:

.

- Understand the importance of effective communication
- Describe the process of communication
- Communicate effectively in different contexts
- Identify parts of speech
- Write correct sentences using appropriate vocabulary
- Reproduce and match words and sentences in a paragraph
- Write various types of paragraphs, notices for different purposes and composition on picture with appropriate format
- Read unseen texts with comprehension

.

**DETAILED CONTENTS**

1 Basics of Communication (13 periods)

1.1 Definition and process of communication

1.2 Types of communication - formal and informal, oral and written, verbal and non-verbal

1.3 Communications barriers and how to overcome them

1.4 Barriers to Communication, Tools of Communication

| 2 | Application of Grammar | | (18 periods) |
|---|---|---|---|
| | 2.1 | Parts of Speech (Noun, verb, adjective, adverb) and modals | |
| | 2.2 | Sentences and its types | |
| | 2.3 | Tenses | |
| | 2.4 | Active and Passive Voice | |
| | 2.5 | Punctuation | |
| | 2.6 | Direct and Indirect Speech | |

3 Reading Skill (10 periods)

Unseen passage for comprehension (one word substitution, prefixes, suffixes, antonyms, synonyms etc. based upon the passage to be covered under this topic)

4 Writing Skill (15 periods)

4.1 Picture composition
4.2 Writing paragraph
4.3 Notice writing

## LIST OF PRACTICALS

**Note:** Teaching Learning Process should be focused on the use of the language in writingreports and making presentations.

Topics such as Effective listening, effective note taking, group discussions and regular presentations by the students need to be taught in a project oriented manner where the learning happens as a byproduct.

### Listening and Speaking Exercises

1. Self and peer introduction
2. Newspaper reading
3. Just a minute session-Extempore
4. Greeting and starting a conversation
5. Leave taking
6. Thanking
7. Wishing well
8. Talking about likes and dislikes
9. Group Discussion
10. Listening Exercises.

## INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centred activities in class room and actively participate in listening exercises

## MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

## RECOMMENDED BOOKS


1. Communicating Effectively in English, Book-I by RevathiSrinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; DhanpatRai Publications, New Delhi.
3. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
4. Excellent General English-R.B.Varshnay, R.K. Bansal, Mittal Book Depot, Malhotra
5. The Functional aspects of Communication Skills – Dr. P. Prsad, S.K. Katria& Sons, New Delhi
6. Q. Skills for success – Level & Margaret Books, Oxford University Press.
7. E-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR.


## Websites for Reference:

1. http://www.mindtools.com/page 8.html – 99k
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 13 | 24 |
| 2 | 18 | 32 |
| 3 | 10 | 16 |
| 4 | 15 | 28 |
| **Total** | **56** | **100** |

## 1.2 APPLIED MATHEMATICS - I

| L | T | P |
|---|---|---|
| 5 | - | - |

**RATIONALE**

Contents of this course provide fundamental base for understanding elementary mathematics and their uses in solving engineering problems. Contents of this course will enable students to use basic mathematical function like logarithms, partial fractions, matrices and basic 2D, curves in solving various engineering problems of all fields.

**LEARNING OUTCOMES**

After undergoing this course, the students will be able to:

- Apply Binomial theorem to solve engineering problems
- Apply determinants properties and Crammer's rule to solve engineering problems
- Apply dot & cross product of vectors to find the solution of engineering problems
- Use complex numbers in various engineering problems
- Apply differential calculus and higher order to solve engineering problems
- Find velocity, acceleration, errors and approximation in engineering problems with application of derivatives.

**DETAILED CONTENTS**

1. Algebra -I (12 Periods)

   1.1 Series : AP and GP; Sum, nth term, Mean

   1.2 Binomial theorem for positive, negative and fractional index (without proof). Application of Binomial theorem.

   1.3 Determinants : Elementary properties of determinant of order 2 and 3, Multiplication system of algebraic equation, Consistency of equation, Crammer's rule

2. Algebra- II (12 Periods )

   2.1 Vector algebra : Dot and Cross product, Scaler and vector triple product.

   2.2 Complex number.

   Complex numbers, Representation, Modulus and amplitude Demoivre theorem, its application in solving algebraic equations, Mod. function and its properties..

3. Trigonometry (10 Periods )

3.1 Relation between sides and angles of a triangle : Statement of various formulae showing relationship between sides and angle of a triangle.

3.2 Inverse circular functions: Simple case only

4. Differential Calculus - I (18 Periods)

4.1 Functions, limits, continuity, - functions and their graphs, range and domain, elementary methods of finding limits (right and left), elementary test for continuity and differentiability.

4.2 Methods of finding derivative, Trigonometric functions, exponential function, Function of a function, Logaritimic differentiation, Differentiation of Inverse trigonometric function, Differentiation of implicit functions.

5. Differential Calculus - II (18 Periods)

5.1 Higher order derivatives, Leibnitz theorem (without proof). Simple applications.

5.2 Application - Finding Tangents, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration, Errors and approximation.

**INSTRUCTONAL STRATEGY**

The basic instructional strategy to teach basic mathematics, Binomial theorem, trigonometry, differential equations etc. should be conceptual with real world applications of relevant branch. More numerical and theory examples can be used for clear understanding of the content**.**

**MEANS OF ASSESSMENT**

- Assignments and Quiz/Class Tests
- Mid-term and End-term Written Tests
- Model/Prototype Making

**RECOMMENDED BOOKS**

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
3Applied Mathematics-I by Chauhan and Chauhan, Krishna Publications, Meerut**.**
4. Applied Mathematics-I (A) by Kailash Sinha and Varun Kumar; Aarti Publication, Meerut

## SUGGESTED DISTRIBUTION OF MARKS

| Topic | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 12 | 20 |
| 2. | 12 | 20 |
| 3. | 10 | 12 |
| 4 | 18 | 24 |
| 5 | 18 | 24 |
| **Total** | **70** | **100** |

## 1.3 APPLIED PHYSICS – I

**L T P**
**5 - 2**

**RATIONALE**

Applied physics includes the study of a diversified topics related to the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects behave. Concrete knowledge of physical laws, analysis and applications in various fields of engineering and technology are given prominence in this course content.

**Note: Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to learn and appreciate these concepts and principles. In all contents, SI units should be followed.**

**LEARNING OUTCOMES**

After undergoing this course, the students must be able to:

- Identify the use of S.I. system of measurement with accuracy and how it is used in engineering
- Represent physical quantities as scalars and vectors, applying the physical laws and concepts of linear and circular motion in everyday life.
- Solve difficult problems (walking of man, horse and cart problem, flying of bird/ aircraft, etc.)
- Analyse and design banking of roads/railway tracks and apply conservation of momentum principle to Explain rocket propulsion, recoil of gun etc.
- Derive work, power and energy relationship and solve problems about work and power.
- Define work, energy and power and their units.
- Describe conservation of energy and its applications
- Understand the concept of rotational motion of a rigid body and its applications
- Apply the physical laws and concepts of gravity, its variation with longitude and latitude and its uses in space satellite etc. .
- Understand the concept of elasticity, surface tension, pressure and the laws governing movement of fluids.
- Express physical work in term of heat and temperature; Measure temperature in various processes on different scales (Celsius, Kelvin, Fahrenheit etc.)
- Distinguish between conduction, convection and radiation, identify the different methods for reducing heat losses
- Understand the laws of thermodynamics, Carnot cycle and their applications.

## DETAILED CONTENTS

1. Units and Dimensions (10 Periods)

1.1 Need of Measurement in engineering and science, unit of a physical quantities - fundamental and derived units, systems of units (FPS, CGS and SI units)

1.2 Dimensions and dimensional formulae of physical quantities.

1.3 Principle of homogeneity of dimensions

1.4 Dimensional equations and their applications, conversion of numerical values of physical quantities from one system of units into another, checking the correctness of physical equations and deriving relations among various physical quantities

1.5 Limitations of dimensional analysis

1.6 Error in measurement, accuracy and precision of instruments, random and systematic errors, absolute error, relative error, and percentage error, Estimation of probable errors in the results of measurement (combination of errors in addition, subtraction, multiplication, division and powers), rules for representing significant figures in calculation.

1.7 Application of units and dimensions in measuring length, diameter, circumference, volume, surface area etc. of metallic and non metallic blocks, wires, pipes etc (at least two each).

2. Force and Motion (10 periods)

2.1 Scalar and vector quantities – examples, representation of vector, types of vectors

2.2 Addition and Subtraction of Vectors, Triangle and Parallelogram law (Statement only), Scalar and Vector Product.

2.3 Resolution of Vectors and its application to lawn roller.

2.4 Force, Momentum, Statement and Derivation of Conservation of linear momentum, its applications such as recoil of gun.

2.5 Impulse and its Applications

2.6 Circular motion (Uniform and Non-uniform), definition of angular displacement, angular velocity, angular acceleration, frequency, time period.

2.7 Relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical)

2.8 Central force, Expression and Applications of Centripetal and centrifugal forces with examples such as banking of roads and bending of cyclist, Principle of centrifuge.

2.9 Application of various forces in lifts, cranes, large steam engines and turbines

3. Work, Power and Energy (10 periods)

3.1 Work: and its units, examples of zero work, positive work and negative work, conservative and non-conservative force,

3.2 Friction: modern concept, types, laws of limiting friction, Coefficient of friction and its Engineering Applications.

3.3 Work done in moving an object on horizontal and inclined plane for rough and plane surfaces with its applications

3.4 Energy and its units: Kinetic energy and potential energy with examples and their derivation, work energy theorem.

3.5 Principle of conservation of mechanical energy for freely falling bodies, examples of transformation of energy.

3.6 Power and its units, calculation of power in numerical problems

3.7 Application of Friction in brake system of moving vehicles, bicycle, scooter, car trains etc.

4 Rotational Motion (10 periods)

4.1 Concept of translatory and rotatory motions with examples

4.2 Definition of torque with examples

4.3 Angular momentum, Conservation of angular momentum (quantitative) and its examples

4.4 Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and perpendicular axes (statements only), Moment of inertia of rod, disc, ring and sphere (hollow and solid) (Formulae only). Concept of Fly wheel.

4.5 Rotational kinetic energy, Rolling of sphere on the slant plane

4.6 Comparison of linear motion and rotational motion.

4.7 Application of rotational motions in transport vehicles, and machines.

5 Motion of planets and satellites (08 periods)

5.1 Gravitational force, Kepler's law of planetary motion

5.2 Acceleration due gravity and its variation

5.3 Gravitational Potential and Gravitational potential energy

5.4 Motion of satellite, orbital velocity and time period of satellite, Total energy and Binding energy of a satellite, Escape energy and escape velocity

5.5 Types of satellites, Geo-stationary satellite, semi-synchronous, polar satellite (concept only) and their uses in science and technology

5.6 Concept of Black Holes

6. Properties of Matter (12 periods)

6.1 Elasticity: definition of stress and strain, different types of modulii of elasticity, Hooke's law, significance of stress strain curve

6.2 Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications

6.3 Surface tension: concept, its units, angle of contact, Capillary action and determination of surface tension from capillary rise method, applications of surface tension, effect of temperature and impurity on surface tension

6.4 Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature on viscosity, application in hydraulic systems.

6.5 Concept of fluid motion, stream line and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem and their applications.

7. Heat and Thermodynamics (10 periods)

` 7.1 Difference between heat and temperature

7.2 Modes of transfer of heat (Conduction, convection and radiation with examples)

7.3 Different scales of temperature and their relationship

7.4 Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them

7.5 Heat conduction in a metal rod, Temperature gradient, Concept of Co-efficient of thermal conductivity, Uses and effects of Heat conduction in Daily life.

7.6 Isothermal and Adibatic process

7.7 Zeroth, First and second law of thermodynamics, Heat engine (concept Only), Carnot cycle.

7.8 Application of various systems of thermometry in refrigeration and air-conditioning etc.

## LIST OF PRACTICALS

1 To find radius of wire and its volume and the maximum permissible error in these quantities by using both vernier calipers and screw gauge.

2 To find the value of acceleration due to gravity on the surface of earth by using a simple pendulum.

3 To determine the Radius of curvature of (i) convex mirror, (ii) concave mirror by spherometer

4 To verify parallelogram law of forces

5 To study conservation of energy of a ball or cylinder rolling down an inclined plane.

6 To find the Moment of Inertia of a flywheel about its axis of rotation

7 To determine the atmospheric pressure at a place using Fortin's Barometer

8 To determine the viscosity of glycerin by Stoke's method

9 To determine the coefficient of linear expansion of a metal rod

10 To determine force constant of spring using Hooks law

## INSTRUCTIONAL STATREGY

Teacher may use various teaching aids like live models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. The teacher should explain about field applications before teaching the basics to develop proper understanding of the physical phenomenon. Use of demonstration and animations can make the subject interesting and may develop scientific temper in the students. Teacher must plan a tour of

Science Park/planetarium available in nearby areas in order to enhance the interest in this course.

## MEANS OF ASSEMENTS

- Assignment & Quiz,
- Mid-Term and End-Term written test,
- Model Making,
- Actual Lab & Practical Work,
- VivaVoice

## RECOMMENDED BOOKS


1 Text Book of Physics for Class XI (Part-I, Part-II); N.C.E.R.T., Delhi

2 Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi

3 Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi

4 B.Sc.Practical Physics by C L Arora, S. Chand Publication..

5 Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi

6 Engineering Physics by DK BhhatacharyaPoonamTandan; Oxford University Press,

7 Modern Engineering Physics by SL Gupta, Sanjeev Gupta, Dhanpat Rai Publications

8 V. Rajendran,physics-I, Tata McGraw-Hill raw Hill publication, New Delhi

9 Arthur Beiser, Applied Physics, Tata McGraw-Hill raw Hill publication, New Delhi

10 Physics Volume 1, 5th edition, HalidayResnick and Krane, Wiley publication


**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 10 | 15 |
| 2 | 10 | 15 |
| 3 | 10 | 15 |
| 4 | 10 | 15 |
| 5 | 8 | 10 |
| 6 | 12 | 16 |
| 7 | 10 | 14 |
| **Total** | **70** | **100** |

## 1.4 APPLIED CHEMISTRY

**L T P**
**5 - 2**

**RATIONALE**

The use of various chemicals and chemical products in diverse technical and engineering fields have repeatedly proved the importance of Applied Chemistry, which enhances its role to a new peak. On the other hand, ever increasing use of such materials will compel engineers, technocrats to acquire essential applied chemistry knowledge in order to select engineering materials, which not only suit them but also provide more environmental compatibility. This situation demands principles of Applied Chemistry in diploma-engineering courses. Principles of Applied Chemistry will enable budding engineers and technocrats to develop scientific temper and appreciate physical, chemical and engineering properties of materials. Hence the subject of Applied Chemistry.

**LEARNING OUTCOMES**

After undergoing this subject, the student will be able to:

- Classify various substances based on state of aggregation
- Substantiate the laws and principles on which structure of atom is established.
- Explain and predict properties of substances.
- Explain sources of water and various characteristics of water (quantitatively).
- Explain cause and factors which can adversely affecting natural water quality and remedial measures available for water purification
- Think critically, develop and adapt water conservation techniques.
- Explain corrosion of metal and their preventive measures.
- explain chemical nature and causes of corrosion
- apply correct and efficient methods of corrosion prevention.
- explain chemistry of fuels and their relative advantages.
- select most efficient fuel for the engine and engineering applications.
- suggest how to subside air pollution caused by the use of fossil fuels
- explain the chemistry of various polymers and plastics
- verify suitability and select polymer/rubber/plastic materials for engineering applications.

**DETAILED CONTENTS**

1. Atomic Structure, Periodic Table and Chemical Bonding (14 periods)

    1.1 Fundamental particles- mass and charges of electrons, protons and neutrons with names of the scientists who discovered these fundamental particles.
    1.2 Bohr's model of atom and successes and limitations of atomic theory (qualitative treatment only).
    1.3 Atomic number, atomic mass number isotopes and isobars.

1.4 Definition of orbit and orbitals, shapes of s and p orbitals only, quantum numbers and their significance,

1.5 Aufbau's principle, Pauli's exclusion principle and Hund's rule electronic configuration of elements with atomic number (Z) = 30 only. (Electronic configurations of elements with atomic number greater than 30 are excluded).

1.6 Modern periodic law and periodic table, groups and periods, classification of elements into s, p, d and f blocks (periodicity in properties - excluded)

1.7 Chemical bonding and cause of bonding and types such as ionic bond in NaCl sigma (σ) and pi (π) covalent bonds in $H_2$, HCl, $Cl_2$, elementary idea of hybridization in $BeCl_2$, $BF_3$, $CH_4$, $NH_3$ and $H_2O$, VSEPR, Molecular orbital Theory

1.8 States of Matter: Solid, Liquid & Gas, Metallic bonding- explanation with the help of electron gas (sea) model.

2. Fuelsand Lubricants (18 periods)

2.1 Definition of fuel, classification of fuels, characteristics of good fuel, relative merits of gaseous, liquid and solid fuels

2.2 Calorific value-higher calorific value, lower calorific value, determination of calorific value of solid or liquid fuel using Bomb calorimeter and numerical examples.

2.3 Coal - types of coal and proximate analysis of coal

2.4 Fuel rating – Octane number and Cetane number, fuel-structural influence on Octane and Cetane numbers

2.5 Gaseous fuels – chemical composition, calorific value and applications of natural gas (CNG), LPG, producer gas, water gas and biogas.

2.6 Elementary ideal on – hydrogen as future fuels, nuclear fuels.

2.7 Lubricants: Definition and properties, mechanism, industrial application and its function in bearings.

2.8 Synthetic lubricants and cutting fluids.

3. Water (14 periods)

3.1 Demonstration of water resources on Earth using pie chart.

3.2 Classification of water – soft water and hard water, action of soap on hard water, types of hardness, causes of hardness, units of hardness – mg per liter ($mgL^{-1}$) and part per million (ppm) and simple numerical, pH and buffer solutions and their applications.

3.3 Disadvantages caused by the use of hard water in domestic and boiler feed water. Primming and foaming and caustic embrittlement in boilers.

3.4 Removal of hardness -Permutit process and Ion-exchange process.

3.5 Physico-Chemical methods for Water Quality Testing

a) Determination of pH using pH meter, total dissolved solids (TDS)

b) Testing and Estimation of- alkalinity, indicator their types and application total hardness by EDTA method and O'Hener's Method. (chemical reaction of EDTA method are excluded).

c) Understanding of Indian Water Quality standards as per WHO

3.6 Natural water sterilization by chlorine and UV radiation and reverse osmosis.

3.7 Municipality waste water treatment. Definition of B.O.D and C.O.D.

4. Electrochemistry (4 periods)

Redox Reaction, Electrode Potential, Nernst equation, Electrochemical cell (Galvanic and Electrobytes); Nernst equation.

5. Corrosion and its Control (10 periods)

5.1 Definition of corrosion and factors affecting corrosion rate.

5.2 Theories of

a) Dry (chemical) corrosion- Pilling Bedworth rule

b) Wet corrosion in acidic atmosphere by hydrogen evolution mechanism

5.3 Definition of passivity and galvanic series

5.4 Corrosion control:

a) Metal coatings – Cathodic protection, Cementation on Base Metal Steel –Application of Metal Zn (Sheradizing),Cr (Chromozing) and Al (Calorizing), Sacrificial protection and impressed current voltage

b) Inorganic coatings – Anodizing and phosphating,

c) Organic coatings - use of paints varnishes and enamels

d) Internal corrosion preventive measures- alloying (with reference to passivating, neutralizing and inhibition) and heat treatment (quenching, annealing)

6. Organic compounds, Polymers and Plastics (10 periods)

6.1 Classification of organic compounds and IUPAC Nomenclature

6.2 Definition of polymer, monomer and degree of polymerization

6.3 Brief introduction to addition and condensation polymers with suitable examples (PE, PS, PVC, Teflon, Nylon -66 and Bakelite)

6.4 Definition of plastics, thermo plastics and thermo setting plastics with suitable examples, distinctions between thermo and thermo setting plastics

6.5 Applications of polymers in industry and daily life

## LIST OF PRACTICALS

1. Estimation of total hardness of water using standard EDTA solution

Estimation of total alkalinity of given water sample by titrating it against standard sulphuric acid solution

3. Proximate analysis of solid fuel)
4. Estimation of temporary hardness of water sample by O' Hener's Method.
5. Determination of flash and fire point of given lubricating oil using Able's flash point apparatus

**INSTRUCTIONAL STRATEGY**

Teachers may take help of various models and charts while imparting instructions to make the concept clear. More emphasis should be laid on discussing and explaining practical applications of various chemical process and reactions. In addition, students should be encouraged or motivated to study those processes in more details, which may find practical application in their future professional career.

**MEANS OF ASSEMENTS**

−Assignment & Quiz,
−Mid-Term and End-Term written test,
−Model Making,
−Actual Lab & Practical Work,
−VivaVoice

**RECOMMENDED BOOKS**


1. Chemistry in Engineering by J.C. Kuricose& J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Engineering Chemistry by P.C. Jain & Monika Jain, DhanapatRai Publishing Company, New Delhi.
3. Eagle's Applied Chemistry - I by S. C. Ahuja & G. H. Hugar, Eagle Prakashan, Jalandhar.
4. Engineering Chemistry – A Text Book by H. K. Chopra & A. Parmar, Narosa Publishing House, New Delhi.
5. Applied Chemistry - I by Dr. P. K Vij & Shiksha Vij, Lords Publications, Jalandhar.
6. Engineering Chemistry by Dr. Himanshu Pandey, Goel Publishing House, Meerut, India


**SUGGESTED DISTRIBUTION OF MARKS**

| Topics | Time Allotted (hrs) | Marks Allotted (%) |
|---|---|---|
| 1. | 14 | 20 |
| 2. | 18 | 24 |
| 3. | 14 | 20 |
| 4. | 4 | 6 |
| 5. | 10 | 15 |
| 6. | 10 | 15 |
| **Total** | **70** | **100** |

## 1.5 ENGINEERING DRAWING - I

**L T P**
**- - 8**

**RATIONALE**

Drawing is the language of engineers and technicians. Reading and interpreting engineering drawing is their day to day responsibility. The subject is aimed at developing basic graphic skills in the students so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation. The emphasis, while imparting instructions, should be to develop conceptual skills in the students following BIS SP 46 – 1988.

**Note:**

i) First angle projection is to be followed

ii) Minimum of 18 sheets to be prepared and atleast 2 sheets on AutoCAD

iii) Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students

**LEARNING OUTCOMES**

After undergoing the subject, the students will be able to:

- Identify and use of different grades of pencils and other drafting instruments which are used in engineering field
- Draw free hand sketches of various kinds of objects.
- Utilize various types of lines used in engineering drawing.
- Read and apply different dimensioning methods on drawing of objects.
- Use different types of scales and their utilization in reading and reproducing drawings of objects and maps.
- Draw 2 - dimensional view of different objects viewed from different angles (orthographic views)
- Draw and interpret complete inner hidden details of an object which are otherwise not visible in normal view
- To make projections of Solid
- Generate isometric (3D) drawing from different 2D (orthographic) views/sketches
- Identify conventions for different engineering materials, symbols, sections of regular objects and general fittings used in Civil and Electrical household appliances
- Use basic commands of AutoCAD.

## DETAILED CONTENTS

1. Introduction to Engineering Drawing (03 sheets)

   1.1 Introduction to drawing instruments, materials, layout and sizes of drawing sheets and drawing boards.
   1.2 Different types of lines in Engineering drawing as per BIS specifications
   1.3 Practice of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, circles, ellipses and curves, hexagonal, pentagon with the help of drawing instruments.
   1.4 Free hand and instrumental lettering (Alphabet and numerals) – upper case (Capital Letter), single stroke, vertical and inclined at 75 degree, series of 5,8,12 mm of free hand and instrumental lettering of height 25 to 35 mm in the ratio of 7:4

2. Dimensioning Technique (01 sheet)

   2.1 Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions)
   2.2 Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sunk holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches

3. Scales (02 sheets)

   3.1 Scales –their needs and importance (theoretical instructions), type of scales, definition of R.F. and length of scale
   3.2 Drawing of plain and diagonal scales

4. Orthographic Projections (06 sheets)

   4.1 Theory of orthographic projections (Elaborate theoretical instructions)
   4.2 Projection of Points in different quadrant
   4.3 Projection of Straight Line ($1^{st}$ and $3^{rd}$ angle)
      4.3.1. Line parallel to both the planes
      4.3.2. Line perpendicular to any one of the reference plane
      4.3.3. Line inclined to any one of the reference plane.
   4.4 Projection of Plane – Different lamina like square, rectangular, triangular and circle inclined to one plane, parallel and perpendicular to another plane in $1^{st}$ angle only
   4.5 Three views of orthographic projection of different objects. (At least one sheet in $3^{rd}$ angle)
   4.6 Identification of surfaces

5 Projection of Solid (02 sheets)

5.1. Definition and salient features of Solid
5.2. Types of Solid (Polyhedron and Solid of revolution)
5.3 To make projections, sources, Top view, Front view and Side view of various types of Solid.

6. Sections (02 sheets)

6.1 Importance and salient features
6.2 Drawing of full section, half section, partial or broken out sections, Offset sections, revolved sections and removed sections.
6.3 Convention sectional representation of various materials, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections
6.4 Orthographic sectional views of different objects.

7. Isometric Views (02 sheets)

7.1 Fundamentals of isometric projections and isometric scale.
7.2 Isometric views of combination of regular solids like cylinder, cone, cube and prism.

8. Common Symbols and Conventions used in Engineering (02 sheets)

8.1 Civil Engineering sanitary fitting symbols
8.2 Electrical fitting symbols for domestic interior installations

*9. Introduction to AutoCAD (02 sheets)

Basic introduction and operational instructions of various commands in AutoCAD. At least two sheets on AutoCAD of cube, cuboid, cone, pyramid, truncated cone and pyramid, sphere and combination of above solids.

* **Auto CAD drawing will be evaluated internally by sessional marks and not by final theory paper.**

## INSTRUCTIONAL STRATEGY

Teacher should show model of realia of the component/part whose drawing is to be made. Emphasis should be given on cleanliness, dimensioning and layout of sheet. Focus should be on proper selection of drawing instruments and their proper use. The institute should procure AutoCAD or other engineering graphics software for practice in engineering drawings. Teachers should undergo training in AutoCAD/Engineering Graphic. Separate labs for practice on AutoCAD should be established.

