

CURRICULUM FOR THREE YEAR
(SIX SEMESTER)
DIPLOMA COURSE IN

=====
: LEATHER TECHNOLOGY (TANNING) :
: Effective from Session :
=====

=====
:Semester System :
=====

=====
UNDER DEVELOPMENT
=====

Prepared By

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: Curriculum Development Cell :
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INSTITUTE OF RESEARCH DEVELOPMENT
& TRAINING, U.P., KANPUR

APPROVED BY

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: BOARD OF TECHNICAL EDUCATION :
: U.P. LUCKNOW, :
:CORRECTED AS SYLLABUS COMMITTEE OF:
: B.T.E. MEETING HELD ON 04.05.2017:
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Corrected and Approved By B.T.E. on Dated 04.05.2017

STUDY AND EVALUATION SCHEME FOR
THREE YEAR (SIX SEMESTER) DIPLOMA COURSE IN LEATHER TECHNOLOGY (Tanning)
(Effective From Session 200 -0)

I Semester

| Curriculum | | | | | | Scheme of Examination | | | | | | | | | |
|------------------|------------------|----------|-----|--------------|-----------|---------------------------------|---------------------|----------------|----------------|---------------------|----------------|----------------|--|-------------|-----|
| Periods Per Week | | | | | | Theory | | | | Practical | | | | Grand Total | |
| Le c. al | Tut ori al | Dr aw | Lab | Work Shop | Tot al | S U B J E C T | Examination Dur. | Sess. Marks | Total Marks | Examination Dur. | Sess. Marks | Total Marks | | | |
| | | | | | | | | | | | | | 4 | - | - |
| 3 | 1 | - | - | - | 4 | 1.2 Applied Mathematics-I(A) | 2.5 | 50 | 20 | 70 | - | - | - | - | 70 |
| 3 | 1 | - | - | - | 4 | 1.3 Applied Physics-I | 2.5 | 50 | 20 | 70 | - | - | - | - | 70 |
| 6 | - | - | 4 | - | 10 | 1.4 Applied Chemistry | 2.5 | 50 | 20 | 70 | 3 | 40 | 20 | 60 | 130 |
| - | - | 10 | - | 10 | 20 | 1.5 Drawing & Workshop Practice | - | - | - | - | 4 | 100 | 50 | 150 | 150 |
| 16 | 2 | 10 | 4 | 10 | 42 | <-----TOTAL-----> | - | 200 | 80 | 280 | - | 140 | 70 | 210 | 490 |
| | | | | | | | | | | | | | Games/NCC/Social and Cultural Activities + Discipline (15 + 10) | | 25 |
| | | | | | | | | | | | | | TOTAL | | 515 |

II Semester

| | | | | | | | | | | | | | | | |
|----|---|---|----|---|----|-------------------------------------|-----|-----|-----|-----|---|-----|--|-----|-----|
| 3 | 1 | - | - | - | 4 | 2.1 Applied Mathematics-I(B) | 2.5 | 50 | 20 | 70 | - | - | - | - | 70 |
| 3 | 1 | - | 4 | - | 8 | 2.2 Applied Physics-II | 2.5 | 50 | 20 | 70 | 3 | 40 | 20 | 60 | 130 |
| 6 | 2 | - | - | - | 8 | 2.3 General Engineering-I | 2.5 | 50 | 20 | 70 | - | - | - | - | 70 |
| 5 | 1 | - | 8 | - | 14 | 2.4 Organic Chemistry | 2.5 | 50 | 20 | 70 | 3 | 60 | 30 | 90 | 160 |
| 4 | 1 | - | 6 | - | 11 | 2.5 Theory of Leather Manufacture-I | 2.5 | 50 | 20 | 70 | 4 | 70 | 30 | 100 | 170 |
| 21 | 6 | - | 18 | - | 45 | <-----TOTAL-----> | - | 250 | 100 | 350 | - | 170 | 80 | 250 | 600 |
| | | | | | | | | | | | | | Games/NCC/Social and Cultural Activities + Discipline (15 + 10) | | 25 |
| | | | | | | | | | | | | | TOTAL | | 625 |

- NOTE:-
- (1) Each period will be of 50 minutes duration.
 - (2) Each session will be of 16 weeks.
 - (3) Effective teaching will be at least 14 weeks.
 - (4) Remaining periods will be utilised for revision etc.