**MEANS OF ASSESSMENT**

- Sketches
- Drawing
- Use of software

**RECOMMENDED BOOKS**


1. A Text Book of Engineering Drawing by Surjit Singh; Dhanpat Rai & Co., Delhi
2. Engineering Drawing by PS Gill; SK Kataria& Sons, New Delhi
3. Elementary Engineering Drawing in First Angle Projection by ND Bhatt; Charotar Publishing House Pvt. Ltd., Anand
4. Engineering Drawing I & II by JS Layall; Eagle Parkashan, Jalandhar
5. Engineering Drawing I by DK Goel, GBD Publication.

## 1.6 MEASURING INSTRUMENTS AND MEASUREMENTS

| L | T | P |
|---|---|---|
| 4 | - | 2 |

**RATIONALE**

The subject of Measuring Instruments and Measurements provides the students necessary knowledge about calibrating, conducting experiments or handling various measuring instruments like Pressure Gauges, Thermometers, Pyrometers, Level Indicators etc.

**LEARNING OUTCOMES**

After undergoing this course, the students will be able to:

- Understand various process instrumentation in process industry
- Operate various measuring instruments like pressure gauge, thermometer, etc.
- Find errors and test various instruments and justify their use in systems and improve productivity.
- Select instruments for various applications.

**DETAILED CONTENTS**

1. Introduction and Classification of Instruments (12 Periods)

   Importance of instruments in chemical process industries, General classification of industrial instruments, Functional elements of instruments, Indicating and recording type instruments, Static and dynamic characteristics of instruments, Description and constructional details, working principle, Ranges and applications of Strip chart recorder, Circular chart recorder, Thermal conductivity measuring instrument.

2. Pressure Measurements (12 Periods)

   Absolute, Gauge and Vacuum pressure, Liquid column gauge, Bourden tube gauge, McLeod gauge, Ionization gauge.

3. Temperature Measurement (12 Periods)

   Temperature scales, Bimetallic thermometer, Liquid expansion thermometer, Thermocouples, Resistance thermometer, Optical and radiation pyrometers, Thermistor.

4. Liquid-Level Meters (12 Periods)

   Visual indicators, Float actuated instrument, the-bubbler system, diaphragm box and air trap systems, electrical contact type liquid level indicators. Hydrostatic head density compensator level meter, hydro step, Radar or microwave level indicator, Ultrasonic or sonic level indicator.

5. Mass and Weight Measurement (08 periods)

   Two-pan balance and single pan mechanical balances, Single pan electronic balance.

## LIST OF PRACTICALS

1. Calibration of Pressure Gauge
2. Calibration of Thermister
3. Calibration of Thermocouple for temperature measurement
4. Calibration of McLeod Gauge for low pressure
5. Calibration of Optical pyrometer.
6. Sketch of single pan electronic balance.
7. Measurement of pressure using Bourden tube.
8. Sketch of diaphragm and air trap system.

## INSTRUCTONAL STRATEGY

This subject gives the knowledge of various instruments used to measure various process parameters. So the theoretical knowledge of this subject should be properly imparted to the students with the help of practical examples. The teacher should use audio-visual aids to show the working of these instruments.

## MEANS OF ASSESSMENT

- Assignments and Quiz/Class Tests
- End-term Written Tests
- Laboratory Work
- Viva-Voce

## RECOMMENDED BOOKS


1. Industrial Instrumentation by Donald.P. Eckmann; CBS., 2004
2. Industrial instrumentation and Control by S.K. Singh; Tata McGraw , 20016
3. Industrial instrumentation, K. Krishnaswamy; New Age International.


## SUGGESTED DISTRIBUTION OF MARKS

| Topic | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 12 | 22 |
| 2. | 12 | 22 |
| 3. | 12 | 20 |
| 4 | 12 | 22 |
| 5 | 08 | 14 |
| **Total** | **56** | **100** |

## 1.7 GENERAL WORKSHOP PRACTICE – I

(Common for Civil Engineering, Electrical Engineering and Chemical Engineering )

| L | T | P |
|---|---|---|
| - | - | 8 |

**RATIONALE**

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices are included in the curriculum in order to provide hands-on experience about use of different tools and basic manufacturing practices. This subject aims at developing general manual and machining skills in the students. In addition, the development of dignity of labour, safety at work place, team working and development of right attitude are the other objectives.

**LEARNING OUTCOMES**

After completing the course, the students will be able to:

- Identify tools and equipment used and their respective functions.
- Identify different types of materials and their basic properties.
- Use and take measurements with the help of basic measuring tools/equipment.
- Select proper tools for a particular operation.
- Select materials, tools, and sequence of operations to make a job as per given specification/drawing.
- Prepare simple jobs independently and inspect the same.
- Follow safety procedures and precautionary measures.
- Use safety equipment and Personal Protection Equipment.

**DETAILED CONTENTS**

**Note:** The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus:

1. Carpentry Shop
2. Painting and Polishing Shop
3. Electrical Shop
4. Welding Shop
5. Plumbing Shop

## 1. CARPENTRY SHOP

1.1 General Shop Talk

1.1.1 Name and use of raw materials used in carpentry shop : wood & alternative materials

1.1.2 Names, uses, care and maintenance of hand tools such as different types of Saws, C-Clamp, Chisels, Mallets, Carpenter's vices, Marking gauges, Try-squares, Rulers and other commonly used tools and materials used in carpentry shop by segregating as cutting tools, supporting tools, holding tools , measuring tools etc.

1.1.3 Specification of tools used in carpentry shop.

1.1.4 Different types of Timbers, their properties, uses & defects.

1.1.5 Seasoning of wood.

1.2. Practice

1.2.1 Practices for Basic Carpentry Work

1.2.2 Sawing practice using different types of saws

1.2.3 Assembling jack plane — Planning practice including sharpening of jack plane cutter

1.2.4 Chiselling practice using different types of chisels including sharpening of chisel

1.2.5 Making of different types of wooden pin and fixing methods. Marking measuring and inspection of jobs.

1.3 Job Practice

| | |
|---|---|
| Job 1 | Marking, sawing, planning and chiselling and their practice |
| Job II | Half Lap Joint (cross, L or T – any one) |
| Job III | Mortise and Tenon joint (T-Joint) |
| Job IV | Dove tail Joint (Lap or Bridle Joint) |

1.4. Demonstration of job showing use of Rip Saw, Bow saw and Tenon saw, method of sharpening various saws.

## 2. PAINTING AND POLISHING SHOP

2.1. Introduction of paints, varnishes, Reason for surface preparation, Advantages of Painting, other method of surface coating ie. Electroplating etc.

2.2. Job Practice

Job 1: To prepare a wooden surface for painting apply primer on one side and to paint the same side. To prepare french polish for wooden surface and polish the other side.

Job II: To prepare metal surface for painting, apply primer and paint the same.

Job III: To prepare a metal surface for spray painting, first spray primer and paint the same by spray painting gun and compressor system.

The sequence of polishing will be as follows:

i) Abrasive cutting by leather wheel
ii) Polishing with hard cotton wheel and with polishing material
iii) Buffing with cotton wheel or buff wheel.

## 3. ELECTRICAL SHOP

3.1 Study, demonstration and identification of common electrical materials with standard ratings and specifications such as wires, cables, switches, fuses, cleats, clamps and allied items, tools and accessories.

3.2 Study of electrical safety measures and protective devices.

Job I Identification of phase, Neutral and Earth wires for connection to domestic electrical appliances and their connections to three pin plugs.

Job II Carrying out house wiring circuits using fuse, switches, sockets, ceiling rose etc. in batten or P.V.C. casing-caping.

3.3 Study of common electrical appliances such as auto electric iron, electric kettle, ceiling/table fan, desert cooler etc.

3.4 Introduction to the construction of lead acid battery and its working.

Job III Installation of battery and connecting two or three batteries in series and parallel.

3.5 Introduction to battery charger and its functioning.

Job IV Charging a battery and testing with hydrometer and cell tester

## 4. WELDING SHOP

4.1 Introduction and importance of welding as compared to other material joining processes. Specifications and type of welding machines, classification and coding of electrodes, welding parameters, welding joints and welding positions. Materials to be welded, safety precautions.

4.2 Job Practice

Job I Practice of striking arc (Minimum 4 beads on 100 mm long M.S. flat).

Job II Practice of depositing beads on plate at different current levels. (Minimum 4 beads on M.S. plate at four setting of current level).

| | |
|---|---|
| Job III | Preparation of lap joint using arc welding process. |
| Job IV | Preparation of T-joint using gas welding or arc welding on 100 mm x 6 mm MS Flat |

**5. PLUMBING SHOP**

5.1. Use of personal protective equipments, safety precautions while working and cleaning of shop.

5.2. Introduction and demonstration of tools, equipment and machines used in plumbing shop.

5.3. Introduction of various pipes and pipe fittings of elbow, nipple, socket, union etc.

5.4. Job Practice

Job 1 : Preparation of job using elbow, bend and nipple

Job II: Preparation of job using Union, Tap, Plug and Socket.

Job III: Threading practice on pipe with die

**MEANS OF ASSESSMENT**

- Workshop jobs
- Report writing, presentation and viva voce

**RECOMMENDED BOOKS**


1. Workshop Technology I,II,III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publishers Pvt. Ltd. Mumbai.
2. Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar.
3. Workshop Training Manual Vol. I, II by S.S. Ubhi; Katson Publishers, Ludhiana.
4. Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd., New Delhi
5. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
6. Workshop Technology by B.S. Raghuwanshi; DhanpatRai and Co., New Delhi
7. Workshop Technology by HS Bawa; Tata McGraw Hill Publishers, New Delhi.

## 2.1 APPLIED MATHEMATICS - II

| L | T | P |
|---|---|---|
| 5 | - | - |

**RATIONALE**

Basic elements of integral calculus, differential calculus, numerical methods, differential m equations included in this course will play a vital role in understanding engineering problem mathematically. This will also develop analytical as well as conceptual abilities among students.

**LEARNING OUTCOMES**

After undergoing this course, the students will be able to:

- Calculate simple integration by methods of integration
- Evaluate the area under curves, surface by using definite integrals.
- Calculate the area and volume under a curve along areas
- Solve the engineering problems with numerical methods.
- Understand the geometric shapes used in engineering problems by co-ordinate geometry.

**DETAILED CONTENTS**

1. Integral Calculus - I (20 Periods)

Methods of Indefinite Integration

1.1 Integration by substitution.
1.2 Integration by rational function.
1.3 Integration by partial fraction.
1.4 Integration by parts.
1.5 Integration of special function

2. Integral Calculus - II (20 Periods)

2.1 Meaning and properties of definite integrals, Evaluation of definite integrals.
2.2 Application : Length of simple curves, Finding areas bounded by simple curves Volume of solids of revolution, centre of mean of plane areas.
2.3 Simposns 1/3rd and Simposns3/8th rule and Trapezoidal Rule : their application in simple cases. Numerical solutions of algebraic equations; Bisections method, Regula-Falsi method, Newton-Raphson's method(without proof), Numerical solutions of simultaneous equations; Gauss elimination method(without proof)

3. Co-ordinate Geometry (2 Dimension) (18 Periods)

3.1 Circle

Equation of circle in standard form. Centre - Radius form, Diameter form, Two intercept form.

4. Co-ordinate Geometry (3 Dimension) (12 Periods)

4.1 Straight lines and planes in space

Distance between two points in space, direction cosine and direction ratios, Finding equation of a straight line (without proof)

## INSTRUCTONAL STRATEGY

Basic elements of Differential Calculus, Integral Calculus and differential equations can be taught conceptually along with real engineering applications in which particular algorithm and theory can be applied. Numerical examples will be helpful in understanding the content of the subject.

## MEANS OF ASSESSMENT

- Assignments and Quiz/Class Tests
- Mid-term and End-term Written Tests
- Model/Prototype Making

## RECOMMENDED BOOKS


1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
3 Applied Mathematics-II by Chauhan and Chauhan, Krishna Publications, Meerut**.**
4. Applied Mathematics-I (B) by Kailash Sinha and Varun Kumar; Aarti Publication, Meerut


## SUGGESTED DISTRIBUTION OF MARKS

| Topic | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 20 | 28 |
| 2. | 20 | 28 |
| 3. | 18 | 24 |
| 4 | 12 | 20 |
| **Total** | **70** | **100** |

## 2.2 APPLIED PHYSICS – II

| L | T | P |
|---|---|---|
| 5 | - | 2 |

**RATIONALE**

Applied physics includes the study of a diversified topics related to the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects behave. Concrete knowledge of physical laws, analysis and applications in various fields of engineering and technology are given prominence in this course content.

**Note: Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to learn and appreciate these concepts and principles. In all contents, SI units should be followed.**

**LEARNING OUTCOMES**

After undergoing this subject, the student will be able to;

- Define wave motion its types (Transverse and Longitudinal), Periodic and Simple Harmonic Motion, solve simple problems.
- Define the terms: frequency, amplitude, wavelength, velocity of a wave.
- Explain various Engineering, Medical and Industrial applications of Ultrasonics.
- Apply acoustics principles to various types of buildings to get best sound effect
- Explain diffraction, interference, polarization.
- Define capacitance and its unit. They will be able to explain the function of capacitors in simple circuits, solve simple problems using C=Q/V
- Explain the role of free electrons in insulators, conductors and semiconductors, qualitatively the terms: potential, potential difference, electromotive force.
- Explain the concept of electric current, resistance and itsmeasurement.
- List the effects of an electric current and their common applications, State and apply Ohm's law, calculate the equivalent resistance of a variety of resistor combinations, determine the energy consumed by an appliance, distinguish between AC and DC electricity
- Explain Biot-Savart Law, Ampere’s law, Lorenz Force.
- State the laws of electromagnetic induction, describe the effect on a current-carrying conductor when placed in a magnetic field
- Explain operation of moving coil galvanometer, simple DC motor
- Apply the knowledge of diodes in rectifiers, adapters IC’s and various electronic circuits. Apply the concept of light amplification in designing of various LASER based instruments and optical sources.
- Explain total internal reflection and apply this concept for optical fibre and its uses in Medical field and Communication.

## DETAILED CONTENTS

1. Wave motion and its applications (12 periods)

1.1 Wave motion, transverse and longitudinal wave motion with examples, sound and light waves, relationship among wave velocity, frequency and wave length and its application

1.2 Wave equation y = r sin wt, phase, phase difference, principle of superposition of waves

1.3 Simple Harmonic Motion (SHM): definition and characteristic, expression for displacement, velocity, acceleration, time period, frequency in S.H.M., Energy of a body executing S. H. M., simple pendulum, concept of simple harmonic progressive wave,

1.4 Free, Damped and forced oscillations, Resonance with examples, Q-factor

1.5 Definition of pitch, loudness, quality and intensity of sound waves, intensity level, Echo and reverberation, Sabine formula for reverberation time(without derivation), coefficient of absorption of sound, methods to control reverberation time and their applications, Accoustics of building defects and remedy.

1.6 Ultrasonics –production, detection, properties and applications in engineering and medical applications.

2. Wave Optics (6 periods)

2.1 Dual nature of light, wave theory of light, laws of reflection and refraction, Snell's law, Power of lens, magnification.

2.2 Two-Source Interference, Double-Slit interference, Interference due to thin films, Fresnel's biprism.

2.3 use of interference making highly efficient solar panel.

2.4 diffraction, Single Slit diffraction, Intensity calculation etc

2.5 Polarization of electromagnetic waves, polarizing sheets, polarizing by Reflection (Brewser's law), Malus law, use of polariods.

3. Electrostatics (12 periods)

3.1 Concept of charge, Coulombs law, Electric field of point charges, Electric lines of force and their properties, Electric flux, Electric potential and potential difference.

3.2 Gauss law of electrostatics: Application of Gauss law to find electric field intensity of straight charged conductor, plane charged sheet and charged sphere.

3.3 Capacitor and its working principle, Capacitance and its units. Capacitance of parallel plate capacitor. Series and parallel combination of capacitors (numericals), charging and discharging of a capacitor.

3.4 Dielectric and its effect on capacitance, dielectric break down.

3.5 Application of electrostatics in electrostatic precipitation of microbes and moisture separation from air and gases in industry for pollution control (Brief explanation only)

4. Current Electricity (12 periods)

4.1 Electric Current, Resistance, Specific Resistance, Conductance, Specific Conductance, Series and Parallel combination of Resistances. Factors affecting Resistance, Colour coding of carbon Resistances, Ohm's law. Superconductivity.

4.2 Kirchhoff's laws, Wheatstone bridge and its applications (meter bridge and slide wire bridge)

4.3 Concept of terminal potential difference and Electro motive force (EMF), potentiometer.

4.4 Heating effect of current, Electric power, Electric energy and its units (related numerical problems), Advantages of Electric Energy over other forms of energy

4.5 Examples of application of DC circuits in various electrical and electronics equipment such as C.R.O, T.V., Audio-Video System, Computers etc.

5. Magneto Statics and Electromagnetism (12 periods)

5.1 Magnetic poles, force on a moving charge, circulating charges, force on a current carrying wire, Hall effect, torque on a current loop.

5.2 Magnetic field due to moving charge(Biot-Savart Law), due to current (Biot-Savart Law), parallel currents, field of a solenoid, Ampere's law.

5.3 Faraday's law, Lenz' law, motional emf, induced electric fields.

5.4 Magnetic dipole and force on a magnetic dipole in a non-uniform field, Magnetization, Gauss' law for magnetism.

5.5 Types of magnetic materials. Dia, para and ferromagnetic materials with their properties,

5.6 Application of electromagnetism in ac/dc motors and generators.

6. Semiconductor physics (8 periods)

6.1 Types of materials (insulator, semi conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction diode and its V-I characteristics

6.2 Diode as rectifier – half wave and full wave rectifier (centre taped),

6.3 Semiconductor transistor, pnp and npn (concepts only)

6.4 Application of semiconductor diodes (Zener, LED) and that of transistor as amplifier and oscillator.

7. Modern Physics (8 Periods)

7.1 Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; laser and its characteristics, population inversion, Types of lasers; Ruby and He-Ne lasers, engineering and medical applications of lasers.

7.2 Fibre optics: Total internal reflection and its applications, Critical angle and conditions for total internal reflection, introduction to optical fibers, light propagation, types, acceptance angle and numerical aperture, types and applications of optical fibre in communication.

7.3 Introduction to nanotechnology, nanoparticles and nano materials,

**LIST OF PRACTICALS** (To perform minimum six experiments)

1. To determine the velocity of sound with the help of resonance tube.
2. To find the focal length of convex lens by displacement method.
3. To find the refractive index of the material of given prism using spectrometer.
4. To find the wavelength of sodium light using Fresnel's biprism.
5. To verify laws of resistances in series and parallel combination
6. To verify ohm's laws by drawing a graph between voltage and current.
7. To measure very low resistance and very high resistances using Slide Wire bridge
8. Conversion of Galvanometer into an Ammeter and Voltmeter of given range.
9. To draw hysteresis curve of a ferromagnetic material.
10. To draw characteristics of a pn junction diode and determine knee and break down voltages.
11. To find wave length of the laser beam.
12. To find numerical aperture of an optical fiber.

**INSTRUCTIONAL STATREGY**

Teacher may use various teaching aids like live models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. The teacher should explain about field applications before teaching the basics to develop proper understanding of the physical phenomenon. Use of demonstration and animations can make the subject interesting and may develop scientific temper in the students. Teacher must plan a tour of Science Park/planetarium available in nearby areas in order to enhance the interest in this course.

**MEANS OF ASSESSMENT**

- Assignment & Quiz
- Mid-Term and End-Term written test
- Model Making
- Actual Lab & Practical Work
- Viva-Voice

**RECOMMENDED BOOKS**


1. Text Book of Physics (Part-I, Part-II); N.C.E.R.T., Delhi
2. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
3. A Text Book of Optics, Subramanian and Brij Lal, S Chand & Co., New Delhi
4. Practical Physics, by C. L. Arora, S Chand publications
5. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
6. Modern Engineering Physics by SL Gupta, Sanjeev Gupta, Dhanpat Rai Publications.
7. Physics Volume 2, $5^{th}$ edition, HalidayResnick and Krane, Wiley publication
8. Fundamentals of Physics by Haliday, Resnick& Walker $7^{th}$ edition, Wiley publication


**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 12 | 18 |
| 2 | 6 | 8 |
| 3 | 12 | 18 |
| 4 | 12 | 16 |
| 5 | 12 | 16 |
| 6 | 8 | 12 |
| 7 | 8 | 12 |
| **Total** | **70** | **100** |

## 2.3 APPLIED MECHANICS

**L T P**

**5 - 2**

### RATIONALE

The subject Applied Mechanics deals with basic concepts of mechanics like laws of forces, moments, friction, centre of gravity, laws of motion and simple machines which are required by the students for further understanding of other allied subjects. The subject enhances the analytical ability of the students.

### LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Interpret various types of units and their conversion from one to another.
- Analyze different types of forces acting on a body and draw free body diagrams.
- Determine the resultant of coplanar concurrent forces.
- Calculate the co-efficient of friction for different types of surfaces.
- Calculate the least force required to maintain equilibrium on an inclined plane.
- Determine the centroid/centre of gravity of plain and composite laminar and solid bodies.
- Determine velocity ratio, mechanical advantage and efficiency of simple machines

### DETAILED CONTENTS

1. Introduction (06 periods)

   1.1 Concept of engineering mechanics definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields. Definition of Applied Mechanics.

   1.2 Definition, basic quantities and derived quantities of basic units and derived units

   1.3 Different systems of units (FPS, CGS, MKS and SI) and their conversion from one to another for density, force, pressure, work, power, velocity, acceleration

   1.4 Concept of rigid body, scalar and vector quantities

2. Laws of forces (12 periods)

   2.1 Definition of force, measurement of force in SI units, its representation, types of force: Point force/concentrated force & Uniformly distributed force, effects of force, characteristics of a force

   2.2 Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of superposition

2.3 Composition and resolution of coplanar concurrent forces, resultant force, method of composition of forces, laws of forces, triangle law of forces, polygon law of forces - graphically, analytically, resolution of forces, resolving a force into two rectangular components

2.4 Free body diagram

2.5 Equilibrant force and its determination

2.6 Lami's theorem (concept only)

[Simple problems on above topics]

2.7 Type of Load, supports, Beams- analysis for simply supported, cantilever beams

3. Moment (14 periods)

3.1 Concept of moment

3.2 Moment of a force and units of moment

3.3 Varignon's theorem (definition only)

3.4 Principle of moment and its applications (Levers – simple and compound, steel yard, safety valve, reaction at support)

3.5 Parallel forces (like and unlike parallel force), calculating their resultant

3.6 Concept of couple, its properties and effects

3.7 General conditions of equilibrium of bodies under coplanar forces

3.8 Position of resultant force by moment

[Simple problems on the above topics]

4. Friction (14 periods)

4.1 Definition and concept of friction, types of friction, force of friction

4.2 Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction

4.3 Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane.

4.4 Calculation of least force required to maintain equilibrium of a body on a rough inclined plane subjected to a force:

a) Acting along the inclined plane Horizontally
b) At some angle with the inclined plane

5. Centre of Gravity (10 periods)

5.1 Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies

5.2 Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion

5.3 Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed
[Simple problems on the above topics]

6. Simple Machines (14 periods)

6.1. Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines

6.2. Simple and compound machine (Examples)

6.3. Definition of ideal machine, reversible and self locking machine

6.4. Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency

6.5. System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency

6.6. Working principle and application of wheel and axle, Weston's Differential Pulley Block , simple screw jack, worm and worm wheel, single and double winch crab. Expression for their velocity ratio and field of their application
[Simple problems on the above topics]

**LIST OF PRACTICALS**

1. Verification of the polygon law of forces using gravesend apparatus.
2. To verify the forces in different members of jib crane.
3. To verify the reaction at the supports of a simply supported beam.
4. To find the mechanical advantage, velocity ratio and efficiency in case of an inclined plane.
5. To find the mechanical advantage, velocity ratio and efficiency of a screw jack.
6. To find the mechanical advantage, velocity ratio and efficiency of worm and Worm wheel.
7. To find mechanical advantage, velocity ratio and efficiency of single purchase crab.

8. To find out center of gravity of regular lamina.
9. To find out center of gravity of irregular lamina.
10. To determine coefficient of friction between three pairs of given surface.

## INSTRUCTIONAL STRATEGY

Applied Mechanics being a fundamental subject, the teacher are expected to emphasize on the application of "Applied Mechanics" in various subjects so that students are able to appreciate the importance of the subject. Students should also be made conversant with the use of scientific calculator to solve numerical problems

## MEANS OF ASSESSMENT

Assignments and quiz/class tests, mid and end-term written tests, model/prototype making.

## RECOMMENDED BOOKS


1. A Text Book of Applied Mechanics by S Ramamurtham,DhanpatRai Publishing Co. Ltd.
2. A Text Book of Engineering Mechanics (Applied Mechanics) by RK Khurmi; S Chand and Co. Ltd., New Delhi.
3. A Text Book of Applied Mechanics by RK Rajput; Laxmi Publications, New Delhi..
4. Text Book of Applied Mechanics by Birinder Singh, Kaption Publishing House, New Delhi.
5. Test Book of Applied Mechanics by AK Upadhya, SK Kataria& Sons, New Delhi


## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Hrs) | Marks Allotted (%) |
|---|---|---|
| 1 | 06 | 8 |
| 2 | 12 | 18 |
| 3 | 14 | 20 |
| 4 | 14 | 20 |
| 5 | 10 | 14 |
| 6 | 14 | 20 |
| **Total** | **70** | **100** |

## 2.4 BASICS OF MECHANICAL AND CIVIL ENGINEERING

**L T P**
**5 - 2**

**RATIONALE**

Apart from the common core subjects, some engineering subjects are included in the diploma course of electrical engineering. One of these subjects is Elementry Mech. Engg. to impart some necessary knowledge and skill about mechanical nature. Inclusion of the subject is further justified by the fact that in practical field, any job of electrical and civil technician is intermingled with either civil or mechanical engineering. As such the relevant basic topics of these disciplines are included in the content of the subject.

Some study exercises along with some field work have been suggested to give feel of jobs and equipments involved.

**LEARNING OUTCOMES**

After undergoing the subject, the students will be able to:

- Apply Thermodynamics Laws.
- Use of various energy sources.
- Solve basics problems related to fuel and combustion.
- Have an idea of loading on machine components.
- Explain the application of different types of bearings.
- Explain the uses of different types of gears and springs.
- Explain the working principle of different lubrication systems.

### SECTION A - MECHANICAL ENGINEERING

### DETAILED CONTENTS

1. Thermal Engineering (14 periods)

1.1 Sources of Energy

Definition, Concept of thermodynamic system and surroundings, Closed system, Open system, Isolated system, Thermodynamics definition of work.Zeroth law of thermodynamics Basic ideas, conventional and nonconventional forms- Thermal, wind, Solar, Biomass and Nuclear and their uses. Hydel, Tidal,

1.2 Fuels & Combustion:

Combustion of fuels- their higher and lower calorific values. Combustion equations for carbon, sulphur, hydrogen and their simple compounds.

Calculation of minimum amount of air required for complete combustion. Combustion analysis n mass basis and on volume basis. Concept of excess air in a boiler furnace combustion. Heat carried away by flue gases. Analysis of flue gases by Orsat apparatus. Simple numerical problems

Idea of specific properties of liquid fuels such as detonation, knock resistance (cetane and octane numbers), viscosity, solidification point, flash point and flame point.

2. Machine Components (20 periods)

Brief idea of loading on machine components.

(i) Pins, Cottor and Knuckle Joints.
(ii) Keys, Key ways and spline on the shaft.
(iii) Shafts, Collars, Cranks, Eccentrics.
(iv) Couplings and Clutches.
(v) Bearings-Plane, Bushed, Split-step, ball, Roller bearing, Journal bearing, Foot step bearing, thrust bearing, collar bearing and Special type bearings and theirapplications.
(vi) Gears

Different types of gears, gear trains and their use for transmission of motion.

Determination of velocity ratio for spur gear trains; spur gear, single and double helical gears, Bevel gears, Mitre wheel, worms, Rack and Pinion. Simple and compound and epicyclic gear trains and their use. Definition of pitch and pitch circle & module.

(vii) Springs

Compression, Tension, Helical springs,Torsion springs, Leaf and Laminated springs. Their use and material.

(08 periods)

3. Lubrication

Different lubrication system for lubricating the componentsof machines.

Principle of working of wet sump and dry sump system of lubrication. ( Explain with simple line diagram). Selection of lubricant based on different application (Requirement with the help of manufacturer catalogue).

## SECTION B : CIVIL ENGINEERING

4. Construction Materials (06 periods)

Properties and uses of various construction materials such as stones, bricks, lime, content and timber with their properties, physical/field testing, elements of brick masonry.

5. Foundations (08 periods)

5.1 Bearing capacity of soil and its imporance

5.2 Types of various foundations and their salient features, suitability of various foundations for heavy, light and vibrating machines.

6. Concrete (08 periods)

Various ingredients of concrete, different grades of concrete, water cement ratio, workability, physical/field testing of concrete, mixing of concrete, placing and curing of concrete..

7. RCC (06 periods )

Basics of reinforced cement concrete and its use (elementary knowledge), introduction to various structural elements of a building.

Note: While imparting instructions, teachers are expected to lay more emphasis on concepts and principles. It will be better if the classes for general engineering are conducted by organized demonstrations for explaining various concepts and principles.

**LIST OF PRACTICALS**

1. Study and Sketch of Pins and Cottor
2. Study and Sketch of Keys and Key ways
3. Study and sketch of Couplings andClutches
4. Study and Sketch of Bearings
5. Study and Sketch of Springs
6. Study of green energy
7. Testing of bricks
   a) Shape and size
   b) Soundness test
   c) Water absorption
   d) Crushing strength
8. Testing of concrete
   a) Slump test
   b) Compressive Strength of concrete cube
9. The students should be taken to different construction sites to show them various construction materials, concreting process and construction of RCC structural elements, foundations and other civil works.

**INSTRUCTIONAL STRATEGY**

Teachers should lay emphasis on basic principles and use charts in class, visits to labs and industry may be arranged to demonstrate certain materials and practices.

**MEANS OF ASSESSMENT**

- Sessional Tests
- End term Tests
- Practicals
- Viva-Voce

**RECOMMENDED BOOKS**


1. Textbook of Concrete Technology 2nd Edition, by Kulkarni, PD Ghosh TK and Phull, YR; New Age International(P) Ltd, Publishers, New Delhi
2. Materials of Construction by Ghosh; Tata McGraw Hill Publishing Co. Ltd., New Delhi
3. Civil Engineering Materials by TTTI, Chandigarh; Tata McGraw Hill Publishing Co. Ltd., New Delhi
4. Concrete Technology by J.Jha and Sinha; Khanna Publishers, Delhi
5. Building Construction by Jha and Sinha; Khanna Publishers, Delhi
6. Building Construction by Vairani and Chandola; Khanna Publishers, Delhi
7. Civil Engineering Materials by SV Deodhar and Singhai; Khanna Publishers, New Delhi
8. Soil Mechanics and Foundation Engineering by SK Garg; Khanna Publishers, New


**SUGGESTED DISTRIBUTION OF MARKS**

| Topic | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 14 | 20 |
| 2. | 20 | 28 |
| 3. | 08 | 12 |
| 4 | 06 | 08 |
| 5 | 08 | 12 |
| 6 | 08 | 12 |
| 7 | 06 | 08 |
| **Total** | **70** | **100** |

## 2.5 SKINS PROTIENS AND PRETANNAGES

| L | T | P |
|---|---|---|
| 6 | - | 6 |

**Rationale**:

The objective of this paper is to equip the student with the fundamental knowledge of history of leather manufacture, anatomical structure and composition of hides and skins, protiens, curing and preservation, pretanning operations, chrome tanning and syntansetc which will prove very useful in realindustrical atmosphere.

### DETAILED CONTENTS

**Unit-I (Introduction & Raw Hides)**

1.1History Of Tannery And Leather
1.2 Hides And Skins Classification
1.3 Defects In Hides And Skins-Antimortem& Postmortem Defects
1.4 Different Region Of Raw Hides And Skins

**Unit-II (Protiens)**

2.1 Anatomical Structure Of Hides And Skins - Cow,Buff,Goat,Sheep
2.2 Grain Pattern Of Different Hides And Skins
2.3 Chemical Constituents Of Hides And Skins
2.4 Brief Study Of Various Fibrous And Non Fibrous Proteins
2.5 Important Role Of Collagen

**Unit-III (Curing & Preservation**

3.1 Flaying ,
3.2 Methods Of Curing Of Hides And Skins
3.3 Merit And Demerits Of Each Methods
3.4 Preservatives Agents
3.5 StorageOf Raw Hides And Skins

**Unit- IV (Pretanning Operation)**

4.1 Introduction Of Tannery Operation-PretanningOperation,Tanning Operation , Post Tanning & Finishing Operation
4.2 Basic Principles& Object Invoved In Pretanning Operation-Soaking,Liming,Deliming,Bating,Pickling,Depickling,Degreasing
4.3 Methods, Temperature, Ph, Time ,Check , Control And Defects Of Each Process Of Pretanning Operation
4.4 Hair Saving Process,Sulphide Free-Unhairing Process, Role Of Enzymes Of Pretanning Operation
4.5 Cleaner Process In Beam House - Desalting

**Unit- V (Types Of Tannages & Leather)**

5.1 Object Of Tanning
5.2 Introduction Of Vegetable , Mineral Tannages,Aldhydes& Oil TannagesEtc
5.3 Introduction Of All Types Of Leather Like -C.T,V.T,Al,Zr,Iron, Aldehyde &Oil Etc
5.4 Introduction Of All Types Of Finishes Products Like Aniline,Semianiline,Nubuck,Nappa,Garment,Upper,Upholestry, Etc
5.5 ManufacturingProcess Of WetblueFrom Various Hides Skins Like-Cow,Buff,Goat,Sheep

## PRACTICALS

1. Tannery Practice In All Beam House And Chrome Tanning Operations.
2. Grading/Selection Of Raw Hides And Skins As Per Indian / International Standard
3. Knowldege Of Various Defects In All Tannery Process
4. Identification Of Various Defects In Hides And Skins As Per Indian / International Standard
5. Use Of Ph And Indicators In Beam House & Chrome Tanning Process.
6. Use Of Chemicals In Beam House & Chrome Tanning Process

NOTE :

All the above noted operations should be practically demonstrated to the students in the tanneries, so that students should be able command practical leather making knowledge. Every week students should be taken to lather processing units as a part of structured-cum-industrial visit. Well designed and detailed programme of such visits should be chalked out in advance for result orientation and skill improvement during their course of study

Each visit of the students to tanneries should be guided be the subject teacher and technical observations, etc. may be observed and verified by the subject teacher.

## RECOMMENDED BOOKS


1- Theory & practice of Leather manufacture by K.T. Sarkar ,The Author Publication.

2- Fundamentals of Leather manufacture by Heidmann, Ad.Tata McGraw Hill Publishers, New Delhi.

3- Analytical Chemistry of Leather Manufacture – P.K.Sarkar, I.L.T.A., Calcutta,

4- The Chemistry & Technology of Leather, Vol. – IV – F.O' Flahorty, W.T.Roddy&R.M.Lollar, original edition, Krieger Publishing


## SUGGESTED DISTRIBUTION OF MARKS

| Topic | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 10 | 20 |
| 2. | 10 | 20 |
| 3. | 10 | 30 |
| 4 | 20 | 30 |
| 5 | 20 | 30 |
| **Total** | **70** | **100** |

## 2.6 GENERAL WORKSHOP PRACTICE –II

(Common for Civil Engineering, Electrical Engineering and Chemical Engineering )

| L | T | P |
|---|---|---|
| - | - | 8 |

**RATIONALE**

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices are included in the curriculum in order to provide hands-on experience about use of different tools and basic manufacturing practices. This subject aims at developing general manual and machining skills in the students. In addition, the development of dignity of labour, safety at work place, team working and development of right attitude are the other objectives.

**LEARNING OUTCOMES**

After completing the course, the students will be able to:

- Identify tools and equipment used and their respective functions.
- Identify different types of materials and their basic properties.
- Use and take measurements with the help of basic measuring tools/equipment.
- Select proper tools for a particular operation.
- Select materials, tools, and sequence of operations to make a job as per given specification/drawing.
- Prepare simple jobs independently and inspect the same.
- Follow safety procedures and precautionary measures.
- Use safety equipment and Personal Protection Equipment.

**DETAILED CONTENTS (PRACTICAL EXERCISES)**

**Note:** The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus:

1 Fitting Shop
2 Sheet Metal Shop
3 Mason Shop
4 Machine Shop

## 1. FITTING SHOP

1.1 Use of personal protective equipment and safety precautions while working.

1.2 Basic deburring processes.

1.3 Introduction to fitting shop tools, marking and measuring devices/equipment.

1.4 Identification of materials. (Iron, Copper, Stainless Steel, Aluminium etc.)

1.5 Identification of various steel sections (flat, angle, channel, bar etc.).

1.6 Introduction to various fitting shop operations/processes (Hacksawing, Drilling, Chipping and Filing).

1.7 Job Practice

Job I Marking of job, use of marking tools, filing and use of measuring instruments. (Vernier caliper, Micrometer and Vernier height gauge).

Job II Filing a rectangular/square piece to maintain dimensions within an accuracy of ±.25 mm.

Job IIIMaking a cut-out from a square piece of MS flat using hand hacksaw and chipping

Job IV Drilling and tapping practice on MS Flat.

## 2. SHEET METAL SHOP

2.1. Introduction to sheet metal shop, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material.

2.2 Introduction and demonstration of hand tools used in sheet metal shop.

2.3 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine,

2.4 Introduction and demonstration of various raw materials used in sheet metal shop e.g. black-plain sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheet etc.

2.5 Study of various types of nuts, bolts, rivets, screws etc.

2.6 Job Practice

Job I: Shearing practice on a sheet using hand shears.

Job II: Practice on making Single riveted lap joint/Double riveted lap Joint. Job III :Practice on making Single cover plate chain type, zig-zag type and single rivetted Butt Joint.

## 3 MASON SHOP

3.1. Introduction and importance of Mason shop

3.2. Introduction of tools, equipment and machines used in Mason shop

3.3. Job Practice

Job I : Preparation of simple bond

Job II : Preparation of Arched bond

Job III: Preparation of RCC structure (column and beam)

## 4 MACHINE SHOP

4.1 Study and sketch of lathe machine

4.2 Study and Sketch of grinders, milling machine, drilling machine and CNC machine.

4.3 Plain and step turning and knurling practice.

4.4 Study and sketch of planning/shaping machine and to plane a rectangle of cast iron.

## MEANS OF ASSESSMENT

- Workshop jobs
- Report writing, presentation and viva voce

## RECOMMENDED BOOKS


1. Workshop Technology I,II,III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publishers Pvt. Ltd. Mumbai.
2. Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar.
3. Workshop Training Manual Vol. I, II by S.S. Ubhi; Katson Publishers, Ludhiana.
4. Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd., New Delhi
5. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
6. Workshop Technology by B.S. Raghuwanshi; DhanpatRai and Co., New Delhi
7. Workshop Technology by HS Bawa; Tata McGraw Hill Publishers, New Delhi.

## 3.1 ENVIRONMENTAL STUDIES

| L | T | P |
|---|---|---|
| 3- | | 2 |

### RATIONALE

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the ecosystem and controlling pollution by various control measures. He should also be aware of environmental laws related to the control of pollution. He should know how to manage the waste. Energy conservation is the need of hour. He should know the concept of energy management and its conservation.

### LEARNING OUTCOMES

After undergoing the subject, the student will be able to:

- Comprehend the importance of ecosystem and sustainable
- Demonstrate interdisciplinary nature of environmental issues
- Identify different types of environmental pollution and control measures.
- Take corrective measures for the abatement of pollution.
- Explain environmental legislation acts.
- Define energy management, energy conservation and energy efficiency
- Demonstrate positive attitude towards judicious use of energy and environmental protection
- Practice energy efficient techniques in day-to-day life and industrial processes.
- Adopt cleaner productive technologies
- Identify the role of non-conventional energy resources in environmental protection.
- Analyze the impact of human activities on the environment

### DETAILED CONTENTS

1. Introduction (04 Periods)

    1.1 Basics of ecology, eco system- concept, and sustainable development, Resources renewable and non renewable.

2. Air Pollution (04 Periods)

    2.1 Source of air pollution. Effect of air pollution on human health, economy, plant, animals. Air pollution control methods.

3. Water Pollution (08 Periods)

    3.1 Impurities in water, Cause of water pollution, Source of water pollution. Effect of water pollution on human health, Concept of dissolved $O_2$, BOD, COD. Prevention of water pollution- Water treatment processes, Sewage treatment. Water quality standard.

4. Soil Pollution (06 Periods)

4.1 Sources of soil pollution
4.2 Types of Solid waste- House hold, Hospital, From Agriculture, Biomedical, Animal and human, excreta, sediments and E-waste
4.3 Effect of Solid waste
4.4 Disposal of Solid Waste- Solid Waste Management

5. Noise pollution (06 Periods)

Source of noise pollution, Unit of noise, Effect of noise pollution, Acceptable noise level, Different method of minimize noise pollution.

6. Environmental Legislation (08 Periods)

Introduction to Water (Prevention and Control of Pollution) Act 1974, Introduction to Air (Prevention and Control of Pollution) Act 1981 and Environmental Protection Act 1986, Role and Function of State Pollution Control Board and National Green Tribunal (NGT), Environmental Impact Assessment (EIA).

7. Impact of Energy Usage on Environment (06 Periods)

Global Warming, Green House Effect, Depletion of Ozone Layer, Acid Rain. Eco-friendly Material, Recycling of Material, Concept of Green Buildings.

**LIST OF PRACTICALS**

1. Determination of pH of drinking water
2. Determination of TDS in drinking water
3. Determination of TSS in drinking water
4. Determination of hardness in drinking water
5. Determination of oil & grease in drinking water
6. Determination of alkalinity in drinking water
7. Determination of acidity in drinking water
8. Determination of organic/inorganic solid in drinking water
9. Determination of pH of soil
10. Determination of N&P (Nitrogen & Phosphorus) of soil
11. To measure the noise level in classroom and industry.
12. To segregate the various types of solid waste in a locality.
13. To study the waste management plan of different solid waste
14. To study the effect of melting of floating ice in water due to global warming

**INSTRUCTIONAL STRATEGY**

In addition to theoretical instructions, different activities pertaining to Environmental Studies like expert lectures, seminars, visits to green house, effluent treatment plant of any industry, rain water harvesting plant etc. may also be organized.

**MEANS OF ASSESSMENT**

−Assignments and quiz/class tests,

−Mid-term and end-term written tests

**RECOMMENDED BOOKS**


1. Environmental and Pollution Awareness by Sharma BR; SatyaPrakashan, New Delhi.
2. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications, New Delhi.
3. Environmental Pollution by Dr. RK Khitoliya; S Chand Publishing, New Delhi
4. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.
5. Engineering Chemistry by Jain and Jain; Dhanpat Rai and Co. (P) Ltd. Delhi.
6. Environmental Studies by ErachBharucha; University Press (India) Private Ltd., Hyderabad.
7. Environmental Engineering and Management by Suresh K Dhamija; S K Katariaand Sons, New Delhi.
6. E-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.


**Websites for Reference:**

http://swayam.gov.in

***SUGGESTED DISTRIBUTION OF MARKS***

| **Topic No.** | **Time Allotted (Periods)** | **Marks Allotted (%)** |
|---|---|---|
| 1 | 04 | 10 |
| 2 | 04 | 10 |
| 3 | 08 | 20 |
| 4 | 06 | 14 |
| 5 | 06 | 14 |
| 6 | 08 | 20 |
| **7** | 06 | 12 |
| **Total** | **42** | **100** |

## 3.2 APPLIED MATHEMATICS –III

| L | T | P |
|---|---|---|
| 5 | - | - |

**RATIONALE**

Contents of this course provide understanding of some elementary and advanced mathematics algorithms and their applications of solving engineering problems. Content of this course will enable students to use some advanced techniques like Beta-Gamma function, Fourier series, Laplace transform and probability distributions in solving complex engineering problems.

**LEARNING OUTCOMES**

After undergoing this course, the students will be able to:

- Understand matrix operations and uses of matrix in different problems.
- Apply elementary row and column operations in finding inverse of a matrix.
- Find Eigen values, Eigen vectors of a matrix and their different properties.
- Understand degree/order of differential equations and their solution techniques.
- Use differential equations in engineering problems of different areas.
- Find Fourier series expansion of a function
- Apply Laplace transform and their applications in solving engineering problems.
- Understand concept of probability distribution and their applications.

**DETAILED CONTENTS**

1. Matrices (16 Periods)

1.1 Algebra of Matrices, Inverse

Addition, Multiplication of matrices, Null matrix and a unit matrix, Square matrix, Symmetric, Skew symmetric, Hermitian, Skew hermition, Orthagonal, Unitary, diagonal and Triangular matrix, Determinant of a matrix.

Definition and Computation of inverse of a matrix.

1.2 Elementry Row/Column Transformation

Meaning and use in computing inverse and rank of a matrix.

1.3 Linear Dependence, Rank of a Matrix

Linear dependence/independence of vectors, Definition and computation of rank of matrix. Computing rank through determinants, Elementary row transformation and through the concept of a set of independent vectors, Consistency of equations.

1.4 Eigen Pairs, Cayley-Hamilton Theorem

Definition and evaluation of eign values and eign vectors of a matrix of order two and three, Cayley-Hamilton theorem (without Proof)and its verification, Use in finding inverse and powers of a matrix.

2. Differential Calculus (15 Periods)

2.1 Function of two variables, identification of surfaces in space, conicoids

2.2 Partial Differentiation

Directional derivative, Gradient, Use of gradient f, Partial derivatives, Chain rule, Higher order derivatives, Euler's theorem for homogeneous functions, Jacobians.

2.3 Vector Calculus

Vector function, Introduction to double and triple integral, differentiation and integration of vector functions, gradient, divergence and curl, differential derivatives.

3. Differential Equation(15 Periods)

3.1 Formation, Order, Degree, Types, Solution

Formation of differential equations through physical, geometrical, mechanical and electrical considerations, Order, Degree of a differential equation, Linear, nonlinear equation.

3.2 First Order Equations

Variable seperable, equations reducible to seperable forms, Homogeneous eqution, equations reducible to homogeneous forms, Linear and Bernoulli form exact equation and their solutions.

3.3 Higher Order Linear Equation :

Property of solution, Linear differential equation with constant coefficients (PI for $X=^{ax}$, Sinax, Cosax, $X^n$, $^{ax}V$, XV

3.4 Simple Applications

LCR circuit, Motion under gravity, Newton's law of cooling, radioactive decay, Population growth, Force vibration of a mass point attached to spring with and without damping effect. Equivalence of electrical and mechanical system

4. Integral Calculus-II (12 Periods)

4.1 Beta and Gamma Functions

Definition, Use, Relation between the two, their use in evaluating integrals.

4.2 Fourier Series

Fourier series of f(x),-n<x<n, Odd and even function, Half range series.

4.3 Laplace Transform

Definition, Basic theorem and properties, Unit step and Periodic functions, inverse Laplace transform, Solution of ordinary differential equations

5. Probability and Statistics (12Periods)

5.1 Probability

Introduction, Addition and Multiplication theorem and simple problem.

5.2 Distribution

Discrete and continuous distribution, Bionimal Distribution, Poisson distribution, Normal Distribution.

**INSTRUCTONAL STRATEGY**

The content of this course is to be taught on conceptual basis with plenty of real world examples. The basic elements of Laplace transform, Differential equations and Applications of differential equations can be taught with engineering applications of relevant branch.

## MEANS OF ASSESSMENT

− Assignments and Quiz/Class Tests

− Mid-term and End-term Written Tests − Model/Prototype Making

## RECOMMENDED BOOKS


1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
3 Applied Mathematics-III by Chauhan and Chauhan, Krishna Publications, Meerut**.**
4. Applied Mathematics-II by Kailash Sinha and Varun Kumar; Aarti Publication, Meerut.
5. E-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.


## SUGGESTED DISTRIBUTION OF MARKS

| Topic | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 16 | 24 |
| 2. | 15 | 20 |
| 3. | 15 | 20 |
| 4 | 12 | 18 |
| 5 | 12 | 18 |
| **Total** | **70** | **100** |

## 3.3 BASICS OF INFORMATION TECHNOLOGY

| L | T | P |
|---|---|---|
| - | - | 6 |

**RATIONALE**

Information technology has great influence on all aspects of life. Primary purpose of using computer is to make the life easier. Almost all work places and living environment are being computerized. The subject introduces the fundamentals of computer system for using various hardware and software components. In order to prepare diploma holders to work in these environments, it is essential that they are exposed to various aspects of information technology such as understanding the concept of information technology and its scope; operating a computer; use of various tools using MS Office/Open Office/Libre Office using internet etc., form the broad competency profile of diploma holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

**Note:**
**Explanation of Introductory part should be demonstrated with practical work. Following topics may be explained in the laboratory along with the practical exercises. There will not be any theory examination.**

**LEARNING OUTCOMES**

After undergoing the subject, the students will be able to:

- Identify Computer Hardware Components, Network Components and Peripherals.
- Explain the role of an Operating System.
- Install System and Application Software.
- Explain the function of the system components including Processor, Motherboard and Input-output devices.
- Use Word Processing Software to prepare document.
- Use Spreadsheet Software to create workbooks and automate calculation.
- Use Presentation Software to create interactive presentation.
- Perform fundamental tasks common to most application software including print, scan, save, edit, cut, copy, paste, format, spell and grammar check.
- Find and evaluate information on the Web.
- Install Antivirus.
- Safeguard against Online Frauds, threats and crimes.
- Use online office tools(Google suits)

**TOPICS TO BE EXPLAINED THROUGH DEMONSTRATION**

1. Introduction to Computers and Peripherals.
   Components of Computer, Types of Computer, CPU, RAM, ROM, Hard disk, USB, Flash drive, CD, DVD,Blue ray, Keyboard, Mouse, Monitor, LCD, Printer, Plotter, Scanner, Modem, Sound Cards, Speakers, CMOS battery, Sharing of Printers.

2. Operation System and Application Software

System Software, Application Software, Virtualization Software, Utility Software, MS Office/Open Office/Libreoffice, Working with window, Desktop components, Menu bars, creating shortcut of program. Installation of Application softwares, Antivirus and Drivers.

3. Word Processing, Spreadsheet and Presentation
   Usage and creation of word document, spreadsheets and presentation, Google Suits (Google drive, google sheet, google doc. Google presentation)

.

4. Internet
   Basics of Networking – LAN, WAN, Wi-Fi technologies, Concept of IP Addrsses, DNS, Search Engines, e-mail, Browsing and cyber laws.

**LIST OF PRACTICAL EXERCISES**

1. Identify various components, peripherals of computer and list their functions.
2. Installation of various application software and peripheral drivers
3. Installation of operating system (windows/linux/others)
4. Creation and Management (Rename, delete, search of file and folders)
5. Installation of Antivirus and remove viruses
6. Scanning and printing documents
7. Browsing, Downloading, Information using Internet
8. E-Mail ID creation, comparing, sending and receiving e-mail. Attaching a file with e-mail message.
9. Word Processing (MS Office/Open Office)
   a) File Management
      Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, giving password protection for a file
   b) Page set up
      Setting margins, tab setting, ruler, indenting
   c) Editing a document
      Entering text, cut, copy, paste using tool- bars
   d) Formatting a document
      Using different fonts, changing font size and colour, changing the appearance through bold/italic/underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods

      Aligning of text in a document, justification of document, inserting bullets and numbering

      Formatting paragraph, inserting page breaks and column breaks, line spacing

      Use of headers, footers: Inserting footnote, end note, use of comments, autotext
      Inserting date, time, special symbols, importing graphic images, drawing tools
   e) Tables and Borders
      Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table

      Print preview, zoom, page set up, printing options
      Using find, replace options
   f) Using Tools like

      Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelops and lables

Using shapes and drawing toolbar,
Working with more than one window .

10. Spread Sheet Processing (MS Office/Open Office/Libre Office)
    a) Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, save worksheet, switching between different spread sheets

    b) Menu commands:

    Create, format charts, organise, manage data, solving problem by analyzing data. Programming with Excel Work Sheet, getting information while working

    c) Work books:

    Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations

    Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet, conditional formatting

    d) Creating a chart:

    Working with chart types, changing data in chart, formatting a chart, use chart to analyze data

    Using a list to organize data, sorting and filtering data in list

    e) Retrieve data with query:
    Create a pivot table, customizing a pivot table. Statistical analysis of data

    f) Exchange data with other application:
    Embedding objects, linking to other applications, import, export document.

11. PowerPoint Presentation (MS Office/Open Office/Libre office)

    a) Introduction to PowerPoint

        - How to start PowerPoint
        - Working environment: concept of toolbars, slide layout & templates.
        - Opening a new/existing presentation
        - Different views for viewing slides in a presentation: normal, slide sorter.

    b) Addition, deletion and saving of slides

    c) Insertion of multimedia elements

        - Adding text boxes
        - Adding/importing pictures

- Adding movies and sound

- Adding tables and charts etc.
- Adding organizational chart
- Editing objects
- Working with Clip Art

d) Formatting slides

- Using slide master
- Text formatting
- Changing slide layout
- Changing slide colour scheme
- Changing background
- Applying design template

12. Google Suits

Using Google drive, Google shut, Google docs, Google slides.

## INSTRUCTIONAL STRATEGY

Since this subject is practice oriented, the teacher should demonstrate the capabilities of computers to students while doing practical exercises. The students should be made familiar with computer parts, peripherals, connections and proficient in making use of MS Office/Open Office/Libre office/Google Suit in addition to working on internet. The student should be made capable of working on computers independently.

## MEANS OF ASSESSMENT

- Class Tests/Quiz
- Software Installation and Use
- Viva-Voce
- Presentation

## RECOMMENDED BOOKS

1. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
2. Information Technology for Management by Henery Lucas, Tata McGraw Hills, New Delhi

3. Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi
4. Computers Today by SK Basandara, Galgotia publication Pvt Ltd. Daryaganj, New Delhi.
5. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
6. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
7. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
8. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
9. On Your Marks - Net…Set…Go… Surviving in an e-world by AnushkaWirasinha, Prentice Hall of India Pvt. Ltd., New Delhi
10. Fundamentals of Information Technology by VipinArora, Eagle Parkashan, Jalandhar

**Reference websites**

1. www. tutorialspoint..com
2. www.sf.net
3. Gsuite.google.com
4. Spoken-tutorial.org
5. Swayam.gov.in

## 3.4 INORGANIC AND ORGANIC TANNING

| L | T | P |
|---|---|---|
| 6 | - | - |

### RATIONALE

The Objective Of The Course Is To Give Focus On The Manufacture Of Different Tanned Leather And Application Of Tanning Materials And Used In Leather Manufacturing Process.

### LEARNING OUTCOME

After undergoing the subject, the students will be able to

- Understand the inorganic & organic tanning materials.
- Understand the application of different tanning materials.
- Understand the principles of different tanning materials.
- Understand the properties of different tanning materials.

### DETAILED CONTENTS

**UNIT-I ( CHROME TANNING) (PERIODS 17)**

DEFINITION OF TANNING, OBJECTIVES OF TANNING, CLASSIFICATION OF TANNAGES WITH EXAMPLES. chrome tanning, WERNER'S COORDINATION THEORY OF CHROME COMPOUNDS, CHEMISTRY OF CHROMIUM SALTS, PREPARATION OF CHROME LIQUORS, SELF BASIFYING CHROME LIQUOR/POWDER-HYDROLYSIS, OLATION, OXOLATION, POLYMERIZATION, THEORY OF CHROME TANNING: DEPOSTION THEORY, RESIDUAL VALENCY THEORY, COMPLEX CO-ORDINATION THEORY. CHEMICAL CONTROLS IN CHROME TANNING/FACTORS INFLUENCING CHROME TANNING LIKE PH, CONCENTRATION, TIME, TEMPERATURE NEUTRAL SALTS & BASICITY. MASKING AGENTS, BASIFICATION,BOIL TEST – SHRINKAGE TEMPERATURE. MECHANISM OF CHROME TANNING. TOXILOGICAL ASPECT AND HAZARDS OF CHROME TANNING, DEFECTS CAUSED BY CHROME TANNING. PROCESS FOR WET-BLUE. PROPERTIES OF CHROME TANNED LEATHER.

**UNIT-II ( VEGETABLE TANNING) (PERIODS 17)**

VEGETABLE T**ANNING, SOURCES/CLASSIFICATION,** PHYSICAL AND CHEMICAL PROPERTIES OF VEGETABLE TANNING MATERIALS. PREPARATION OF VEGETABLE TANNING LIQUORS BY LEACHING AND PREPARATION/MANUFACTURE OF EXTRACT, TYPES OF EXTRACTS, FACTORS INVLOVED IN VEGETABLE TANNING, MECHANISM OF VEGETABLE TANNING. BLEACHING, FILLING,

FIXATION OF VEGETABLE TANNED LEATHER, NON-TANS, CONTROLS OF VEGETABLE TANNAGE, DEFECTS OF VEGETABLE TANNAGE. PROPERTIES OF VEGETABLE TANNED LEATHER.

**UNIT-III ( OIL TANNING TANNING) (PERIODS 19)**

OIL TANNING/OIL TANNAGE. DISTINGUISH BETWEEN OILS, FATS AND WAXES. DIFFERENT OILS USED IN LEATHER INDUSTRY. CHAMOIS LEATHER & SELECTION OF RAW MATERIALA & FISH OIL FOR MAKING CHAMOIS LEATHER, MECHANISM OF OIL TANNING/CHAMOIS TANNAGE, APLLICATION OF OIL TANNING, MANUFACTURE PROCESS & PROPERTIES & APPLICATION OF NEW CHAMOIS LEATHER.

**UNIT-IV ( ALUM TANNING,) (RIODSPE 19)**

ALUM TANNAGE , BASIC ALUMINIUM COMPOUND, CHEMISTRY OF ALUMINIUM SALTS (CHLORIDES AND SULPHATES) HYDROLYSIS, OLATION, OXOLATION AND POLYMERIZATION, EFFECT OF MASKING SALTS, PREPARATION OF BASIC ALUMINIUMSULPHATE LIQUOR, ROLE OF INORGANIC /ORGANIC SALTS IN ALUMINIUM LIQUOR THEORY/MECHANISM OF ALUMINIUM TANNING/ALUM TANNAGE& USES. DIFFERENCE BETWEEN CHROMIUM & ALUMINIUM TANNED LEATHER.

**UNIT-V ( DIFFERENT TANNING MATERIALS) (PERIODS 12)**

ALDEHYDE TANNAGE AND THEORY OF ALDEHYDE TANNING, PROPERTIES OF ALDEHYDE TANNED LEATHER, ZIRCONIUM TANNAGE AND THEORY OF ZIRCONIUM TANNING. & PROPERTIES OF ZERCONIUM TANNED LEATHER, IRON TANNAGE AND THEORY OF IRON TANNING. & PROPERTIES OF IRON TANNED LEATHER, OBJECTIVES OF COMBINATION TANNAGES

**INSTRUCTIONAL STRATEGY**

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

**MEANS OF ASSESSMENT**

- Class Test
- Home Assignment
- Attendance
- Sessional Test

**RECOMMENDED BOOKS**

- Introduction to the principles of leather manufacture -s.s.dutta.
- Indian leather technology association, calcutta.
- Practical leather technology - j.c.Thorstenson, e. Kreigerpublishing company – malabar, florida – 1993.
- Theory and practice of leather manufacture - k.t. Sarkar, ajoysorcar, madras.
- Leather technician hand book - j.h. Sharphouseleather producer association, north hampton – 1995.Clri publications, madras.

## SUGGESTED DISTRIBUTION OF MARKS

| **Topic** | **Time Allotted (Periods)** | **Marks Allotted (%)** |
|---|---|---|
| 1. | 17 | 20 |
| 2. | 17 | 20 |
| 3. | 19 | 23 |
| 4 | 19 | 23 |
| 5 | 12 | 14 |
| **Total** | **84** | **100** |

## 3.5 POST TANNING AND FINISHING OPERATIONS

| L | T | P |
|---|---|---|
| 6 | - | 8 |

### RATIONALE

The objective of the course is to give focus on the manufacturing process from post tanning to finishing operation and application of each process to manufacture of good quality of finished leather.

### LEARNING OUTCOME

After undergoing the subject, the students will be able to

- Understand The Post Tanning & Finishing Operation.
- Understand The Application Of All Tannery Machines.
- Understand The Application Of All Wet End Chemicals.

### DETAILED CONTENTS

### UNIT-I NEUTRALIZATION /DEACIDIFICATION(17 PERIODS)

1. SORTING/ SELECTION OF WETBLUE.
2. MECHANICAL OPERATION: SAMMYING, SPLITTING, SHAVING & SHAVED WEIGHT.
3. WETBACK / ACIDWASH, RECHROMING.
4. NEUTRALIZATION & ITS OBJECT.
5. EFFECT OF NEUTRALIZATION ON DYEING & FAT LIQUORING, CONTROLS OF NEUTRALIZATION PROCESS.
6. EFFECT OF NEUTRALIZATION WITH ORGANIC SALTS AND SYNTANS
7. CHOICE OF CHEMICALS FOR NEUTRALIZATION PROCESS, PARAMETERS OF DEACIDIFICATION / NEUTRALIZATION.
8. POSSIBLE DEFECTS OF NEUTRALIZATION PROCESS, WHAT IS SPUE.

### UNIT-II RETANNING & DYEING (17 PERIODS)

1. RETAINING & ITS OBJECT.
2. VARIOUS TYPES OF RETAINING AGENTS INCLUDING THEIR PROPERTIES AND USES.
3. TYPES AND USE OF VARIOUS RESIN TANNAGE /SYNTANS.
4. BLEACHING, ITS OBJECT AND METHODS.
5. DYES & ITS OBJECT & PROPERTY
6. VARIOUS TYPES OF DYES INCLUDING NATURAL DYES & ITS PROPERTIES, METAL COMPLEX DYES, FASTNESS PROPERTIES OF DYES
7. COLOR MATCHING OF DYES AND BEHAVIOR TOWARDS LEATHERS.
8. DIFFERENT TYPES OF DYEING METHODS & AUXILIARY (LEVELING, FIXING AGENTS AND MORDENTS ETC.) SELECTION OF DYES & DYEING OF LEATHER.

9. PRINCIPLE OF DYEING AND USES FOR DIFFERENT END PRODUCTS WITH DIFFERENT RECIPES. RESTRICTED/BANNED ARYLE AMINE (AZO DYES) BASE DYES, DOXOLOGICAL HAZARDOUS ASPECTS OF DYES.

**UNIT-III** (FAT LIQUORING & STUFFING) **(18 PERIODS)**

1. FATLIQUORING PROCESS & ITS OBJECT & PROPERTIES.
2. EMULSION & DIFFERENT THEORIES OF EMULSION .
3. NATURAL OILS /FATS, SOURCES & SELECTION OF OILS/FATS FOR FATLIQUORING PROCESS.
4. SYNTHETIC OILS/FATS, DIFFERENT TYPES OF FATLIQUORS INCLUDING SYNTHETIC FAT LIQUERS.
5. PREPARATION OF FAT LIQUORS AND THEIR PROPERTIES AND PARAMETERS / CONTROLS POSSIBLE DEFECTS OF FATLIQUORING PROCESS,
6. FACTORS EFFECTING, CHOICE OF FAT LIQUOR, MECHANISM OF FAT LIQUORING. WATER REPELLANT AND WATER PROOF FAT LIQUORS.
7. STUFFING & ITS OBJECT & PROPERTIES AND DIFFERENCE BETWEEN FATLIQUORING& STUFFING.
8. USES / APPLICATION AND VARIOUS MEHODS OF STUFFING.

**UNIT-** IV **WATER REPELLANT AGENTS, FIXATION & DRYING (18 PERIODS)**

1. DIFFERENT WATER PROFFING/WATER REPELLANT AGENTS INCLUDING PROPERTY AND THEIR APPLICATION.
2. FIXATION OF LEATHER & AND CHOICE OF CHEMICALS FOR FIXING/FIXATION PROCESS
3. CHECK & DRAIN / WASH & PILING OVER NIGHT& AGEING
4. SAMMYING (IF YOU NEED) AND SETTING .
5. DRYING & ITS OBJECT.
6. VACUUM DRYING AND OTHER METHODS OF DRYING: HANGING ,TOGGLING ETC
7. SELECTION OF DRYING METHODS FOR VARIOUS LEATHERS
8. POSSIBLE DRYING DEFECTS.
9. CRUST

**UNIT- V FINISHING (14 PERIODS)**

1. FINISHING PROCESS & ITS OBJECT
2. VARIOUS FINISHING MATERIALS.
3. DIFFERENT TECHNIQUES OF FINISHES: SEASONS, METHOD OF APPLICATIONS OF DIFFERENT FINISHES TECHNIQUES: STOCCO, BRUSHING, PADDING , ROLLER COATING, SPRAYING AND POLISHING, GLAZING, HOT PLATING, EMBOSSING ETC
4. FINISHING MACHINES & OPERATION INVOLVED IN FINISHING OF DIFFERENT TYPES OF LEATHER
5. PROPERTIES & SELECTION OF FINISHED LEATHER & FINISHING DEFECTS
6. APPLICATION OF MEASURING MACHINES, PACKING/DISPATCH.

**LIST OF PRACTICALS**

1- TANNERY PRACTICE IN ALL POST TANNING OPERATIONS WITH MERIT AND DEMERIT
2- GRADING/SELECTION OF WET BLUE , CRUST & FINISHED LEATHER
3- KNOWLEDGE OF VARIOUS DEFECTS IN ALL TANNERY PROCESS

4- KNOWLEDGE OF PH AND INDICATORS
5- LIST OF CHEMICALS USED UP TO FINISHING OPERATION.
6- STUDY OF POST TANNING & FINISHING MACHINES

## INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

## MEANS OF ASSESSMENT

− Class Test

− Home Assignment −
Attendance

− Sessional Test

## RECOMMENDED BOOKS


- MODERN PRACTICE OF RETANNING, DYEING AND FINISHING BY K.T.SARKAR – CHENNAI.
- LEATHER TECHNICIAN HAND BOOK BY J.H.SHARP HOUSE, LEATHER PRODUCERS ASSOCIATION – NORTH HAMPTON – 1995.
- C.KOTESWARARAO AND M.S.OLIVANNAN LECTURE NOTES ON DYEING AND FINISHING OF LEATHERS –CLRI – CHENNAI – 20. C.L.R.I PUBLICATION – MADRAS – 20
- PRACTICAL LEATHER TECHNOLOGY BY J.THORNSTEIN, E.KRIEGER PUBLISHING COMPANY – MALABAR – FLORIDA – 1993.
- INTRODUCTION TO THE PRINCIPLES OF LEATHER MANUFACTURE - S.S.DUTTA.
- INDIAN LEATHER TECHNOLOGY ASSOCIATION, CALCUTTA.
- PRACTICAL LEATHER TECHNOLOGY - J.C.THORSTENSON, E. KREIGER PUBLISHING COMPANY – MALABAR, FLORIDA – 1993.
- THEORY AND PRACTICE OF LEATHER MANUFACTURE - K.T. SARKAR, AJOYSORCAR, MADRAS.
- LEATHER TECHNICIAN HAND BOOK BY J.H. SHARPHOUSE LEATHER PRODUCER ASSOCIATION, NORTH HAMPTON – 1995.


## SUGGESTED DISTRIBUTION OF MARKS

| Topic | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 17 | 20 |
| 2. | 17 | 20 |
| 3. | 18 | 21 |
| 4 | 18 | 21 |
| 5 | 14 | 18 |
| **Total** | **84** | **100** |

## 3.6 ELEMENTRY MICROSCOPY AND MICROBIOLOGY

| L | T | P |
|---|---|---|
| 6 | - | 4 |

## RATIONALE

THE QUALITY OF THE FINAL LEATHER DEPENDS ON THE QUALITY OF RAW MATERIAL, PROCESS VARIATIONS AND PRESERVATION TECHNIQUES. SYSTEMATIC MICROBIOLOGICAL TECHNIQUES ARE AIMED TO DEVELOP THE UNDERSTANDING AND APPLICATION SKILLS IN THE STUDENT FOR BETTER RAW MATERIAL SELECTION, BETTER PROCESS VARIATIONS, UP GRADATION OF LOWER QUALITY MATERIALS IN LEATHER MAKING.

## LEARNING OUTCOME

After undergoing the subject, the students will be able

- TO KNOW THE BASIC TECHNIQUES OF MICROSCOPY HISTOLOGY AND BACTERIOLOGY.
- TO UNDERSTAND THE USE OF THESE IN STUDYING THE SKIN STRUCTURE AND ACTION OF BACTERIA, FUNGI, INSECTS AND PARASITES OF SKIN.
- TO IDENTIFY THE DEFECTS DURING THE SELECTION OF RAW MATERIAL
- TO APPLY THE METHODS FOR EFFECTIVE CONTROL OF MICRO ORGANISMS TO PRODUCE AND PRESERVE THE QUALITY OF LEATHERS.

## DETAILED CONTENTS

### UNIT-I MICROSCOPY (15 PERIODS)

(i) INTRODUCTION TO MICROSCOPY, DIFFERENT TYPES OF MICROSCOPES, STUDY OF COMPOUND MICROSCOPE.

(ii) SLIDE PREPARATION FOR MICROSCOPIC STUDY: PREPARATION OF MATERIALS, FIXING, EMBODDING, SECTION CUTTING, STAINING AND MOUNTING.

(iii) STRUCTURAL CHANGES IN THE HIDE/ SKIN DURING LEATHER PROCESSING

### UNIT-II ANATOMICAL STRUCTURE OF HIDE AND SKIN (16 PERIODS)

DEFINE GRAIN SURFACE PATTERN OF HIDES AND SKINS-FIBRE STRUCTURE OF LEATHER-MICROSCOPIC ASSESSMENT OF LEATHER, APPLICATION OF MICROSCOPY IN LEATHER PROCESSING FROM SOAKING TO FINISHING.

### UNIT-III ROLE OF MICRO ORGANISM IN DIFFERENT PROCESSES (16 PERIODS)

1-THE EFFECT OF PH AND TEMPERATURE ON THE SURVIVAL AND GROWTH OF BACTERIA
2-PHASE IN THE GROWTH OF BACTERIA
3-THE EFFECT OF MICROORGANISMS DURING LEATHER MANUFACTURING AND STORAGE

4-THE EFFECT OF MOULDS ON LEATHER

**UNIT-IV BACTERIOLOGY** **(19 PERIODS)**

(i) UNDERSTAND THE MORPHOLOGY, FUNDAMENTALS OF BACTERIOLOGY: MICROSCOPIC STUDY OF BACTERIA, PREPARATION OF VARIOUS CULTURE MEDIA- STERILIZATION MORPHOLOGICAL CHARACTERISTICS OF BACTERIA, STAINING OF BACTERIA AND CLASSIFICATION- BIOCHEMICAL PROPERTIES OF BACTERIA-BACTERIA COUNT.

(ii) ACTION OF BACTERIA ON HIDES AND SKINS: DAMAGE CAUSED BY BACTERIAL INFESTATION, HAIR SLIP, LIBERATION OF AMMONIA-HALOPHILIC ,BACTERIA, PROBLEM OF MOLD HEAT AND ITS CURE-BACTERIAL ANALYSIS OF VARIOUS TANNERY SUBSTRATES IN THE PREVENTION OF GROWTH BY USE OF PRESERVATIVES AS BACTERIOSTATIC AND BACTERICIDES AGENTS, DETERMINATION OF PRODUCTIVE ACTIVITY OF BACTERIA.

**UNIT-V MOULDS** **(18 PERIODS)**

MOULDS AND THEIR DIFFERENCE FROM BACTERIA-DAMAGES THAT CAN BE PRODUCED BY MOULDS TO LEATHER, TAN LIQUOR, PICKLED SKINS AND MOULD PREVENTION. MOULD GROWTH TO FINISHED VEGETABLE TANNED LEATHER/WET BLUE CHROME. STUDY OF PRESERVATIVE IN LEATHER SCIENCE, ACTION OF FUNGS ON LEATHER, DIFFERENT TYPES OF FUNGS.

## LIST OF PRACTICALS

1. STUDY OF COMPOUND MICROSCOPE.
2. EXAMINATION OF HIDES, SKINS AND LEATHER UNDER MICROSCOPE.
3. EXAMINATION OF GRAIN PATTERN OF DIFFERENT TYPES OF LEATHER.
4. PREPARATION OF SLIDES OF DIFFERENT TYPES OF LEATHER.
5. BASIC HISTOLOGICAL TECHNIQUES FIXATION, EMBEDDING, SECTIONING, STAINING, MOUNTING
6. MICROSCOPIC ASSESSMENT OF LEATHER PROCESSING – CURING, LIMING, BATING, TANNING.
7. IDENTIFICATION OF INSECTS AND PARASITES ATTACKING LIVESTOCK, STORED HIDES.
8. ASSESMENT OF COW/BUFF/HEAT/SHEEP LEATHER SLIDE
9. IDENTIFICATION OF DEFECTS – FUNGAL, INSECT DAMAGES, PROCESS FAULTS

## INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

## MEANS OF ASSESSMENT

− Class Test

− Home Assignment −
Attendance

− Sessional Test

## RECOMMENDED BOOKS


1. PROGRESS IN LEATHER SCIENCE, BLMRA, LONDON.
2. A.J.SALLE, FUNDAMENTAL PRINCIPLES OF BACTERIOLOGY, MC.GRAW HILL BOOK COMPANY.
3. HISTOLOGICAL CHARACTERISTICS OF INDIAN HIDES AND SKINS – CLRI PUBLICATION.

4. J.C.TANCOUSE, SKIN, HIDE AND LEATHER DEFECTS.
5. VETERINARY, PARASITOLOGY, E.GURR.
6. B.S MALIK – PRACTICAL MANUAL OF VETERINARY BACTERIOLOGY, MYCOLOGY AND VIROLOGY – TATA MCGRAWHILL CO.
7. F.W. TANNER, PRACTICAL BACTERIOLOGY, JOHN WILEY.

## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 15 | 20 |
| 2 | 16 | 20 |
| 3 | 16 | 20 |
| 4 | 19 | 20 |
| 5 | 18 | 20 |
| **Total** | **84** | **100** |

## 4.1 COMMUNICATION SKILLS – II

| L | T | P |
|---|---|---|
| 4 | - | 2 |

### RATIONALE

Knowledge of English Language plays an important role in career development. This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills as parts of Communication Skill.

### LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Frame correct sentences with illustrations
- Comprehend the language correctly
- Interpret the language correctly
- Use given material in new situations.
- Correspond effectively using various types of writings like letters, memos etc.
- Communicate effectively in English with appropriate body language making use of correct and appropriate vocabulary and grammar in an organised set up and social context.

### DETAILED CONTENTS

1. Functional Grammar (16 periods)

    1.1 Prepositions
    1.2 Framing Questions
    1.3 Conjunctions
    1.4 Tenses

2 Reading (16 periods)

    2.1 Unseen Passage for Comprehension ( Vocabulary enhancement - Prefixes, Suffixes, one word substitution, Synonym and Antonym) based upon the passage should be covered under this topic.

3 Writing Skill (24 periods)

    3.1. Correspondence

        a) Business Letters- Floating Quotations, Placing Orders, Complaint Letters.
        b) Official Letters- Letters to Government and other Offices

    3.2. Memos, Circular, Office Orders

    3.3. Agenda & Minutes of Meeting

    3.4. Report Writing

## LIST OF PRACTICALS

**Note:** Teaching Learning Process should be focused on the use of the language in writing reports and making presentations.

Topics such as Effective listening, effective note taking, group discussions and regular presentations by the students need to be taught in a project oriented manner where the learning happens as a byproduct.

**Speaking and Listening Skills**

1. Debate
2. Telephonic Conversation: general etiquette for making and receiving calls
3. Offering- Responding to offers.
4. Requesting – Responding to requests
5. Congratulating
6. Exploring sympathy and condolences
7. Asking Questions- Polite Responses
8. Apologizing, forgiving
9. Complaining
10. Warning
11. Asking and giving information
12. Getting and giving permission
13. Asking for and giving opinions

## INSTRUCTIONAL STRATEGY

Students should be encouraged to participate in role play and other student-centered activities in class rooms and actively participate in listening exercises

## MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

## RECOMMENDED BOOKS

. Communicating Effectively in English, Book-I by RevathiSrinivas; Abhishek Publications, Chandigarh.

2 Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.

3 High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.

4. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

**Websites for Reference:**

1. http://www.mindtools.com/ page 8.html – 99k
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 16 | 28 |
| 2 | 16 | 28 |
| 3 | 24 | 44 |
| **Total** | **56** | **100** |

## 4.2 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

| L | T | P |
|---|---|---|
| 5 | - | 4 |

### RATIONALE

The objective of the course is to impart basic knowledge and skills regarding basic electrical engineering, which diploma holders will come across in their professional life. This course will provide the students to understand the basic concepts and principles of d.c. and a.c. fundamentals, electromagnetic induction, batteries, transformers, motors distribution system, domestic installation, electrical safety etc. The students will also learn basic electronics including diodes and transistors and their applications.

### LEARNING OUTCOME

After undergoing the subject, the students will be able to

- Understand the meaning of basic electrical quantities such as voltage, current, power etc.
- Use working principle of transformer.
- Use basic Network Theorem and Kirchoff's laws.
- Understand the concept of Junction Diode, transistor and field effect transistor.

### DETAILED CONTENTS

1. Application and Advantages of Electricity (03 periods)
   Difference between ac and dc, various applications of electricity, advantages of electrical energy over other types of energy

2. Basic Electrical Quantities (06 periods)
   Definition of voltage, current, power and energy with their units, name of instruments used for measuring above quantities, connection of these instruments in an electric circuit

3. AC Fundamentals (08 periods)
   Electromagnetic induction-Faraday's Laws, Lenz's Law; Fleming's rules, Principles of a.c. circuits; Alternating emf, Definition of cycle, frequency, amplitude and time period. Instantaneous, average, r.m.s and maximum value of sinusoidal wave; form factor and Peak Factor. Concept of phase and phase difference. Concept of resistance, inductance and capacitance in simple a.c. circuit. Power factor and improvement of power factor by use of capacitors. Concept of three phase system; star and delta connections; voltage and current relationship (no derivation)

4. Transformers (06 periods)
   Working, principle and construction of single phase transformer, transformer ratio, emf equation, losses and efficiency, cooling of transformers, isolation transformer, CVT, auto transformer (brief idea), applications.

5. D.C. Circuits (10 periods)

5.1 Ohm/s law, resistivity, effect of temperature on resistance, heating effect of electric current, conversion of mechanical units into electrical units.

5.2 Kirchoff's laws, application of Kirchoff's laws to solve, simple d.c. circuits

5.3 Thevenin's theorem, maximum power transfer theorem, Norton's theorem and superposition theorem, simple numerical problems.

6. Basic Electronics (22 periods)

6.1 Basic idea of semiconductors – P and N type; diodes, Zener diodes and their applications,

6.2 Introduction to BJT : NPN and PnP transistors, other symbols and mechanism of current flow, explanation of fundamental current relations. Comparison of CB, CE and CC configuration transistor as amplifier in CE configuration.

6.3 Field Effect Transistor (FET) : Construction, Operation and Characteristics of Junction FET, Comparison of SFET, MOSFET & CMOS.

## LIST OF PRACTICALS

1. Identification of Resistor, Capacitor, Inductor, Transformer, LBD etc
2. Familiarization with multimeter/CPO etc.
3. Measurement of wave shapes of half wave rectifier and full wave rectifier.
4. Plot the P&T characteristics and determination of its parameter from this characteristics.
5. Connection and reading of an electric energy meter
6. Use of ammeter, voltmeter, wattmeter, and multi-meter
7. Study of different types of fuses, MCBs and ELCBs
8. Study of Zener diode as a constant voltage source and to draw its V-I characteristics
9. To draw V-I characteristics of PN junction diode
10. Verify Thevenin and Norton theorem

## INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

## MEANS OF ASSESSMENT

− Class Test

− Home Assignment −
Attendance

− Sessional Test

**RECOMMENDED BOOKS**


1. Basic Electrical Engineering by PS Dhongal; Tata McGraw Hill Publishers, New Delhi
2. A Text Book of Electrical Technology, Vol. I and II by BL Thareja; S Chand and Co., New Delhi
3. Basic Electricity by BR Sharma; SatyaPrakashan, New Delhi
4. Basic Electrical Engineering by JB Gupta, S Kataria and Sons, Delhi
5. Experiments in Basic Electrical Engineering by SK Bhattacharya and KM Rastogi, New Age International Publishers Ltd., New Delhi
6. Basic Electronics by VK Mehta; S Chand and Co., New Delhi
7. Electrical Machines by SK Bhattacharya; Tata McGraw Hill, New Delhi
8. Basic Electronics and Linear Circuits by NN Bhargava and Kulshreshta, Tata McGraw Hill New Delhi.
9. Electronic principles by SK Sachdev, Dhanpat Rai and Sons, New Delhi.
10. Electronic Devices and circuits by Rama RaddyNarora Publishing House Pvt. Ltd. New Delhi.
11. Principles of electrical and electronics Engineering by VK Mehta; S Chand and Co. New Delhi
12. Digital Electronics by Malvino


**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 03 | 05 |
| 2 | 06 | 10 |
| 3 | 09 | 15 |
| 4 | 06 | 10 |
| 5 | 10 | 18 |
| 6 | 22 | 42 |
| **Total** | **56** | **100** |

## 4.3 PROCESS OF HEAVY AND SPORTS LEATHER

| L | T | P |
|---|---|---|
| 6 | - | 6 |

### RATIONALE

The objective of the course is to give focus on the manufacture of heavy & sports leather and application of different types of heavy & sports leather.

### LEARNING OUTCOME

After undergoing the subject, the students will be able to

- Understand The Manufacturing Process Of Heavy & Sports Leather.
- Understand The Selection Of Raw Materials & Wet Blue & Crust & Finished Leather.
- Understand The Checking Point Of Each Process.

### DETAILED CONTENTS

**UNIT-I (17 PERIODS)**
Selection of hides for heavy and sports leather, selection of wet blue.
Introduction of all tannery operation from soaking to finishing operation.
Classification of heavy and sports leather.

**UNIT-II(17 PERIODS)**
Manufacturing process of all heavy leather along with their properties and application like: sole leather, harness leather, belting leather, safety leather.
INDUSTRIAL GLOVE LEATHER.

**UNIT-III(17 PERIODS)**
Manufacturing process of all other heavy leather along with their properties and application like: waterproof leather, bookbinding leather, luggage leather, picking band leather,
CUP AND PUMP WASHER LEATHER**.**

**UNIT-IV(17 PERIODS)**
Manufacturing process of all sports leather along with their properties and application like: cricket ball leather, football leather, glove leather for wicket keepers & boxing, hockey ball leather

**UNIT-V(16 PERIODS)**
Manufacturing process of all other sports leather along with their properties and application like: basket ball leather, rugby ball leather, volley ball leather
Quality control aspects with special reference to heavy and sports leather manufacture.

## LIST OF PRACTICALS

Manufacture process of some important heavy & sports leather.

1- Manufacture process ofsome important heavy leathers like: sole leather, harness leather, belting leather, safety leather.INDUSTRIAL GLOVE LEATHER. Waterproof leather, bookbinding leather, luggage leather, picking band leather, CUP AND PUMP WASHER LEATHER.

2- Manufacture process of some important light leathers like: cricket ball leather, football leather, glove leather for wicket keepers & boxing, hockey ball leather, basket ball leather, rugby ball leather, volley ball leather

## INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

## MEANS OF ASSESSMENT

− Class Test

− Home Assignment −
Attendance

− Sessional Test

## RECOMMENDED BOOKS


- CHOICHIOGIWARA, 'A PRACTICAL GUIDE TO HEAVY LEATHER PROCESSING', FUEL AND LEATHER RESEARCH CENTRE KAVACHI – 1980.
- K.T.SARKAR. THEORY AND PRACTICE OF LEATHER MANUFACTURE. AJOYSORCAR. MADRAS – 1981.
- S.S.DATTA. INTRODUCTION TO THE PRINCIPLES OF LEATHER MANUFACTURE.
- INDIAN LEATHER TECHNOLOGICAL ASSOCIATION. CALCUTTA – 1980. CLRI, PUBLICATION, CHENNAI.

## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 17 | 20 |
| 2 | 17 | 20 |
| 3 | 17 | 21 |
| 4 | 17 | 20 |
| 5 | 16 | 19 |
| **Total** | **84** | **100** |

## 4.4 ELEMENTS OF FOOTWEAR TECHNOLOGY

| L | T | P |
|---|---|---|
| 6 | - | 4 |

**RATIONALE**

The objective of the course is to give focus on the manufacture,evaluation and application of materials and components used in footwear manufacture.

**LEARNING OUTCOME**

After undergoing the subject, the students will be able

- To Understand The Construction Of A Shoe And Its Components.
- To Understand The Design And Pattern Development.
- To Understand The Cutting, Preclosing And Closing.
- To Understand The Method Of Lasting

**DETAILED CONTENTS**

**UNIT-I ANOTOMY OF HUMAN FOOT (18 PERIODS)**
Introduction of foot anatomy (body, bones, joints, arches) and their relation to footwear, History of shoe, basic knowledge of shoe size scale.

**UNIT-II FOOTWEAR MATERIALS AND COMPONENTS (18 PERIODS)**
Different types of leather used in shoe industry, soling materials, threads, heels, reinforcement, grinderies, adhesive, shoe dressing materials etc.

**UNIT-III CLICKING AND CLOSING (18 PERIODS)**
Principles of cutting- hand, machines, clicking room design and management. Checking incoming work, stitch making, skiving, punching and gimping, heat embossing, flow molding, toe puff attachment, attaching linings and scrims, trimming linings, finishing off closed seams. Top line and other edge treatments, local reinforcements, attaching fasteners and trims.

**UNIT-IV LASTING (18 PERIODS)**
Methods of lasting for different types of shoe construction, sole attaching, lasted margin, upper preparation, sole preparation, sole cementing, upper cementing, bottom fillers and shanks, adhesive drying, heat activation, spotting.
Pressing, last slipping, health and safety, quality control and fault finding problems- solving.

**UNIT-V SHOE CONSTRUCTION (12 PERIODS)**
Various methods of shoe construction- oxford & derby, cemented shoe construct.

**LIST OF PRACTICALS**

1. Components of Oxford & Derby.
2. Inner Form, Outer form & Mean Form of Oxford & Derby
3. Upper Preparation for Oxford & Derby

4. Size System British & French.

## INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

## MEANS OF ASSESSMENT

- Class Test
- Home Assignment
- Attendance
- Sessional Test

## RECOMMENDED BOOKS


1. Sarkar K.T THEORY & PRACTICEOF LEATHER MANUFACTURE
2. Dutta S.S AN INTRODUCTION OF THE PRINCIPLES OF LEATHER MANUFACTURE.
3. Compressive FOOTWEAR TECHNOLOGY MR. SOMNATH GANGULY


## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 18 | 21 |
| 2 | 18 | 22 |
| 3 | 18 | 21 |
| 4 | 18 | 22 |
| 5 | 12 | 14 |
| **Total** | **84** | **100** |

## 4.5 LEATHER TRADE ENGINEERING

| L | T | P |
|---|---|---|
| 6 | - | 2 |

### RATIONALE

The objective of the course is to give focus on the selection of tannery sites, evolution and application of tannery machines and maintenance used in leather manufacture.

### LEARNING OUTCOME

After undergoing the subject, the students will be able to know

- LEATHER PRODUCTION, WHICH INVOLVES LOT OF MACHINERY OPERATION.
- UNDERSTAND THE WORKING PRINCIPLES OF VARIOUS MACHINES WILL PROVIDE EFFECTIVE SUPERVISION FOR GETTING FINISHED LEATHER OF GOOD QUALITY.
- THE STUDENT WILL BE ABLE TO SELECT A SITE FOR STARTING A TANNERY, SELECT THE MACHINERY, CAN VISUALIZE THE TROUBLE SHOOTING AND CAN ATTEND TO MINOR MAINTENANCE.

### DETAILED CONTENTS

### UNIT- I SELECTION OF SITE AND LAYOUT (17 PERIODS)

PLANT LAYOUT & ITS DEFINITION. IMPORTANCE & OBJECTIVES OF PLANT LAYOUT, STEPS INVOLVED IN DESIGNING A PLANT LAYOUT, FACTORS AFFECTION THE PLANT LAYOUT DECISION, CHARACTERISTICS OF EFFICIENT LAYOUT, ADVANTAGES OF A GOOD LAYOUT, BAD LAYOUT, TYPES OF PLANT LAYOUT, ADVANTAGES & DISADVANTAGES OF DIFFERENT LAYOUT, LOCATION OF TANNERY, LAYOUT OF DIFFERENT SECTIONS WITH VARIOUS PITS, DRUMS AND OTHER MACHINERY, DRAW A GOOD PLANT LAYOUT FOR TANNERY.

### UNIT-II WATER AND BOILER (17 PERIODS)

SOURCES OF WATER AND ITS STORING, DISTRIBUTION OF WATER BY PIPE LINES, VALVES ETC. BOILER & ITS USE IN LEATHER INDUSTRY. DIFFERENT TYPES OF BOILERS, THEIR MAIN COMPONENTS AND FUNCTIONS.

### UNIT-III DRUMS, PADDLES AND PITS (17 PERIODS)

PITS OF TANNERY-USE OF PITS, CONSTRUCTION DETAILS, ADVANTAGES DISADVANTAGES OF PITS AND WORKING SYSTEMS OF PITS-PADDLES USED FOR TANNERY-VARIOUS USES OF PADDLE, WORKING PRINCIPLE, CONSTRUCTION DETAILS MAINTENANCE AND REPAIR OF PADDLES-DRUMS USED FOR TANNERY-DIFFERENT USES OF DRUM, SIZES, SPEED – CONSTRUCTION AND WORKING PRINCIPLE OF DRUM. MAINTENANCE AND REPAIR OF DRUMS – LATEST DEVELOPMENTS OF DRUM, ADVANTAGES AND DISADVANTAGES OF DRUM. COMPARISON OF PITS WITH PADDLES AND DRUMS.

## UNIT-IV TANNERY MACHINES (17 PERIODS)

MACHINERY USED FOR TANNNRY -WORKING PRINCIPLES, GENERAL CONSTRUCTION, VARIOUS TANNERY MACHINES USING TO MAKE LEATHER FROM SOAKING TO FINISHING OPERATIONS LIKE FLESHING, UNHAIRING MACHINE, SCUDDING, SAMMYING, SPLITTING, SHAVING, SETTING, VACCUME, TOGGLE, MOLLISHA, STACKING, BUFFING / SNUFFING, AUTO/HAND SPRAY, EMBOSSING, MILLING DRUM, ROLLOR COTTER, HYDRAULIC PRESS, FINIFLEX PRESS & AREA MEASURING ETC. FUNCTION AND COST & MAINTENANCE OF EACH MACHINES. WITH FREE HAND DRAWING, WEIGHT, COST AND CAPACITIES POWER REQUIRED, SAFETY PRECAUTIONS TO BE OBSERVED IN CASE OF EACH MACHINE.

## UNIT-V PLANT MAINTENANCE (16 PERIODS)

FUNCTIONS OF MAINTENANCE DEPARTMENT, MAINTENANCE PROCEDURE-PREVENTIVE MAINTENANCE, ROUTINE MAINTENANCE AND BREAKDOWN MAINTENANCE OF LEATHER MACHINERIES AND ACCESSORIES. LUBRICATION AND OILING PROCEDURE IN ROUTINE MAINTENANCE AND DEVELOPMENT OF LUBRICATION CHARTS. FABRICATION AND REPAIR OF COMPONENTS FOR BREAKDOWN MAINTENANCE, SAFETY ENGG. - DEFINITION & IMPORTANCE, CAUSES OF ACCIDENTS, ACCIDENT PREVENTION RULES, GENERAL SAFETY DEVICES, INTRODUCTION OF CONSERVATION OF ENERGY AND WATER.

## LIST OF PRACTICALS

1. STUDY OF VARIOUS WORKING PARTS OF THE TANNERY MACHINES, THEIR FUNCTION & LAYOUT OF TANNERY
2. REMOVAL OF PARTS FOR GENERAL MAINTENANCE AND ROUTINE SERVICE REPAIR, RENEWAL AND REASSEMBLY.
3. STUDY OF DRUM, PITS, PADDLES.
4. STUDY OF UNHEARING MACHINE
5. STUDY OF FLESHING MACHINE
6. STUDY OF INVOLVED MECHANICAL OPERATION MACHINES.
7. STUDY OF DRYING CHAMBER.

## INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

## MEANS OF ASSESSMENT

- Class Test
- Home Assignment
- Attendance
- Sessional Test

## RECOMMENDED BOOKS


1. SARKAR K.T THEORY & PRACTICEOF LEATHER MANUFACTURE
2. DUTTA S.S AN INTRODUCTION OF THE PRINCIPLES OF LEATHER MANUFACTURE.
3. LEATHER TECHNICIANS HANDBOOK J.H SHARPHOUSE


## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 17 | 20 |
| 2 | 17 | 20 |
| 3 | 17 | 21 |
| 4 | 17 | 20 |
| 5 | 16 | 19 |
| **Total** | **84** | **100** |

# INDUSTRIAL TRAINING OF STUDENTS

It is needless to emphasize further the importance of Industrial Training of students during their 3 years of studies at Polytechnics. It is industrial training, which provides an opportunity to students to experience the environment and culture of industrial production units and commercial activities undertaken in field organizations. It prepares student for their future role as diploma engineers in the world of work and enables them to integrate theory with practice. Polytechnics have been arranging industrial training of students of various durations to meet the above objectives.

This document includes guided and supervised industrial training of 4 weeks duration to be organized during the semester break starting after second year i.e. after 4$^{th}$ semester examinations. The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that a training schedule may be drawn for each student before starting of the training in consultation with the training providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, important machines and materials used in the training organization.

Equally important with the guidance is supervision of students training in the industry/organization by the teachers. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

An external assessment of 50 marks has been provided in the study and evaluation scheme of 5$^{th}$ Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

Teachers and students are requested to see the footnote below the study and evaluation scheme of 4$^{th}$ semester for further details.

The teacher along with field supervisors will conduct performance assessment of students.

The components of evaluation will include the following:

a) Punctuality and regularity 15%
b) Initiative in learning new things 15%
c) Presentation and VIVA 15%
d) Industrial training report 55%

## 5.1 FINANCIAL COSTING AND ACCOUNTING

| L | T | P |
|---|---|---|
| 6 | - | - |

### RATIONALE

The objective of the course is to give focus on the cost accounting, evaluation and application of budget and used in leather footwear industry.

### LEARNING OUTCOME

After undergoing the subject, the students will be able

- To understand the cost elements for leather / footwear industry
- To understand the budgeting control in leather / footwear industry.
- To understand the economic importance of leather/footwear industry.

### DETAILED CONTENTS

**UNIT-I** (17 PERIODS)

Cost accounting, elements of cost, classification of cost elements-examples from leather and footwear industry, method of costing, accounting principles-basic records, depreciation, depreciation methods-preparation & interpretation of profit & loss statement-balance sheet, fixed assets-current assets.

**UNIT-II** (17 PERIODS)

Cost profit volume analysis, breakeven analysis, standard costing, analysis of variance, costing of leather & leather product-material, labor, power, overhear expenses, current assets & liability decision, estimation of working capital requirements, managements of accountings receivable-inventory-cash-inventory valuation methods.

**UNIT-III** (17 PERIODS)

**Budget**.Types of budgets, budgeting& control in tanneries & leather product industry, cost estimates & demand forecasting for leather & leather products, different sources of finance, budget preparation, annual cost, variable cost & allocation of cost, semi & variable cost, capital budgeting, payback & present value method, foreign exchange, exchange rates, risk strategies.

**UNIT-IV** (17 PERIODS)

Leather products, India's share at the global level, India competitors & their strength, international prices , Indian government policies in the leather sector, economic importance of leather, present & past condition of indigenous leather industry & leather product industry of India, market constraints ( quality, image, brand name & merchandising method)

**UNIT-V** (16 PERIODS)

Marketing & export concept, strategies, product planning & development, decision making, sales promotion, export golden rules for successful exporting, necessary steps for documents.

## INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

## MEANS OF ASSESSMENT

- Class Test
- Home Assignment
- Attendance
- Sessional Test

## RECOMMENDED BOOKS


1- S.N. MAHESWARAN,MANAGEMENT ACCOUNTING AND FINANCIAL CONTROL, SULTAN CHAND,1992

2- THUKARAM RAO ME, COST ACCOUNTING AND FINANCIAL MANAGEMENT NEW AGE INTERNATIONAL BNGLALORE 2004


## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 17 | 20 |
| 2 | 17 | 20 |
| 3 | 17 | 20 |
| 4 | 17 | 20 |
| 5 | 16 | 20 |
| **Total** | **84** | **100** |

## 5.2 POLLUTION CONTROL AND INDUSTRIAL SAFETY

**LTP**

**5 - 6**

### RATIONALE

A Chemical Engineering technician must have the knowledge of different types of pollution caused due to industrialization so that he may help in balancing the eco-system and control the pollution by means of control devices. The technician must know various types of accidents which occur in chemical plants and how to safeguard them to avoid injury to men and material. Hence this subject.

### LEARNING OUTCOMES

After completion of this course, the students will be able to:

- Understand different types of pollution caused due to industrialization.
- Balance pollutants to save the ecosystem
- Control pollution by means of control devices
- Have knowledge of different Acts and rules about the environmental protection.
- Manage solid wastes to reduce the pollution.
- Have Knowledge of various types of accidents which occur in chemical plants

### DETAILED CONTENT

1 Introduction (10 Periods)

Environment and Pollution, Classification of pollution e.g. Land, Water, Air, Noise.Environment Impact assessment Studies, Character and origin of industrial wastes.

2. Air Pollution (10 Periods)

i) Definition of air pollution, Types of Air pollutants and their sources like SPM, SOX, NOX, $NH_3$, F, C1, CFC, $CO_2$ etc.
ii) Air Pollution control equipment in industries.
   a) Settling chamber
   b) Cyclone
   c) Scrubber (dry & wet)
   d) Multicyclone
   e) Electrostatic precipitator
   f) Bag Filter
iii) Ambient air quality measurement & their standards
iv) Vehicular Pollution and its control
v) Noise Pollution and its control mechanism

3. Water Pollution (10 Periods)

Water pollution, standards for drinking water, domestic waste water and industrial waste water. Methods of measurement of various parameter like BOD, SS, pH, COD, TDS etc. Methods of treatment of industrial waste water like

a) Chemical treatment
b) Physio-Chemical treatment
c) Bio-chemical treatment
d) Any other advance treatment

4. Environment Protection (15 Periods)

Environmental protection from hazardous chemicals waste:
Terminology relating to chemical hazards and air pollution, classification of chemical hazards and hazardous chemicals, codes of safety for operational hazards in laboratories, industries etc. (Reference should be made of I.S. Codes)

5. Radio Active Pollution (10 Periods)

Sources and effect on human, animal, plant and material. Measurement, means to control, preventive measures.

6. Solid Waste Management (10 Periods)

Municipal solid waste, biomedical waste, Plastic waste and its management, solid waste disposal methods such as open dumping, sanitary landfilling composting, incineration.
Importance of development of green area

7. Pollution Acts

A water pollution prevention control Act 1974, Air Pollution Act 1981, Environment protection Act 1986, Hazardous chemical manufacturing, storage and impact rules 1989 and hazardous waste and management and handling rules 1989, Regulation and control Rules 2000.

8. Safety in Chemical Industry (25 Periods)

Receiving and storing chemicals- transporting and moving chemicals- Safety in chemical reactions, pipe-lines with color coding in chemical factories. Precautions in the case of processes in operations involving explosive or inflammable dusts, gases, vapours etc. Maintenance of chemical plants-corrosion health hazards in common chemical processes, Fire hazards and their prevention. Codes of practice and specification for safety equipment (Reference should be made from I.S. Codes), case study of major chemical process industries disasters/accidents.

## LIST OF PRACTICALS

1. Determination of pH value.
2. Determination of turbidity
3. Determination of total solids, suspended solids and total dissolved solids.
4. Determination of dissolved oxygen (DO)
5. Determination of BOD.
6. Determination of COD
7. Determination of sulphate in water
8. Determination of chloride in water
9. Prepare chart for treatments of different solid waste.
10. Removal of suspended impurities from air using fabric filter.
11. Removal of suspended solids by coagulation

## INSTRUCTIONAL STRATEGY

Case Study of any disaster should be undertaken. Study should be data based.

Field visit to the industries should be planned.

Student should encouraged to undertake project work related to environmental problems.

## MEANS OF ASSESSMENT

- Class Test
- Home Assignment
- Attendance
- Sessional Test

## RECOMMENDED BOOKS

1. Safety in Process Plant Design by Wells
2. Safety and Accident Prevention in Chemical Operation by H. H, Tanacatte and W. S. Wood
3. Engineering Chemistry by P.C. Jain

## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 6 | 8 |
| 2. | 6 | 8 |
| 3. | 6 | 8 |
| 4. | 10 | 14 |
| 5. | 6 | 8 |
| 6. | 8 | 12 |
| 7. | 8 | 12 |
| 8. | 20 | 28 |
| **Total** | **70** | **100** |

## 5.3 ANALYTICAL CHEMISTRY OF LEATHER MANUFACTURE

| L | T | P |
|---|---|---|
| 6 | - | 5 |

### RATIONALE

The objective of the course is to give focus on theQUALITY OF LEATHER THAT IS DEPENDENT ON THE QUALITY OF THE CHEMICALS USED AND THE PROCESS ADOPTED IN EVERY STAGE OF THE TANNERY PROCESS. SELECTION OF LEATHER FOR A SPECIFIC END USE DEPENDS ON ITS PHYSICAL AND CHEMICAL PROPERTIES.

### LEARNING OUTCOME

After undergoing the subject, the students will be able

1- To understand the quality of water
2- To understand the physical testing of leather.
3- To understand the chemical testing of leather & chemicals.

### DETAILED CONTENTS

**UNIT**-I **(15 PERIODS)**

sources of water, characteristics of water, types of water- soft & hard water, hardness of water, types of hardness , degree & units of hardness of water, removal/methods of hardness of water- T.H.-by boiling,byclark's method. P.H. by- lime-soda process, zeolite or permutit process, calgon process, ion exchange resin process, difference between permutit & soda lime process, influence / effects of hard water on the leather processing from soaking to finishing operation.

**UNIT-II (15 PERIODS)**

methods of physical testing of leather, few popular thumb test for upper leather & sole leather disadvantages of thumb test, development & classification of physical testing methods, collection & preparation of sample, sampling positions: for full hide or skin and sides, for bends or butts, for shoulder, for belly, conditioning, measurement of leather surface area, leather thickness.

**UNIT-III (15 PERIODS)**

methods for determination of different strengths of leather - tensile strength & percentage elongation, stitch tearing strength, tearing strength, tongue tearing strength, buckle tear strength, distention, strength of grain bursting strength by the lastometer& by the tensometer. few more important tests for upper & light leathers - flexing endurance test, water vapour permeability & air permeability test, dynamic water proffness test, shrinkage temperature, scuff resistance, colour rub fastness/ dry & wet rubfastness.

**UNIT-IV (15 PERIODS)**

important test for sole leather - methods for determination of apperent density & real density, abrasion resistance, absorption of water by kubalka method for sole & light leather, dynamic water proofness test, resistance to cracking of grain & grain crack index, grain pipiness, perspiration resistance of leather, compressibility of leather & resiliency of leather.

**UNIT-V (12 PERIODS)**

analysis of water, analysis of pretanning materials & chrome tanning materials , conservation of chemical & water , what is quality control, quality control in leather manufacturing process from soaking to finishing process, advantages of applying qality control.

**UINIT-VI (12 PERIODS)**

methods of chemical analysis of leather - conditioning, determination of moisture content, total ash content, oil/fats (grease) content, total water soluble matter of c.t & v.t tanned leater, determination of chromium (as cr2o3) chrome content in c.t. leather &b.c.s, aluminum as alumina (al2o3) in alum tanned leather, detection of presence of formaldehyde, degree of tannage, determination of hide substance. FUNCTIONS OF ISO - NEED, BENEFITS OF ISO-9000 QUALITY SYSTEMS

**LIST OF PRACTICALS**

- **MEASUREMENT OF PHYSICAL PROPERTIES OF LEATHER LIKE**:

different strengths of leather - tensile strength & percentage elongation, stitch tearing strength, tearing strength, tongue tearing strength, buckle tear strength, strength of grain bursting strength by the lastometer& by the tensometer, flexing endurance test, water vapour permeability & air permeability test, dynamic water proffness test, shrinkage tempertaure, scuff resistance, colourrubfastness/ dry & wet rubfastness. important test for sole leather - methods for determination of apperent density & real density, abrasion resistance, absorption of water by kubalka method for sole & light leather, dynamic water proofness test, resistance to cracking of grain & grain crack index, grain pipiness, perspiration resistance of leather, compersibility of leather & resiliency of leather.

- **MEASUREMENT OF CHEMICAL PROPERTIES OF LEATHER LIKE:**

analysis of water, analysis of pretanning materials & chrome tanning materials, methods of chemical analysis of leather - conditioning, determination of moisture content, total ash content, oil/fats (grease) content, total water soluble matter of c.t & v.t tanned leater, determination of chromium (as cr2o3) chrome content in c.t. leather &b.c.s, aluminum as alumina (al2o3) in alum tanned leather, detection of presence of formaldehyde, degree of tannage, determination of nitrogen hide substance.

## INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

## MEANS OF ASSESSMENT

- Class Test
- Home Assignment
- Attendance
- Sessional Test

## RECOMMENDED BOOKS


1. PHYSICAL TESTING OF LEATHER - S.S.DATTA
2. ISI STANDARD BOOK ON LEATHER TESTING
3. METHODS OF PHYSICAL TESTING OF LEATHERS, IS : 5914 – 1970 BIS, NEW DELHI.
4. S.BANGAMSWAMY, TECHNOLOGICAL CONTROLS IN LEATHER MANUFACTURE, CLRI PUBLICATION
5. METHODS OF CHEMICAL TESTING OF LEATHERS, BUREAU OF INDIAN STANDARDS.
6. P.K.SARKAR, ANALYTICAL CHEMISTRY OF LEATHER MANUFACTURE, ISLTC PUBLICATION, CALCUTTA.
7. CHEMISTRY AND TECHNOLOGY OF LEATHER, O'FLAHERTY VOL. IV.
8. T.S.K.MAHADEVAN- HAND BOOK OF REFERENCE ON CHEMICAL ANALYSIS AND PHYSICAL TESTING OF LEATHERS- SANKARAN& CO, MADRAS
9. OFFICAL METHODS OF ANALYSIS, SLTC , U.K 1965
10. DIFFERENT STANDARDS ISSUED BY BIS FROM TO TIME.


## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 15 | 18 |
| 2 | 15 | 18 |
| 3 | 15 | 18 |
| 4 | 15 | 18 |
| 5 | 12 | 14 |
| 6 | 12 | 14 |
| **Total** | **84** | **100** |

## 5.4 RENEWABLE ENERGY SOURCES

**LTP**
**4 - -**

**RATIONALE**

Energy is an important input in all sectors of country's economy. Standard of living of a country can be directly judged by per capita consumption of energy. In light of energy crises and environmental concerns, renewable energy is the only solution to save our planet. Hence this subject.

**LEARNING OUTCOMES**

After completion of this course, the students will be able to:

- Understand the importance and applications of various renewable sources of energy
- Understand the types of biogas plants and electricity generation from biomass
- Identify usage of different types of wind turbines
- Understand the working of various types of collectors and applications of solar energy
- Understand different geothermal power plants
- Understand the usage of tidal and wave energy
- Understand the importance of hydrogen energy

**DETAILED CONTENTS**

1. Renewable and Non-Renewable Sources of Energy (06 Periods)

1.1. Introduction
1.2. Need of renewable sources of energy
1.3. Renewable sources of energy such as biomass, wind, solar, geothermal, tidal and wave, hydrogen energy.

2. Biomass Energy (08 Periods)

2.1. Introduction to biomass energy
2.2. Resources of biomass energy
2.3. Types of biogas plants-fixed dome and floating type
2.4. Electricity generation from biomass
2.5. Other useful products from biomass

3. Wind Energy (06 Periods)

3.1. Introduction to wind energy
3.2. Site selection of wind mill
3.3. Types of Wind Turbines-Horizontal axis wind turbine (HWAT) and vertical axis wind turbine (VAWT), their construction, working, advantages and disadvantages

4. Solar Energy (20 Periods)

4.1. Introduction to solar energy, solar spectral and greenhouse effect
4.2. Classification of solar thermal collectors- flat type, focusing type and central tower receivers, their construction and working

4.3. Application of solar energy like solar cooker, solar water heater, solar crop dryers and solar pond
4.4. Solar photo voltaic- construction and working principle
4.5. Solar energy storage methods

5. Geothermal Energy (06 Periods)

5.1. Introduction and its significance
5.2. Geothermal Power Plants-dry stream, flash steam and binary cycle

6. Tidal and Wave Energy (06 Periods)

6.1. Generation of Tidal and Wave Energy
6.2. Tidal Power Plant
6.3. Wave Power Plant

7. Hydrogen Energy (04 Periods)

7.1. Methods for hydrogen production
7.2. Storage of Hydrogen
7.3. Transportation of Hydrogen-through pipelines and containers

## INSTRUCTION STRATEGY

This subject is of great importance, therefore the teachers are expected to lay considerable stress on renewable sources, their importance, production, utilization and storage system. As far as possible, the teaching of the subject must be supplemented by showing the videos on working principle of various renewable energy equipment and also visits to nearby places where such equipmentis installed.

## MEANS OF ASSESSMENT

− Assignments and quiz/class tests
− Mid-term and end-term written tests

## LIST OF REFERENCE BOOKS

1. Non Conventional Energy Sources by G.D. Rai; Khanna Publishers, New Delhi.
2. Renewable and Conventional Energy by S. Rao; Khanna Publisher, New Delhi
3. Non-Conventional Sources of Energy by Umesh Chandra Sharma; Studium Press, Texas, USA
4. Solar Energy by S.P. Sukhatme; Tata McGrawHill Publishing Co. Ltd., New Delhi

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time allotted(Periods) | Marks Allotted % |
|---|---|---|
| 1 | 06 | 10 |
| 2 | 08 | 14 |
| 3 | 06 | 10 |
| 4 | 20 | 38 |
| 5 | 06 | 10 |
| 6 | 06 | 10 |
| 7 | 04 | 08 |
| **Total** | **56** | **100** |

## 5.5LEATHER GOODS AND GARMENT MANUFACTURING

**LTP**
**6-5**

**RATIONALE**

The objective of the course is to give focus on theknowledge on making leather goods and garments.

**LEARNING OUTCOMES**

After completion of this course, the students will be able

- To understand the various components associated with the manufacture of leather goods and garments.
- To understand various processing steps involved in the making of leather goods and garments.
- To be aware of machines involved in the making of leather goods and garments.
- To design leather goods and garments.

**DETAILED CONTENTS**

**UNIT-I** (17 PERIODS)

Characteristics and Classification of Leather Goods: Light & Heavy Leather Goods, sports goods ,Industrial and consumer leather goods Materials used for leather goods . Selection of leather for various leathers goods .Stretchlessness , waterproofness and Shape retention property for the leather goods

**UNIT-II** (17 PERIODS)

Development and Making of leather Goods : Sports goods such as football, Vollyball, hockey balls, cricket ball, Sports gloves such as wicket keeping, batting , football ,hockey gloves, introduction of harness & saddle. Golf equipment kits, consumer goods as key case, cigarette case, coin purse, etc,

**UNIT-III** (16 PERIODS)

Tools, fitting and machines used in leather goods such as buttons, rivets, D-ring, buckles locks, metal fittings, hinges, handles, zips and fasteners, Adhesive used in leather goods, polishes, lacquers ,emulsions and antifungal chemicals used in leather goods industry. Industrial sewing machine, cloth cutting machine, button hole and button stitching machines, Ironing press, Tools used in garment manufacture such as gimping scissors, Wooden and iron hammers, measuring tapes, dummies for checking fittings

**UNIT-IV** (17 PERIODS)

Characteristics and Classification of leather garments on the basis of animals , tanning , finishing and uses . cow , buff, calf , kid , sheep goat, chrome , vegetable, full grain , corrected grain suede, nubuck , printed , fur , embossed , pigmented etc leather . Materials used for garment manufacturing . Principles of tailoring such as size measurement and fittings. Uses non leather materials as a substitute or in combination with leather for garment manufacturing .

**UNIT-V** (17 PERIODS)

Designing and manufacturing of garments . Preparation of patterns, Principles of cutting of components ,arrangements of patterns to minimize wastage of leather, colour matching, Type of stitching and attachments used, Sequence of operations for assembly of components for

garments, Ironing and finishing, Inprocess checking and final checking of measurements and overall quality, Freehand sketching, drafting and preparation of patterns

## LIST OF PRACTICAL

1- Manufacturing of key case, mobile phone cover, ladies purse.

2- Making of football volleyball, sports gloves and industrial gloves.

3- Free hand sketching of jackets, Safari, ladies coat, skirts.

4- Taking measurements for size and fittings.

5- Designing of gloves, tie and cap/hat.

6- Preparation of 3 items of garment and one item of each gloves ties and cap/hat

## INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

## MEANS OF ASSESSMENT

- Class Test
- Home Assignment
- Attendance
- Sessional Test

## RECOMMENDED BOOKS


1. SARKAR K.T THEORY & PRACTICEOF LEATHER MANUFACTURE
2. DUTTA S.S AN INTRODUCTION OF THE PRINCIPLES OF LEATHER MANUFACTURE.
3. COMPRENSIVE FOOTWEAR TECHNOLOGY MR. SOMNATH GANGULY


## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 17 | 20 |
| 2 | 17 | 20 |
| 3 | 17 | 20 |
| 4 | 17 | 20 |
| 5 | 16 | 20 |
| **Total** | **84** | **100** |

## 5.6 Universal Human Values

**L-T-P**

**2-0-1**

### Course Objectives

This introductory course input is intended

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually
   enriching interaction with Nature

Thus, this course is intended to provide a much needed orientational input in value education to the young enquiring minds.

### Course Methodology

1. The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. It is free from any dogma or value prescriptions.
3. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.
4. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.
5. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

### The syllabus for the lectures is given below:

- After every two lectures of one hour each, there is one hour practice session.
- The assessment for this subject is as follows:
- Sessions Marks (Internal): 20
- Practical Marks (External): 30
- Total Marks: 50

### UNIT 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels

**UNIT 2: Understanding Harmony in the Human Being - Harmony in Myself!**

1. Understanding human being as a co-existence of the sentient 'I' and the material the Body'
2. Understanding the needs of Self ('I') and 'Body' - *Sukh* and *Suvidha*
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
4. Understanding the characteristics and activities of 'I' and harmony in 'I'
5. Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail
6. Programs to ensure *Sanyam* and *Swasthya*

-Practice Exercises and Case Studies will be taken up in Practice Sessions.

**UNIT 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship**

1. *Understanding Harmony in the family – the basic unit of human interaction*
2. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*;
   *a.* Trust (*Vishwas)* and Respect (*Samman)* as the foundational values of relationship
3. Understanding the meaning of *Vishwas*; Difference between intention and competence
4. Understanding the meaning of *Samman,* Difference between respect and differentiation; the other salient values in relationship
5. Understanding the harmony in the society (society being an extension of family): *Samadhan, Samridhi,Abhay, Sah-astitva*as comprehensive Human Goals
6. Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj),* Universal Order (*SarvabhaumVyawastha )*- from family to world family!

-Practice Exercises and Case Studies will be taken up in Practice Sessions.

**UNIT 4: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence**

1. Understanding the harmony in the Nature
2. Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature
3. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space

4. Holistic perception of harmony at all levels of existence
   -Practice Exercises and Case Studies will be taken up in Practice Sessions.

**UNIT 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics**

1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
4. Competence in professional ethics:
   a) Ability to utilize the professional competence for augmenting universal human order
   b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
   c) Ability to identify and develop appropriate technologies and management patterns for above production systems.
5. Case studies of typical holistic technologies, management models and production systems
6. Strategy for transition from the present state to Universal Human Order:

a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
b) At the level of society: as mutually enriching institutions and organizations

7. To inculcate Human Values among Students:The Role of self ,Parents and Teachers -Practice Exercises and Case Studies will be taken up in Practice Sessions.

**Practical Session also Includes Different Yogic Exercises and Meditation Session**

**INSTRUCTONAL STRATEGY**

The content of this course is to be taught on conceptual basis with plenty of real world examples.

**MEANS OF ASSESSMENT**

−Assignments and quiz/class tests,
−Mid-term and end-term written tests
−Practical assessment

**Reference Material**

The primary resource material for teaching this course consists of

a. The text book (Latest Edition)

R.R Gaur, R Asthana, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi.

b. The teacher's manual (Latest Edition)

R.RGaur, R Asthana, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi.

In addition, the following reference books may be found useful for supplementary reading in connection with different parts of the course:

1. B L Bajpai, 2004, *Indian Ethos and Modern Management*, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Purblishers.
3. Sussan George, 1976, *How the Other Half Dies*, Penguin Press. Reprinted 1986, 1991
4. Ivan Illich, 1974, *Energy & Equity*, The Trinity Press, Worcester, and HarperCollins,

USA

5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.

6. Subhas Palekar, 2000, *How to practice Natural Farming*,Pracheen(Vaidik) KrishiTantraShodh, Amravati.
7. A Nagraj, 1998, *JeevanVidyaekParichay*,Divya Path Sansthan, Amarkantak.
8. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if peoplemattered*, Blond & Briggs, Britain.
9. A.N. Tripathy, 2003, *Human Values*, New Age International Publishers.

**Relevant websites, movies and documentaries**

1. Value Education websites, http://uhv.ac.in,*http://www.aktu.ac.in*
2. Story of Stuff, *http://www.storyofstuff.com*
3. Al Gore, *An Inconvenient Truth*, Paramount Classics, USA
4. Charlie Chaplin, *Modern Times*, United Artists, USA
5. IIT Delhi, *Modern Technology–the Untold Story*
6. Case study Hevade Bazar Movie
7. RC Shekhar , Ethical Contradiction ,Trident New Delhi
8. *Gandhi A., Right Here Right Now, Cyclewala Production*

***SUGGESTED DISTRIBUTION OF MARKS***

| Unit | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 08 | 20 |
| 2 | 08 | 20 |
| 3 | 08 | 20 |
| 4 | 08 | 20 |
| 5 | 10 | 20 |
| **Total** | **42** | **100** |

## 6.1 ENERGY CONSERVATION

| L | T | P |
|---|---|---|
| 3 | - | 2 |

**RATIONALE**

The requirement of energy has increased manifolds in last two decades due to rapid urbanization and growth in industrial/service sector. It has become challenging task to meet ever increasing energy demands with limited conventional fuels and natural resources. Due to fast depletion of fossil fuels and a tremendous gap between supply and demand of energy, it is essential to adopt energy conservation techniques in almost every field like industries, commercial and residential sectors etc. Energy conservation has attained priority as it is regarded as additional energy resource. Energy saved is energy produced. This course covers the concepts of energy management and its conservation. It gives the insight to energy conservation opportunities in general industry and details out energy audit methodology and energy audit instruments.

**LEARNING OUTCOMES**

After undergoing this subject, the students will be able to:

- define principles and objectives of energy management and energy audit.
- understand Energy Conservation Act 2001 and its features.
- understand various forms & elements of energy.
- identify electrical and thermal utilities. Understand their basic principle of operation and assess performance of various equipments.
- identify areas of energy conservation and adopt conservation methods in various systems.
- evaluate the techno economic feasibility of the energy conservation technique adopted.

**DETAILED CONTENTS**

1. Basics of Energy

   1.1 Classification of energy- primary and secondary energy, commercial and non-commercial energy, non-renewable and renewable energy with special reference to solar energy, Capacity factor of solar and wind power generators.

   1.2 Global fuel reserve

   1.3 Energy scenario in India and state of U.P. Sector-wise energy consumption (domestic, industrial, agricultural and other sectors)

   1.4 Impact of energy usage on climate

2. Energy Conservation and EC Act 2001

   2.1 Introduction to energy management, energy conservation, energy efficiency and its need

   2.2 Salient features of Energy Conservation Act 2001 & The Energy Conservation (Amendment) Act, 2010 and its importance. Prominent organizations at centre and state level responsible for its implementation.

2.3 Standards and Labeling: Concept of star rating and its importance, Types of product available for star rating

3. Electrical Supply System and Motors

3.1 Types of electrical supply system

3.2 Single line diagram

3.3 Losses in electrical power distribution system

3.4 Understanding Electricity Bill: Transformers Tariff structure, Components of power (kW, kVA and kVAR) and power factor, improvement of power factor, Concept of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC)

3.5 Transformers: Introduction, Losses in transformer, transformer Loading, Tipsfor energy savings in transformers

3.6 Electric Motors

Types of motors, Losses in induction motors Features and characteristics of energy efficient motors, Estimation of motor loading, Variation in efficiency and power factor with loading, Tips for energy savings in motors

4. Energy Efficiency in Electrical Utilities

4.1 Pumps: Introduction to pump and its applications, Efficient pumping system operation, Energy efficiency in agriculture pumps, Tips for energy saving in pumps

4.2 Compressed Air System: Types of air compressor and its applications, Leakage test, Energy saving opportunities in compressors.

4.3 Energy Conservation in HVAC and Refrigeration System: Introduction, Concept of Energy Efficiency Ratio (EER), Energy saving opportunities in Heating, Ventilation and Air Conditioning (HVAC) and Refrigeration Systems.

5. Lighting and DG Systems

5.1 Lighting Systems: Basic definitions- Lux, lumen and efficacy, Types of different lamps and their features, Energy efficient practices in lighting

5.2 DG Systems: Introduction, Energy efficiency opportunities in DG systems, Loading estimation

6. Energy Efficiency in Thermal Utilities

6.1 Thermal Basics: Thermal energy, Energy content in fuels, Energy Units and its conversions in terms of Metric Tonne of Oil Equivalent (MTOE)

6.2 Energy Conservation in boilers and furnaces : Introduction and types of boilers, Energy performance assessment of boilers, Concept of stoichiometric air and excess air for combustion, Energy conservation in boilers and furnaces, Do’s and Don’ts for efficient use of boilers and furnaces

6.3 Cooling Towers: Basic concept of cooling towers, Tips for energy savings in cooling towers

6.4 Efficient Steam Utilization

7. Energy Conservation Building Code (ECBC)

7.1 ECBC and its salient features

7.2 Tips for energy savings in buildings: New Buildings, Existing Buildings

8. Waste Heat Recovery and Co-Generation

8.1 Concept, classification and benefits of waste heat recovery

8.2 Concept and types of co-generation system

9. General Energy Saving Tips

Energy saving tips in:

9.1 Lighting

9.2 Room Air Conditioner

9.3 Refrigerator

9.4 Water Heater

9.5 Computer

9.6 Fan, Heater, Blower and Washing Machine

9.7 Colour Television

9.8 Water Pump

9.9 Cooking

9.10 Transport

10. Energy Audit

10.1 Types and methodology

10.2 Energy audit instruments

10.3 Energy auditing reporting format

**PRACTICAL EXERCISES**

1. To conduct load survey and power consumption calculations of small building.
2. To check efficacy of different lamps by measuring power consumption and lumens using lux meter.
3. To measure energy efficiency ratio (EER) of an air conditioner.
4. To measure effect of valve throttling and variable frequency drive (VFD ) on energy consumption by centrifugal pump.
5. To measure and calculate energy saving by arresting air leakages in compressor.
6. To measure the effect of blower speed on energy consumed by it.

## STUDENT ACTIVITIES ON ENERGY CONSERVATION/ENERGY EFFICIENCY

− Presentations of Case Studies −
Debate competitions

− Poster competitions −
Industrial visits

− Visual Aids

## INSTRUCTIONAL STRATEGY

Teachers are expected to lay considerable stress on understanding the basic concepts in energy conservation, principles and their applications. For this purpose, teachers are expected to give simple problems in the class room so as to develop necessary knowledge for comprehending the basic concepts and principles. As far as possible, the teaching of the subject must be supplemented by demonstrations and practical work in the laboratory. Visits to industries must be carried out. Expert from industry must be invited to deliver talks on energy conservation to students and faculty.

## RECOMMENDED BOOKS


1. Guide book on General Aspects of Energy Management and Energy Audit by Bureau of Energy Efficiency, Government of India. Edition 2015
2. Guide book on Energy Efficiency in Electrical Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
3. Guide book on Energy Efficiency in Thermal Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
4. Handbook on Energy Audit & Environmental Management by Y P Abbi & Shashank Jain published by TERI. Latest Edition


**Important Links:**

(i) Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India. www.beeindia.gov.in.

(ii) Ministry of New and Renewable Energy (MNRE), Government of India. www.mnre.gov.in.

(iii) Uttar Pradesh New and Renewable Energy Agency (UPNEDA), Government of Uttar Pradesh. www.upneda.org.in.

(iv) **Central Pollution Control Board (CPCB),** Ministry of Environment, Forest andClimate Change, Government of India. www.cpcb.nic.in.

(v) Energy Efficiency Sevices Limited (EESL). www.eeslindia.org.

(vi) Electrical India, Magazine on power and electrical products industry. www.electricalindia.in.

## 6.2 INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

| L | T | P |
|---|---|---|
| 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. It may be further added that an entrepreneurial mind set with managerial skills helps the student in the job market. This subject focuses on imparting the necessary competencies and skills of enterprise set up and its management.

**LEARNING OUTCOMES**

After undergoing this course, the students will be able to :

- Know about various schemes of assistance by entrepreneurial support agencies
- Conduct market survey
- Prepare project report
- Explain the principles of management including its functions in an organisation.
- Have insight into different types of organizations and their structures.
- Inculcate leadership qualities to motivate self and others.
- Manage human resources at the shop-floor
- Maintain and be a part of healthy work culture in an organisation.
- Use marketing skills for the benefit of the organization.
- Maintain books of accounts and take financial decisions.
- Undertake store management.
- Use modern concepts like TQM, JIT and CRM.

**DETAILED CONTENTS**

**SECTION – A**

**ENTREPRENEURSHIP**

1. Introduction (04 Periods)

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

2. Market Survey and Opportunity Identification/Ideation (04 Periods)

2.1 Scanning of the business environment

2.2 Salient features of National and Haryana State industrial policies and resultant business opportunities

2.3 Types and conduct of market survey

2.4 Assessment of demand and supply in potential areas of growth

2.5 Identifying business opportunity

2.6 Considerations in product selection

2.7 Converting an idea into a business opportunity

3. Project report Preparation (06 Periods)

3.1 Preliminary project report

3.2 Detailed project report including technical, economic and market feasibility

3.3 Common errors in project report preparations

3.4 Exercises on preparation of project report

3.5 Sample project report

**SECTION –B**

**MANAGEMENT**

4. Introduction to Management (06 Periods)

4.2 Definitions and importance of management

4.3 Functions of management: Importance and process of planning, organising, staffing, directing and controlling

4.4 Principles of management (Henri Fayol, F.W. Taylor)

4.5 Concept and structure of an organisation

4.6 Types of industrial organisations and their advantages

4.7 Line organisation, staff organisation

4.8 Line and staff organisation

4.9 Functional Organisation

5. Leadership and Motivation (08 Periods)

5.2 Leadership: Definition and Need, Qualities and functions of a leader, Manager Vs leader, Types of leadership, Case studies of great leaders

5.3 Motivation: Definition and characteristics, Importance of self motivation, Factors affecting motivation, Theories of motivation (Maslow, Herzberg, Douglas, McGregor)

6. Management Scope in Different Areas (14 Periods)

6.1 Human Resource Management: Introduction and objective, Introduction to Man power planning, recruitment and selection, Introduction to performance appraisal methods

6.2 Material and Store Management: Introduction functions, and objectives, ABC Analysis and EOQ

6.3 Marketing and sales: Introduction, importance, and its functions, Physical distribution, Introduction to promotion mix, Sales promotion

6.4 Financial Management: Introductions, importance and its functions, knowledge of income tax, sales tax, excise duty, custom duty, VAT, GST

7. Work Culture (08 Periods)

7.1 Introduction and importance of Healthy Work Culture in organization

7.2 Components of Culture

7.3 Importance of attitude, values and behavior

7.4 Behavioural Science – Individual and group behavior.

7.5 Professional ethics – Concept and need of Professional Ethics and human values.

8. Basic of Accounting and Finance (10 Periods)

8.1 Basic of Accounting: Meaning and definition of accounting, Double entry system of book keeping, Trading account, PLA account and balance sheet of a company

8.2 Objectives of Financial Management: Profit Maximization v/s Wealth Maximization

9. Miscellaneous Topics (10 Periods)

9.1 Total Quality Management (TQM): Statistical process control, Total employees Involvement, Just in time (JIT)

9.2 Intellectual Property Right (IPR) : Introduction, definition and its importance, Infringement related to patents, copy right, trade mark

## INSTRUCTIONAL STRATEGY

Some of the topics may be taught using question/answer, assignment, seminar or case study 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.

## MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/Prototype making.

**RECOMMENDED BOOKS**

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development and Management by J.S.Narang; DhanpatRai& Sons, Delhi.
3. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
4. Handbook of Small Scale Industry by PM Bhandari
5. Entrepreneurship Development and Management by MK Garg
6. E-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

**Websites for Reference:**

http://swayam.gov.in

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 04 | 06 |
| 2 | 04 | 06 |
| 3 | 06 | 08 |
| 4 | 06 | 08 |
| 5 | 08 | 12 |
| 6 | 14 | 20 |
| 7 | 08 | 12 |
| 8 | 10 | 14 |
| 9 | 10 | 14 |
| **Total** | **70** | **100** |

## 6.3 LEATHER AND PRODUCT MERCHANDISING

| L | T | P |
|---|---|---|
| 6 | - | - |

### RATIONALE

The objective of the course is to impart knowledge on leather and leather products merchandising that relates to the domestic and global leather and leather product merchandising.

### LEARNING OUTCOME

After undergoing the subject, the students will be able to

- understand the basic principles of marketing management
- understand the purchasing principles and management
- fundamentals of procurement and merchandising
- basic knowledge of retail sector
- Knowledge of global marketing and global sourcing.

### DETAILED CONTENTS

### UNIT-I PRINCIPLES OF MARKETING MANAGEMENT (17 PERIODS)

introduction, definition, importance and scope of marketing, philosophies of marketing management, elements of marketing- needs, wants, demands, customer, markets and marketers, marketing vs selling. Consumer markets and industrial markets. Concept of organizations, qualities of marketing manager. Organizations, qualities of marketing manager. Marketingenvironment, factors affecting marketing environment, marketing information system and marketing research, strategic marketing planning.

### UNIT-II PRINCIPLES &PRACTICE OF MERCHANDISING (17 PERIODS)

Merchandising concepts, technology, systems, planning, merchandise pricing and budgeting, sample handling- managing merchandise assortments- developing and presenting product lines- introduction to shipping operation.

### UNIT-III RETAIL SECTOR OF LEATHER (17 PERIODS)

overview of retailing, changing retail environment-typology of retail buying- understanding the consumer - competitive strategies in the retail industry - retail location strategy, store layout & design- product planning and selection , inventory management - retail pricing , retail communication - customer service.

### UNIT-IV GLOBAL SOURCING OF LEATHER (17 PERIODS)

globalization and its influences- the role and importance of global sourcing - global sourcing process and strategy - investigation and tendering- supplier , selection and development- operationalozation of global sourcing strategy- performance measurement - the benefits and

challenges of global sourcing- coping with customer clearance uncertainties- sourcing on the internet - supplier relationship development- merchandising language for sourcing.

**UNIT-V EXPORT STRATEGIES & GOVERNMENT PROMOTION(16 PERIODS)**

Export- meaning & growth, preliminaries for exporting, compulsoryformalities financing, insurance, documents, leather industry, government promotion, policies fgrowth of leather industry

**INSTRUCTIONAL STRATEGY**

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

**MEANS OF ASSESSMENT**

- Class Test
- Home Assignment
- Attendance
- Sessional Test

**RECOMMENDED BOOKS**


1- The Indian Leather Industry-Secretariat For Industrial Assistance, Govt. Of India
2- Kothari's Desk Book Series- The Leather Industry
3- Economic Of Leather Industry-B.R.Rau, Calcutta University Press(1920)
4- Apparel Product Design & Merchandising Strategies By Cynthia L. Regan Publisher Prentice Hall


**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 17 | 20 |
| 2 | 17 | 20 |
| 3 | 17 | 20 |
| 4 | 17 | 20 |
| 5 | 16 | 20 |
| **Total** | **84** | **100** |

## 6.4 TANNERY WASTE MANAGEMENT

| L | T | P |
|---|---|---|
| 6 | - | - |

### RATIONALE

The objective of the course is to give focus on the tannery wastes, how to minimization of this and application of techniques to clean production in the leather processing.

### LEARNING OUTCOME

After undergoing the subject, the students will be able

- To understand the cleaner process technology.
- To understand the treatment of effluent.
- To understand the recovery & reuse of chromium.
- To understand the utilization of solids of tannery.

### DETAILED CONTENTS

.

**UNIT-I (14 PERIODS)**

Sources, composition, types &characteristics of tannery wastes viz pretanning, tanning, post tanning, finishing operations. characteristics of waste water effluent) viz ph, ts, tss, tds, do, bod, cod, protein content, chlorides, sulphides, sulphades, chromium etc.

**UNIT-II (14 PERIODS)**

concept of environment , how to control environment pollution, issues of environment , sources,effects,control of water,soil,air,noise pollution , tannery pollutants, industrial waste water , physical, chemical, biological characteristics of waste water/effluent , effects of industrial waste water/effluent-effects of human, aquatic ecosystem, plants, animals, materials. What is BIS, CPCB, SPCB & object &its function & power of BIS, CPCB, SPCB. what is CETP/ ETP, object of CETP/ ETP, reasons of failure of CETP/ ETP

**UNIT-III (14 PERIODS)**

Level/process of tannery waste water/effluent treatment - principles of physical treatment - screening, mixing, equalization, settling/sedimentation, filteration. principles of chemical treatment- coagulation/flocculation, precipitation, flotation. biological/secondary treatment & various process- aerobic process- activated sludge process (asp), trickling filter ,oxidation ponds, aerated lagoon & anaerobic process - sludge digester, septik tank. Tertiary (advanced) treatment- coagulation, disinfection, ion exchange resin. process flow diagram of effluent treatment plant (ETP).

**UNIT-IV (14 PERIODS)**

Recovery & reuse of chromium from chrome containing waste water in tannery. Process flow diagram of chrome recovery & reuse system. what is sludge, generation of sludge, characteristics of sludge from CETP/ ETP, quantity of sludge, types of sludge, sludge treatment & disposal- (a) sludge thickener/thickening, (b) mechanical sludge dewatering handling, (c)

filter press, (d) sludge drying beds, (e) thermal hydrolysis process (thp), anaerobic digestion (digestion of sludge).

**UNIT-V (14 PERIODS)**

What is solid waste in tannery, sources of solid waste generation , quantity of solid waste generation, types of solid waste , reuse & disposal of solid waste , utilization of solid waste by manufacturing/making the product of glue/ gelatin, leather board, dog chew leather with application & properties.

**UNIT-VI (14 PERIODS)**

Waste minimization, importance of 3r's (reduction, reuse, recycle) for waste minimization, what is clean technology/cleaner production & its importance and barriers. short notes on clean technological option in leather processing & its advantages- salt free curing option, mechanical desalting soaking operation, supplied minimization unhairing system (hair save unhairing - liming), ammonia free deliming operation , recovery of salt from soaking & pickle liquor, water less chrome tanning system, water management (water conservation), using enzymes & ecofriendly chemicals, green fleshing, lime splitting.

## INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

## MEANS OF ASSESSMENT

- Class Test
- Home Assignment
- Attendance
- Sessional Test

## RECOMMENDED BOOKS

1- An introduction to the principal of leather manufacture duttas.s
2-sharp housej.h leather technician's handbooks.
3-thorestensen t.c. practical leather technology.
4-sarkar k.t. theory & practice of leather manufacture.
5-WASTE WATER ENGINEERING – TREATMENT, DISPOSAL, REUSE BY MCAFFE AND EDDY – INC. TATA, MC. GRAW HILL PUBLISHING CO. LTD., NEW DELHI.

## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 14 | 20 |
| 2 | 14 | 20 |
| 3 | 14 | 20 |
| 4 | 14 | 20 |
| 5 | 14 | 20 |
| 6 | 14 | 20 |
| **Total** | **84** | **100** |

## 6.5 PROCESS OF LIGHT LEATHERS

| L | T | P |
|---|---|---|
| 6 | - | 10 |

### RATIONALE

The objective of the course is to give focus on the manufacture of light leathers using raw materials & wet blue without any defects.

### LEARNING OUTCOME

After undergoing the subject, the students will be able

- TO PROCESS DIFFERENT TYPES OF LEATHERS USED FOR MAKING GARMENTS, LEATHER GOODS AND FOOTWEAR ETC FROM DIFFERENT TYPES OF RAW MATERIALS, LIKE GOATSKIN, SHEEPSKIN, BUFFALO AND COW HIDES.
- TO PROCESS THE LEATHERS FORM DIFFERENT STAGES OF RAW MATERIALS, WET SALTED, WET BLUE, E.I. TANNED LEATHERS AND CRUST.

### DETAILED CONTENTS

**UNIT-I (17 PERIODS)**
Selection of raw materials for light leathers, selection of wet blue, classification of light leathers.

**UINIT-II (17 PERIODS)**
Manufacturing process of all leather along with their properties & application like: upper leather, buff printed leather, buff c.g. leather, burnish leather, patend leather.

**UNIT-III (17 PERIODS)**
Manufacturing process of all leather along with their properties & application like: buff nubuck leather, buff suede leather, cow smooth leather, cow brush off leather, chamois leather.

**UNIT-IV (17 PERIODS)**
Manufacturing process of all leather along with their properties & application like: cow softy leather, buff lining leather, buff upholstery leather, shrunken grain leather, glove leather.

**UNIT-V (16 PERIODS)**
Manufacturing process of all leather along with their properties & application like: oil pulp leather, crazy horse leather, garment leather, goat glaze kid leather, cow hair on leather. Quality control aspects with special reference to light leather manufacture.

### LIST OF PRACTICALS

Manufacturing process of some important light leathers like:

1. MANUFACTURE WET BLUE LEATHER FROM GOAT, SHEEPSKINS AND COW AND BUFFALO HIDES.
2. PROCESS F/CR GOAT UPPER.

3. MANUFACTURE FOR SHEEP UPPER LEATHER..
4. MANUFACTURE FOR GARMENT LEATHER FROM SHEEPSKINS.
5. MANUFACTURE FOR GARMENT LEATHER FROM GOATSKINS.
6. MANUFACTURE FOR LINING LEATHER.
7. MANUFACTURE FOR COW UPPER LEATHER.
8. MANUFACTURE FOR NAPPA LEATHER.
9. MANUFACTURE FOR BUFFALO UPPER LEATHER. ETC

## INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

## MEANS OF ASSESSMENT

− Class Test

− Home Assignment −
Attendance

− Sessional Test

## RECOMMENDED BOOKS

1-C. KOTESWARARAO AND M.S.OLIVANNAN - LECTURE NOTES ON DYEING AND FINISHING OF LEATHERS. C.L.R.I., CHENNAI 1983.
2-THE MANUFACTURE OF UPPER LEATHERS - D.H. TUCK, TROPICAL PRODUCTS INSTITUTE, LONDON 1981.
3-GLOVING, CLOTHING AND SPECIAL LEATHERS - P.S. BRIGGT, TROPICAL PRODUCTS INSTITUTE, LONDON 1981.
4-C.L.R.I. PUBLICATION, ADAYAR, MADRAS – 20.

## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 17 | 20 |
| 2 | 17 | 20 |
| 3 | 17 | 20 |
| 4 | 17 | 20 |
| 5 | 16 | 20 |
| **Total** | **84** | **100** |

## 6.6 PROJECT WORK

| L | T | P |
|---|---|---|
| - | - | 8 |

**RATIONALE**

Project Work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. In addition, the project work is intended to place students for project oriented practical training in actual work situation for the stipulated period.

**LEARNING OUTCOMES**

After undergoing the project work, the students will be able to:

- Apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project.
- Develop understanding regarding the size and scale of operations and nature of field-work in which students are going to play their role after completing the courses of study
- Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.
- Develop firsthand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems related to the world of work.
- Develop abilities like interpersonal skills, communication skills, positive attitudes and values etc.
- Assemble/fabricate and test an electronics gadget.

**General Guidelines**

The individual students have different 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. The activity of problem identification should begin well in advance (say at the end of second year). Students should be allotted a problem of interest to him/her as a major project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. 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 to a group. The project work identified in collaboration with industry should be preferred.

This practical training cum project work **should not be considered** as merely conventional industrial training in which students are sent at work places with either minimal or no supervision. This experience is required to be planned in advance and supervised on regular basis by the polytechnic faculty. For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience to students. It is necessary that each organization is visited well in advance and activities to be performed by students are well defined. The chosen activities should be such that it matches with the curricular interest to students and of professional value to industrial/ field organizations. Each teacher is expected to supervise and guide 5-6 students.

The project assignments may consist of:

Development of prototypes

Study of different types of vessels, heads and joints (can be done through factory visit)

Study of pumps and valves used in process industries

Fabrication of components/equipments

Fault diagnosis and rectification experiences

Bringing improvements in the existing system/equipment

Audits of industry- energy audit, water audit, material audit etc.

Case Studies

**NOTE:**

The list is only the guideline for selecting a project; however a student is at liberty to select any other related project of his choice independently under guidance of his teacher.

A suggestive criterion for assessing student performance by the external (person 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** |

**General Guidelines**

The overall grading of the practical training shall be made as per following table.

1. In order to qualify for the diploma, students must get "Overall Good grade" failing which the students may be given one more chance to improve and re-evaluate 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.

| | 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 |

**Important Notes**

2. These 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.

3. The criteria for evaluation of the students have been worked out for 200 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.

4. 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.

5. 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 other 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.

10. RESOURCE REQUIREMENT

## 10.1 PHYSICAL RESOURCES

### (A) Space requirement

Norms and standards laid down by All India Council for Technical Education (AICTE) are to be followed to work out space requirement in respect of class rooms, tutorial rooms, drawing halls, laboratories, space required for faculty, student amenities and residential area for staff and students.

### (B) Equipment requirement:

Following Laboratories are required for diploma programme in Chemical Engineering:

−Communication Laboratory
−Applied Physics Laboratory
−Applied Chemistry Laboratory
− Engineering Drawing
− Electrical Engineering Laboratory
−Basics of IT/Computer Applications \Laboratory
− Carpentry Shop
− Painting and Polishing Shop
−Basics of Electrical and Electronic Engg.
−Welding Shop
− Fitting and Plumbing Shop
− Sheet Metal Shop
− Mason Shop
− Machine Shop
− Fluid Mechanics Laboratory Shop
−CAD Lab
−Microscopy & Microbiology Lab
− Environment Engineering Laboratory
− Energy Conservation Lab.
− Pollution Control and Industrial Safety
−Footwear Workshop
−Designing Shop
−Garments Shop
−Leather Goods Shop
−Footwear & Leather Goods Manufacture Shop
−Leather manufacture Shop

EQUIPMENT REQUIRED FOR LEATHER TECHNOLOGY (TANNING)

| Sr. No. | Description | Qty | Total Price (Rs) |
|---|---|---|---|
| **COMMUNICATION LABORATORY** | | | |
| 1. | Stools | 40 | 10,000 |
| 2. | Display Board/Screen | 2 | 6,000 |
| 3. | Sound recording and playing system | 1 | 6,000 |
| 4. | Audio cassettes | 60 | 2,000 |
| 5. | Overhead Projector | 1 | 5,000 |
| 6. | Transparencies slides | 100 | 500 |
| 7. | TV, VCR and camera for video recording | 1 each | 20,000 |
| 8. | English spoken course | 1 | 2,000 |
| 9. | A Quiz room equipped with two way audio system, back projection system and slide projector | 1 | 30,000 |
| 10. | Miscellaneous | LS | 1,500 |
| **APPLIED PHYSICS LABORATORY** | | | |
| 1. | Vernier calipers<br>Working length 160 mm, Internal and external dia with locking arrangement | 12 | 2,000 |
| 2. | Screw Gauges<br>Working length 15 mm, pitch 0.5 mm, least count .005 mm | 12 | 2,000 |
| 3. | Spherometers<br>Distance between legs 2.5 mm, pitch 0.5 mm, least count .005 mm. | 12 | 2,000 |
| 4. | Mirrors (convex, concave) | 5 Each | 1,500 |
| 5. | Pendulum Setup | 02 | 4,000 |
| 6. | Gravesand's Apparatus | 02 | 3,000 |

| | | | |
|---|---|---|---|
| 7. | Inclined Plane Setup | 02 | 2,000 |
| 8. | Flywheel Setup | 02 | 4,000 |
| 9. | Prism | 05 | 1,500 |
| 10. | Spectrometer | 02 | 25,000 |
| 11. | DC Ammeters<br>Moving coil weston-type ammeter with ebonite stand | 10 | 3,500 |
| 12. | DC Miliammeters | 2 | 1,000 |
| 13. | DC Microammeters | 2 | 700 |
| 14. | DC voltmeters | 10 | 700 |
| 15. | DC Millivoltmeters | 10 | 2,000 |
| 16. | Sensitivity Galvanometer | 2 | 800 |
| 17 | Student Galvanometers | 10 | 4,000 |
| 18. | Demonstration type DC Ammeters<br>Range; 0 to 1 Amp. | 2 | 1,000 |
| 19. | D type DC Voltmeter<br>Range : 0 to 1 Volt | 2 | 1,000 |
| 20. | D type Galvanometers<br>Sensitivity : 20 microamperes per scale division, | 8 | 8,000 |
| 21. | Resistance boxes (dial type) assorted | 8 | 8,000 |
| 22. | Rheostats | 10 | 4.000 |
| 23. | Miscellaneous items (Spring, Pan, Glycerine, Optic fibre, Ferromagnetic material) | LS | 2,000 |
| 24. | Fortin's Barometer (Wall type) | 2 | 20,000 |
| 25. | Stoke's Apparatus | 2 | 10,000 |
| 26. | Gumther's Apparatus | 2 | 16,000 |
| 27. | Resonance Tube Apparatus with accessories and Tuning fork set | 2 | 14,000 |
| 28. | Sodium Lamp setup with Biprism | 2 | 10,000 |

| | | | |
|---|---|---|---|
| 29. | Ohmic resistance coil | 10 | 5,00 |
| 30. | Slide wire bridge | 2 | 8,000 |
| 31. | PN Junction diode Apparatus | 2 | 10,000 |
| 32. | Laser (as per requirement) | 1 | 1,00,000 |
| 33. | Numerical aperture setup | 1 | 25,000 |
| 34. | Miscellaneous | LS | 3,000 |
| **APPLIED CHEMISTRY LABORATORY** | | | |
| 1. | Digital Balance | 1 | 80,000 |
| 2. | Burette 50ml | 30 | 3,000 |
| 3. | Pipette 25ml | 60 | 4,000 |
| 4. | Beakers 100ml | 60 | 4,000 |
| 5. | Burette stand | 30 | 30,000 |
| 6. | Glazed tile | 30 | 1,000 |
| 7. | Conical flask 50ml (Titration flask) | 60 | 4,000 |
| 8. | Standard (Measuring) flask (to prepare standard solution) 250ml/100ml | 30 | 6,000 |
| 9. | Able's Flash Point apparatus | 2 | 10,000 |
| 10. | (1/10)°C thermometer | 06 | 6,000 |
| 11. | Candles | 20 | 100 |
| 12. | Crucible with lid | 06 | 2,000 |
| 13. | Muffle furnace | 1 | 18,000 |
| 14. | Decicators | 06 | 8,000 |
| 15. | Pair of tongue (small and big) | 24 (small)<br>2 (big) | 2,000 |
| 16. | Chemicals | | |
| | - EDTA-1 kg<br>- Eriochrome Black-T(solochrome black T)-200g<br>- Buffer solution ($NH_3$ - 2.5 ltr, $NH_4Cl$ – 1 kg) | | |

| | | | |
|---|---|---|---|
| | - Zinc sulphate- 500g<br>- $H_2SO_4$- 2.5 ltr<br>- Phenolphthalein indicator (as per requirement)<br>- Methyl orange indicator (as per requirement)<br>- Charcoal (as per requirement)<br>- Kerosene- 1 ltr | LS | 20,000 |
| 17. | Miscellaneous | LS | 2,000 |

| | | | |
|---|---|---|---|
| **ENGINEERING DRAWING** | | | |
| 1. | Drawing Boards (700 x 500mm) | 60 | 25,000 |
| 2. | Draughtsman Tables | 60 | 1,80,000 |
| 3. | Draughtsman Stools | 60 | 40,000 |
| 4. | Computer Aided Drawing (CAD) Software | 30 User | 5,00,000 |
| 5. | Model of different wooder joints | 1 | 1,000 |
| 6. | Model of different screw threads | 1 | 1,000 |
| 7. | Model of various locking devices | 1 | 1,000 |
| 8. | Model of various joints | 1 | 1,000 |
| 9. | Cut section Model of various couplings | 1 | 3,000 |
| 10. | Miscellaneous | LS | 5,000 |
| **ELECTRICAL AND ELECTRONICS ENGINEERING LABORTORY** | | | |
| 1. | Voltmeter | 5 | 7,500 |
| 2. | Ammeter | 5 | 10,000 |
| 3. | CRO | 1 | 15,000 |
| 4. | Wattmeter | 5 | 10,000 |
| 5. | Multimeter | 1 | 4,000 |
| 6. | Resistive load | 1 | 4,000 |
| 7. | Regulated supply | 1 | 8,000 |
| 8. | Signal generator | 1 | 5,000 |
| 9. | Rheostat | 2 | 2,500 |
| 10. | Lead acid battery | 1 | 4,000 |
| 11. | Cables, Coils, Lamp (as per requirements) | LS | 1,500 |
| 12. | Resistance, Inductor, Capacitor (as per requirements) | LS | 1,500 |
| 13. | Miscellaneous/Electronics Components | LS | 2,500 |

**BASICS OF IT LABORATORY/COMPUTER APPLICATIONS LABORATORY**

| | | | |
|---|---|---|---|
| 1. | Computer System with latest configuration | 30 | 8,00,000 |
| 2. | Printer (MFP) | 1 | 25,000 |
| 3. | Printer (Laser) | 1 | 35,000 |
| 4. | Plotter | 1 | 75,000 |
| 5. | Digitiser | 1 | 50,000 |
| 6. | Antivirus Software | LS | 10,000 |
| 7. | Internet Facility on Computers | LS | 2,00,000 |
| 8. | LCD Projector | 1 | 35,000 |
| 9. | UPS | 60 | 1,20,000 |
| 10. | Software (latest windows, latest MS Office) | 1 | 1,00,000 |
| 11. | Scanner | 1 | 10,000 |
| 12. | Software MATLAB | 1 | 2,00,000 |
| 13. | Miscellaneous | LS | 5,000 |
| ***CARPENTRY SHOP*** | | | |
| 1 | Work benches fitted with carpenter vices | 5 | 20,000 |
| 2. | Circular saw grinder | 1 | 6,000 |
| 3. | Wood cutting band saw-vertical | 1 | 10,000 |
| 4. | Bench grinder | 1 | 5,000 |
| 5. | Drilling machine | 1 | 8,000 |
| 6. | Wood turning lathe | 1 | 40,000 |
| 7. | Wood Planner | 1 | 20,000 |
| 8. | Tool accessories measuring and marking Instruments | 25 | 25,000 |
| 9. | Band saw blade brazing unit | 1 | 10,000 |
| 10. | Miscellaneous | LS | 1,500 |

| Sr. No. | Description | Qty | Total Price (Rs) |
|---|---|---|---|
| **PAINTING AND POLISHING SHOP** | | | |
| 1. | Spray gun with hose pipe | 1 | 1,000 |
| 2. | Paint brushes | 20 | 2,000 |
| 3. | Paint/Varnish | LS | 2,000 |
| 4. | Air Compressor with 2 hp motor | 1 set | 10,000 |
| 5. | Miscellaneous | LS | 2,000 |
| **ELECTRICAL SHOP** | | | |
| 1. | Tool kit (Plier, Screw driver, Knife, Steel rule, hammer, scriber, pincer steel tape etc.) | 20 | 20,000 |
| 2. | Fuses, Switches, Plugs, Sockets, Ceiling rose, Wires, cleats, Clamps, Test lamp, Tester.( as per requirement) | | 8,000 |
| 3. | Electric Iron | 1 | 1,500 |
| 4. | Electric kettle | 1 | 1,500 |
| 5. | Ceiling fan/table fan | 1 | 2,500 |
| 6. | Desert cooler | 1 | 5,000 |
| 7. | Lead acid battery | 2 | 8,000 |
| 8. | Battery Charger | 1 | 6,000 |
| 9. | Miscellaneous | | 3,000 |
| **WELDING SHOP** | | | |
| 1. | Electrical welding transformer set with accessories | 3 | 30,000 |
| 2. | Gas Cutting Unit | 1 | 3,000 |
| 3. | Work benches with vices | 3 | 5,000 |
| 4. | Welding generator set | 1 | 10,000 |
| 5. | Oxy acetylene welding set with accessories | 1 | 7,000 |
| 6. | Acetylene generating set | 1 | 6,000 |
| 7. | Electric welder tool kit | 10 | 10,000 |
| 8. | Projection welding machine | 1 | 15,000 |
| 9. | Brazing equipment with accessories | 1 | 10,000 |

| | | | |
|---|---|---|---|
| 10. | Soldering irons | 3 | 1,000 |
| 11. | Pedestal grinder | 1 | 10,000 |
| 12. | Metal spraying gun | 1 | 10,000 |
| 13. | Spot welder | 1 | 25,000 |
| 14. | TIG welding set | 1 | 1,00,000 |
| 15. | MIG welding set | 1 | 1,00,000 |
| 16. | Welding Partition Screen | 5 | 2,500 |
| 17. | Miscellaneous | LS | 3,000 |

**FITTING AND PLUMBING SHOP**

| | | | |
|---|---|---|---|
| 1. | Work benches with vices (4 vices on each bench) | 5 | 30,000 |
| 2. | Marking tables with scribers | 4 | 24,000 |
| 3. | Surface plates | 5 | 20,000 |
| 4. | Accessories like calipers, V blocks, height, gauges steel rules and scribers | 25 | 50,000 |
| 5. | Tool kits – taps, dies, drills | 25 | 40,000 |
| 6. | Tool kits – chiesels, hammers, files, hacksaw | 25 | 25,000 |
| 7. | Drilling machine | 2 | 12,000 |
| 8. | Pipe vice | 4 | 1,000 |
| 9. | Chain wrenches | 5 | 1,250 |
| 10. | Ring spanner set | 5 | 600 |
| 11. | Pipe die set 2” | 2 set | 1,000 |
| 12. | Pipe bending device | 1 | 5,000 |
| 13. | Various plumbing fittings | LS | 2,000 |
| 14. | Miscellaneous | LS | 1,500 |

**SHEET METAL SHOP**

| | | | |
|---|---|---|---|
| 1. | Hammers | 8 | 3,000 |

| | | | |
|---|---|---|---|
| 2. | Mallets (Hard & Soft) | 5 | 2,000 |
| 3. | Sheet and wire Ganges | LS | 8,00 |
| 4. | Shearing Machine | 1 | 20,000 |
| | | | |
| 5. | Bar folding Machine | 1 | 20,000 |
| 6. | Burring machine | 1 | 10,000 |
| 7. | Various sheet (black plain, galvanized iron, corrugated, Aluminium) | 1 Each | 1,000 |
| 8. | Hand Shears/Snippers | 4 | 2,000 |
| 9. | Nuts, Bolts, Rivets, Screw | LS | 5,00 |
| 10. | Miscellaneous | LS | 1,000 |
| **MASON SHOP** | | | |
| 1. | Mason Trowel | 10 | 1,000 |
| 2. | Concrete Finishing Trowel | 10 | 1,000 |
| 3. | Gauging Trowel | 10 | 1,000 |
| 4. | Margin Trowel | 10 | 1,000 |
| 5. | Pointing Trowel | 10 | 1,000 |
| 6. | Round Trowel | 10 | 1,000 |
| 7. | Mason/Brick Hammer | 10 | 3,000 |
| 8. | Comb hammer | 10 | 3,000 |
| 9. | Blocking chisel | 10 | 1,000 |
| 10. | Plumb bob | 10 | 500 |
| 11. | Spirit level | 10 | 1,000 |
| 12. | Straight Edge | 10 | 1,000 |
| 13. | Jointer | 10 | 1,000 |
| 14. | Masonry Pan | 10 | 1,500 |
| 15. | Steel Measuring Tape | 10 | 500 |
| 16. | Miscellaneous (Bricks, Blocks, Stones, Sand, Cement) | 10 | 3,000 |
| **MACHINE SHOP** | | | |
| 1. | Centre lathes | 10 | 6,00,000 |
| 2. | Grinder | 1 | 10,000 |

| | | | |
|---|---|---|---|
| 3. | Universal milling machine | 1 | 1,25,000 |
| 4. | Shaper | 2 | 1,20,000 |
| 5. | Plainer | 2 | 1,20,000 |
| 6. | Work bench | 3 | 10,000 |
| 7. | Precision instruments | 1 | 10,000 |
| 8. | Hand tools and accessories | 2 | 8,000 |
| 9. | CNC trainer lathe | 1 | 4,00,000 |
| 10. | Miscellaneous | LS | 5,000 |

**FOOTWEAR WORKSHOP**

| Sr. | Particulars | Unit |
|---|---|---|
| 1. | Upper splitting M/C<br>Feeding Speed : 4 Ele-Mec/Vario-Opz<br>Installed Pawer : 2.7 KW<br>Knife Dimensions : 0.7X50X3100mm<br>Max. Splitting Thickness : 8mm<br>Min. Splitting Thickness : 0.6/0.2mm<br>Working width : 420mm | 01 |
| 2. | Clicking press<br>Maximum cutting power : 20-30 Ton<br>Maximum stroke : 110mm<br>Cutting Table : 900X450mm<br>Arm width : 380mm<br>Motor : 1.5 HP<br>Net weight (with oil) : 780Kg.<br>Size : 900X1000X1370mm | 02 |
| 3. | Sewing Machine<br>(a) Flat bed sewing M/C<br>Stickiness per minute : 200-3200<br>(b) Zig Zag sewing M/C<br>Stitches per minute : 2000-2600 S.P.M.<br>Stitch Lenght : 5mm<br>Width of Zig Zag : 8mm-12mm<br>Needle : DPX17<br>Needle bar strocke : 34-35mm<br>Thickness of the sewn products : Light – Medium upto 10mm<br>(c) Post bed sewing M/C single needle<br>Stitches Per minute : 2200-2600 S.P.M.<br>Maximum Stitch Length :6mm<br>Lift of pressure foot : llmm (by knee)<br>Needle : DPX5 | 10<br><br><br>01<br><br><br><br><br><br><br><br>05 |

| | | |
|---|---|---|
| | Needle bar strocke : 36mm<br>Hook Type : Vertical Rotating Hook<br>Link Take Up Lever<br>(d) Post bed sewing M/C double needle<br>(e) Cording M/C<br>(f) Stroebel Stitching Machine<br>(g) G Heavy Duty Sewing M/c | <br><br><br><br>01<br>01<br>01<br>02 |
| 4. | Mechanical clicking press for bottomcomponents | 01 |
| 5. | Strap cutting M/C<br>Cutting Width : 2-350 mm<br>Cutting Thickness : 10mm<br>Working Width : 350mm | 02 |
| 6. | Glamping hand drive M/C | 01 |
| 7. | Binding M/C | 01 |
| 8. | Pull over M/C | 01 |
| 9. | Heal lasting M/C | 01 |
| 10. | Pounding M/C<br>Dimensions : 650X500X1300mm<br>Power : 550W, 220V<br>Voltage : 440V<br>Production : 3000 pairs/8 hours | 01 |
| 11. | Roughing M/C | |
| 12. | A. Edge trimming M/C (For lining)<br>Power : 0937KW<br>Net Weight : 64Kg<br>Dimensions : 1100X530X1165mm<br>B. Edge trimming M/C (For Sole)<br>C. Hell Attaching machine (For Lining) | 01<br><br><br><br>01<br>01 |
| 13. | Heal trimming M/C | 01 |
| 14. | Ironing Machine | 01 |
| 15. | Working Tables with stoob | 60 |
| 16. | Decorative punching M/C | 01 |
| 17. | Dies, toobs, moulds, lasts etc. | L.S. |
| 18. | Tools boxes for students | 60 |
| 19. | Thickness measuring gauge | 02 |
| 20. | Pattern shear | 02 |
| 21. | Pattern Binding M/C | 01 |
| 22. | Pattern Vaccum Forming M/C | 01 |

| FOOTWEAR WORKSHOP | | |
|---|---|---|
| Sr. | Particulars | Unit |
| 24. | Tapping & Seam Rubbing M/C complete with devices. | 01 |
| 25. | Top Cap applicator thermoplastic two stations | 01 |
| 26. | Lining trimming M/C with strorepening device | 01 |
| 27. | Automatic Eyeletting& punching M/C | 01 |
| 28. | Stitch marking M/C | 01 |
| 29. | Back part moulding M/C | 01 |
| 30. | Mocassion performing M/C | 01 |
| 31. | Mocassion performing M/C with one beating head (electric) | 01 |
| 32. | Vamp clapping M/C | 01 |
| 33. | Insole trimming & attaching M/C | 01 |
| 34 | Conditioning M/C | 01 |
| 35. | Forepart Lasting M/C with Adhesive tapes | 01 |
| 36. | Conditioning for back port | 01 |
| 37.A. | Heal setting plant with 4 chambers and single vaccum | 01 |
| B. | Reactivating plant for sales | 01 |
| 38. | Delasting (Slip Last) M/C | 01 |
| 39. | Spray booth with sprayer etc. | 01 |
| 40. | DVP Two station machine | 01 |
| 41. | Thickness measuring Machine<br>Capacity : 1mm-35mm for thickness of raw hide<br>Operated : Electronics<br>Power : 3 Phase Induction Motor 1.5HP | 01 |
| 42. | Compressor for Pneumatic machine<br>Motor : 2HP<br>Tank capacity : 115 lit.<br>Air Delivery : 340L/min.<br>Pressure : 10 Bar | 01 |
| 43. | Punching Machine<br>Punching Width : 36 mm<br>Feed : 0-60mm<br>Speed : 250-350/min.<br>Motor : 200W<br>Net Weight : 45 Kg.<br>Dimension 365X370X360mm or Standard | 01 |

| | | |
|---|---|---|
| 44. | Simplex Matie 33 mts. conveyor with 1 mech. tier | 01 |
| 45. | Two colour horizontal injection moulding M/C with moulds etc. | 01 |
| 46. | D.M.S. M/C 4 bed with moulds etc. | 01 |

| **FOOTWEAR WORKSHOP DESIGNING SHOP** | | |
|---|---|---|
| Sr. | Particulars | Unit |
| 1. | Pattern Binding Machine<br>Hydraulic pattern binding machine. Binding precision is 0.1-1 mm, Electrically operated, 440 volts supply, Weight less than 150 kg, power 1.5 kg. | 01 |
| 2. | Shoe Last (Fiber, PVC)<br>Hing Last- Derby Oxford Sporty<br>41/42 size male, 37/38 Female<br>Medium Fitting<br><br>Boot Last<br>41/42 size male, 37/38 Female<br>Medium Fitting | 01 |
| 3. | Designing Tools | 30 Sets |
| 4. | Designing Table | 30 Sets |

| **FOOTWEAR WORKSHOP GARMENT SHOP** | | |
|---|---|---|
| Sr. | Particulars | Unit |
| 1. | Needle feed M/C | 01 |
| 2. | Swing Machine Power Operated<br>Stitches per minute 200-2600<br>Maximum Stitch Length 6mm<br>Lift of pressure foot 11mm (by knee) | 01 |
| 3. | Button hole M/C<br>For punching cloths, hats, umbrella,<br>Work system, pneumatically or automatic Punching Width 36mm Max.<br>Feed 0-60mm<br>Speed 250-350/min<br>Motor : 200 W | 01 |
| 4. | Button sewing M/C | 01 |

| FOOTWEAR WORKSHOP<br><br>LEATHER GOODS SHOP | | |
|---|---|---|
| Sr. | Particulars | Unit |
| 1. | Football panel cutting M/C<br>Machine should be able to cut the size given below<br>Pentagon Panel Size 4.5 cm (Each Core)<br>Hexagon Pannel Size 4.5 cm. (Each Core)<br>Combing punch in each core 9 No.<br>Punching width up to maxi. 8mm. | 01 |
| 2. | Football shaping M/C<br>Machine is design for shaping the football/Volleyball<br>Sphere of panel circumference 60-70cm<br>Air pressure min. 1 Kgf/cm2 | 01 |
| 3. | Planni meter | 01 |
| 4. | Belt cutting Machine<br>Width Half Inch to 2 Inch<br>Cutting Thickness 10 mm Max.<br>No. of Belt Cutting at a time 6 No.<br>Motor 1 HP.<br>Speed 200-250 RPM | 01 |
| 5. | Belt SplitingMaching Power | 01 |
| 6. | Belt Edge Skiving M/c | 01 |
| 7. | Belt Adhesive Coating M/C | 01 |
| 8. | Belt Pressing M/C | 01 |
| 9. | Belt Side Decorating M/C<br><br>Machine mechanical and electrical<br><br>Power operated single phase on 220V | 01 |
| 10. | Belt Punching M/C (Manual) | |
| 11. | Belt Colouring M/C | |
| 12. | Belt Eyelet Fixing M/C | |
| 13. | Belt Finishing M/C | |
| 14. | Belt Creasing M/C | |
| 15. | Belt Edge Making M/C | |
| 16. | Leather Round Belt Making M/c<br>(Circular Strip Cutting M/c) | |
| 17. | Spacer for Round Belt | |
| 18. | Strap Cutting M/C | |

| | | |
|---|---|---|
| 19. | Belt Punching & Fixing M/C<br>Punching Width 36mm<br>Feed 0-60 mm<br>Speed 250-350/min.<br>Motor 200W<br>Dimension 365X370X360mm or standard | |
| 20. | Spray Gun<br>Capacity 500ml, Made of stainless Steel | |

| **FOOTWEAR WORKSHOP& LEATHER GOODS MANUFACTURE SHOP** | | |
|---|---|---|
| Sr. | Particulars | Unit |
| 1. | Proctor Extractor | 01 |
| 2. | Muffle Furnace | 01 |
| 3. | Water distillation plant | 01 |
| 4. | Platinum Crussible | 02 |
| 5. | Gas Plant | 01 |
| 6. | Oven | 02 |
| 7. | Soxlet Apparatus | 02 |
| 8. | pH Meter | 02 |
| 9. | Magnetic Stirrer | 01 |
| 10. | Hot plate & Mantle Heater | 02 |
| 11. | Refrigerator | 01 |
| 12. | Fuming cup board | 01 |
| 13. | Mantle Heater set | 01 |
| b. | Physical Testing Lab | |
| 1. | Shrinkage Tester | 01 |
| 2. | Humidity & Temperature Control | 02 |
| 3. | Thickness Measuring Gauge | 01 |
| 4. | Hardness tester | 01 |
| 5. | Ross Flening M/C | 01 |
| 6. | Flexometer For Upper Leather | 01 |
| 7. | Colour Fastness Tester | 01 |

| | | |
|---|---|---|
| 8. | Precision Lasto meter | 01 |
| 9. | SATRA type sole adhension tester | 01 |
| 10. | SATRA Tensile Tester | 01 |
| 11. | Shoe Hardness Tester for Rubber | 01 |
| 12. | Bally Cantrometer | 01 |
| 13. | Fibre Board Flexing M/C | 01 |
| 14. | Furniture & Fixture | 01 |
| 15. | Water Absorption Machine Static (Kubelca Method) | 01 |
| 16. | Water Absorption Machine Dynamic (Heavy Leather) | 01 |
| 17. | Water vapour permeability tester | 01 |
| 18. | Flexometer | 01 |
| 19. | Abrasion Tester | 01 |
| 20. | Dynamic water Absorption tester | 01 |
| 21. | Tensile Testing machine (Computerised) | 02 |

| **PROCESS OF LEATHER MANUFACTURE SHOP**<br>(Experimental Tannery/Leather Trade Engg.) | | |
|---|---|---|
| Sr. | Particulars | Unit |
| 1. | Wooden paddle | 02 |
| 2. | Small experimental drum steel | 02 |
| 3. | Spray booth with compressor & exhaust fan & guns etc | 01 |
| 4. | Tubewell with pump & motor | 01 |
| 5. | Wooden houses | 08 |
| 6. | Fleshing and scudling Knives | 06 |
| 7. | Fleshing and scudling beams | 06 |
| 8. | Misc tools | |
| 9. | Mini Auto spray with 4-6 guns | 01 |
| 10. | Auto toggling Humidily fixers | 01 |
| 11. | Shaving M/C | 01 |
| 12. | Dayana vac. drying M/C | 01 |
| 13. | Molissastaker | 01 |
| 14. | Finiflex | 01 |
| 15. | Dusting off M/C | 01 |
| 16. | Wooden Sample Drum<br>Operated : 3 Phase Induction Motor<br>440 Volt Supply<br>Power : 1.5 HP<br>Capacity : 5 Kg-50Kg Rawide<br>Size : 10 Fit Diameter | 01 |
| 17. | Shaving Machine (Mechanical) | 01 |
| 18. | Splitting Machine | 01 |
| 19. | Sammying/Setting Machine | 01 |
| 20. | Toggling Frame with Toggles | 01 |
| 21. | Drying Chamber | 01 |
| 22. | Slowcon Staking Machine/MolisaStaker | 01 |
| 23. | Buffing Machine 1800 mm (Double Width) | 01 |
| 24. | Glazing Machine | 01 |
| 25. | Area Measuring Machine | 01 |

| | | |
|---|---|---|
| 26. | Dhakia Setting Machine<br><br>(For Sole Leather) | 01 |
| 27. | Hydraulic Press (Ironing & Embossing)<br>Operated : 3 Phase Induction Motor<br>440Volt Supply<br>Power : 1.5HP<br>At the Tem. up to 60$^{o}$C embossing | 01 |
| 28. | Weight Bridge/Balance | 01 |
| 29. | Baby Boiler | 01 |
| 30. | Vacuum Drying Machine | 01 |
| 31. | Compressor | 01 |
| 32. | Polishing Machine | 01 |
| 33. | Roller Coater (Small Size) | 01 |
| 34. | Hand Setting Machine | 01 |
| 35. | Seasoning Table-II | 01 |
| 36. | Aquamix (Rotomix) | 01 |
| 37. | Spray Gun<br><br>Capacity 500 ml, Made of Stainless Steel | 01 |
| 38. | Thickness Measuring Gauge | 01 |
| 39. | Electronic Balance | 01 |
| 40. | Experimental Drum | 01 |
| 41. | Hand Flashing Knife | 01 |

**ENERGY CONSERVATION LABORATORY**

| | | |
|---|---|---|
| 1 | Clamp meter | 02 |
| 2 | Multimeter | 02 |
| 3 | Power Analyser | 01 |
| 4 | Different types of lamps (LS)<br>− 60 W lamp, 230 V , 100 V<br>− 200 W lamp<br>− 500 W lamp<br>− 100 W lamp, 110 V, 150 V | 10 |
| 5 | Lux meter | 02 |
| 6 | Standard window A.C. | 01 |
| 7 | Anemometer | 02 |
| 8 | Thermometer | 03 |
| 9 | Flow meter | 02 |
| 10 | Pumping set with at least two pumps of different capacity. | 1 set |
| 11 | Pressure gauge fitted on discharge lines | 1 set |
| 12 | Variable Frequency Drive | 02 |
| 13 | A small compressor with a small network of pipe line fitted with suitable pipeline, pressure gauge, safety valve and loading / unloading pressure switch. | 1 |
| 14 | Stop watch | 2 |
| 15 | Small blower (1.5 kW motor) with inlet and outlet ducts of approximately one meter length on both sides | 1 |

**POLLUTION CONTROL AND INDUSTRIAL SAFETY**

| | | |
|---|---|---|
| 1 | BOD incubator (5 C- 50C) with digital temperature indicator | 1 |
| 2 | COD Heater | 1 |
| 3 | Refrigerator, 280 ltrs. | 1 |
| 4 | Laboratory oven 2'x2'x2' | 1 |
| 5 | Turbidity meter (0-4000 NTU) | 1 |

| | | |
|---|---|---|
| 6 | TDS portable meter | 1 |
| 7 | Electronic balance (0.001 grams) | 1 |
| 8 | Beakers | 1 |
| 9 | Conical flask, round bottom flasks | 1 |
| 10 | Condenser, reflux condenser | 1 |
| 11 | BOD bottles, rubber pipe, burette, pipette etc. | LS |

**NOTE:**

In addition to the above, laboratories in respect of physics, chemistry, Computer Centre etc will be required for effective implementation of the course. Provision for photocopiers, PC facilities along with LCD Projection System etc. has also to be made.

**(C) Furniture Requirement**

Norms and standards laid down by AICTE be followed for working out furniture requirement for this course.

**10.2 Human Resources Development:**

Weekly work schedule, annual work schedule, student teacher ratio for various group and class size, staffing pattern, work load norms, qualifications, experience and job description of teaching staff workshop staff and other administrative and supporting staff be worked out as per norms and standards laid down by the AICTE.

## 11. EVALUATION STRATEGY

### 11.1 INTRODUCTION

Evaluation plays an important role in the teaching-learning process. The major objective of any teaching-learning endeavor is to ensure the quality of the product which can be accessed through learner's evaluation.

The purpose of student evaluation is to determine the extent to which the general and the specific objectives of curriculum have been achieved. Student evaluation is also important from the point of view of ascertaining the quality of instructional processes and to get feedback for curriculum improvement. It helps the teachers in determining the level of appropriateness of teaching experiences provided to learners to meet their individual and professional needs. Evaluation also helps in diagnosing learning difficulties of the students. Evaluation is of two types: Formative and Summative (Internal and External Evaluation)

**Formative Evaluation**

It is an on-going evaluation process. Its purpose is to provide continuous and comprehensive feedback to students and teachers concerning teaching-learning process. It provides corrective steps to be taken to account for curricular as well as co-curricular aspects.

**Summative Evaluation**

It is carried out at the end of a unit of instruction like topic, subject, semester or year. The main purpose of summative evaluation is to measure achievement for assigning course grades, certification of students and ascertaining accountability of instructional process. The student evaluation has to be done in a comprehensive and systematic manner since any mistake or lacuna is likely to affect the future of students.

In the present educational scenario in India, where summative evaluation plays an important role in educational process, there is a need to improve the standard of summative evaluation with a view to bring validity and reliability in the end-term examination system for achieving objectivity and efficiency in evaluation.

### 11.2 STUDENTS' EVALUATION AREAS

The student evaluation is carried out for the following areas:

- Theory
- Practical Work (Laboratory, Workshop, Field Exercises)
- Project Work
- Professional Industrial Training

## A. Theory

Evaluation in theory aims at assessing students' understanding of concepts, principles and procedures related to a course/subject, and their ability to apply learnt principles and solve problems. The formative evaluation for theory subjects may be caused through sessional /class-tests, home-assignments, tutorial-work, seminars, and group discussions etc. For end- term evaluation of theory, the question paper may comprise of three sections.

**Section-I**

It should contain objective type items e.g. multiple choice, matching and completion type. Total weight age to Section-1 should be of the order of 20 percent of the total marks and no choice should be given in this section. The objective type items should be used to evaluate students' performance in knowledge, comprehension and at the most application domains only.

**Section-II**

It should contain short answer/completion items. The weightage to this section should be of the order of 40 percent of the total marks. Again, no choice should be given in section-II

**Section-III**

It may contain two to three essay type questions. Total weightage to this section should be of the order of 40 percent of the total marks. Some built-in, internal choice of about 50 percent of the questions set, can be given in this section

Table II : Suggested Weightage to be given to different ability levels

| Abilities | Weightage to be assigned |
|---|---|
| Knowledge | 10-30 percent |
| Comprehension | 40-60 percent |
| Application | 20-30 percent |
| Higher than application i.e. Analysis, Synthesis and Evaluation | Upto 10 percent |

## B. Practical Work

Evaluation of students performance in practical work (Laboratory experiments, Workshop practicals/field exercises) aims at assessing students ability to apply or practice learnt concepts, principles and procedures, manipulative skills, ability to observe and record, ability to interpret and draw conclusions and work related attitudes. Formative and summative evaluation may comprise of weightages to performance on task, quality of product, general behaviour and it should be followed by viva-voce.

## C. Project Work

The purpose of evaluation of project work is to assess student's ability to apply, in an integrated manner, learnt knowledge and skills in solving real life problems, manipulative skills, ability to observe, record, creativity and communication skills. The formative and summative evaluation may comprise of weightage to nature of project, quality of product, quality of report and quality of presentation followed by viva-voce.

## D. Professional Industrial Training

Evaluation of professional industrial training report and viva-voce/ presentation aims at assessing students' understanding of materials, industrial processes, practices in the industry/field and their ability to engage
In activities related to problem-solving in industrial setting as well as understanding of application of learnt knowledge and skills in real life situation. The formative and summative evaluation may comprise of weightages to performance in testing, general behavior, quality of report and presentation during viva-voce.

## 12. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION

This curriculum document is a Plan of Action and has been prepared based on exhaustive exercise of curriculum planning and design. The representative sample comprising selected senior personnel (lecturers and HODs) from various institutions and experts from industry/field have been involved in curriculum design process.

The document so prepared is now ready for its implementation. It is the faculty of polytechnics who have to play a vital role in planning instructional experiences for the courses in four different environments viz. class-room, laboratory, library and field and execute them in right perspective. It is emphasized that a proper mix of different teaching methods in all these places of instruction only can bring the changes in stipulated studentsbehaviour as in the curriculum document. It is important for the teachers to understand curriculum document holistically and further be aware of intricacies of teaching-learning process (T-L) for achieving curriculum objectives. Given below are certain suggestions which may help the teachers in planning and designing learning experiences effectively. These are indicative in nature and teachers using their creativity can further develop/refine them. The designers of the programme suggest every teacher to read them carefully, comprehend and start using them.

### (A) Broad Suggestions:

1. Curriculum implementation takes place at programme, course and class-room level

   Respectively and synchronization among them is required for its success. The first step towards achieving synchronization is to read curriculum document holistically and understand its rationale and philosophy.

2. An academic plan needs to be prepared and made available to all polytechnics well in advance. The Principals have a great role to play in its dissemination and, percolation upto grass-root level. Polytechnics, in turn are supposed to prepare institutional academic plan.

3. HOD of every Programme Department along with HODs and incharges of other departments are required to prepare academic plan at department level referring to institutional academic plan.

4. All lecturers/Senior lecturers are required to prepare course level and class level lesson plans referring departmental academic plan.

## (B) Course Level Suggestions

Teachers are educational managers at class room level and their success in achieving course level objectives lies in using course plan and their judicious execution which is very important for the success of programme by achieving its objectives.Polytechnic teachers are required to plan various instructional experiences viz. theory lecture, expert lectures, lab/workshop practicals, guided library exercises, field visits, study tours, camps etc. In addition, they have to carry out progressive assessment of theory, assignments, library, practicals and field experiences. Teachers are also required to do all these activities within a stipulated period of time. It is essential for them to use the given time judiciously by planning all above activities properly and ensure execution of the plan effectively.

Following is the gist of suggestions for subject teachers to carry out T-L process effectively:

1. Teachers are required to prepare a course plan, taking into account departmental academic plan, number of weeks available and courses to be taught.

2. Teachers are required to prepare lesson plan for every theory class. This plan may comprise of contents to be covered, learning material for execution of a lesson plan. They may follow steps for preparing lesson plan e.g. drawing attention, state instructional objectives, help in recalling pre-requisite knowledge, deliver planned subject content, check desired learning outcomes and reinforce learning etc.

3. Teachers are required to plan for expert lectures from field/industry. Necessary steps are to plan in advance, identify field experts, make correspondence to invite them, take necessary budgetary approval etc.

4. Teachers are required to plan for guided library exercises by identification of course specific experience requirement, setting time, assessment, etc. The assignments and seminars can be thought of as terminal outcome of library experiences.

5. Concept and content based field visits may be planned and executed for such content of course which is abstract in nature and no other requisite resources are readily available in institute to impart them effectively.

6. There is a dire need for planning practical experiences in right perspective. These slots in a course are the avenues to use problem based learning/activity learning/ experiential learning approach effectively. The development of lab instruction sheets for the course is a good beginning to provide lab experiences effectively.

7. Planning of progressive assessment encompasses periodical assessment in a semester, preparation of proper quality question paper, assessment of answer sheets immediately and giving constructive feed back to every student.

8. The student centred activities may be used to develop generic skills like task Management, problem solving, managing self, collaborating with others etc.

9. Where ever possible, it is essential to use activity based learning rather than relying on delivery based conventional teaching all the time.

10. Teachers may take initiative in establishing liaison with industries and field organizations for imparting field experiences to their students.

11. Students be made aware about issues related to ecology and environment, safety, concern for wastage of energy and other resources etc.

12. Students may be given relevant and well thought out project assignments, which are purposeful and develop practical skills. This will help students in developing creativity and confidence for their gainful employment.

13. A Project bank may be developed by the concerned department of the polytechnics in consultation with related Industry, research institutes and other relevant field organizations in the state.

## LIST OF PARTICIPANT

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