STUDY AND EVALUATION SCHEME FOR
THREE YEAR (SIX SEMESTER) DIPLOMA COURSE IN LEATHER TECHNOLOGY (Tanning)
(Effective From Session)

III SEMESTER

| Curriculum | | | | | | S U B J E C T | Scheme of Examination | | | | | | | | |
|--|----------|-----|-----|-----------|-------|--|-----------------------|-------|-------|-------------|-----------|-------|-------|-----|-------------|
| Periods Per Week | | | | | | | Theory | | | | Practical | | | | Grand Total |
| Lec. | Tutorial | Dr. | Lab | Work Shop | Total | | Examination | Sess. | Total | Examination | Sess. | Total | Total | | |
| | | | | | | Dur. | Marks | Marks | Dur. | Marks | Marks | Marks | | | |
| 6 | 1 | - | 4 | -- | 11 | 3.1 Elementary Microscopy & Microbiology | 2.5 | 50 | 20 | 70 | 3 | 40 | 20 | 60 | 130 |
| 6 | 1 | - | -- | -- | 7 | 3.2 Theory of Leather Manufacture - II | 2.5 | 50 | 20 | 70 | -- | -- | -- | -- | 70 |
| 8 | - | - | 6 | -- | 14 | 3.3 Theory of Leather Manufacture - III | 2.5 | 50 | 20 | 70 | 3 | 70 | 30 | 100 | 170 |
| 6 | - | - | 4 | - | 10 | 3.4 General Engineering-II | 2.5 | 50 | 20 | 70 | 3 | 40 | 20 | 60 | 130 |
| 26 | 2 | - | 14 | - | 42 | <-----TOTAL-----> | -- | 200 | 80 | 280 | | 150 | 70 | 220 | 500 |
| Games/NCC/Social and Cultural Activities + Discipline (15 + 10) | | | | | | | | | | | | | | 25 | |
| TOTAL | | | | | | | | | | | | | | 525 | |

IV SEMESTER

| | | | | | | | | | | | | | | | |
|--|---|---|----|----|----|---|-----|-----|----|-----|----|-----|-----|-----|-----|
| 4 | - | - | - | - | 4 | 4.1 Functional Communicaton | 2.5 | 50 | 20 | 70 | - | -- | -- | -- | 70 |
| 7 | - | - | 7 | -- | 14 | 4.2 Process of Leather Manufacture - I | 2.5 | 50 | 20 | 70 | 12 | 80 | 30 | 110 | 180 |
| 5 | - | - | 6 | -- | 11 | 4.3 Process of Leather Manufacture - II | 2.5 | 50 | 20 | 70 | 12 | 70 | 30 | 100 | 170 |
| 3 | - | - | 3 | - | 6 | 4.4 Leather Trade Engg. | 2.5 | 50 | 20 | 70 | 3 | 40 | 20 | 60 | 130 |
| 2 | - | - | 5 | -- | 7 | 4.5 Introduction To Computer | -- | -- | -- | -- | 3 | 60 | 30 | 90 | 90 |
| 21 | - | - | 21 | -- | 42 | | | 200 | 80 | 280 | | 250 | 110 | 360 | 640 |
| Games/NCC/Social and Cultural Activity/Community Development Work + Discipline (15 + 10) | | | | | | | | | | | | | | 25 | |
| AGGREGATE | | | | | | | | | | | | | | 665 | |

- NOTE:-
- (1) Each period will be of 50 minutes duration.
 - (2) Each session will be of 16 weeks.
 - (3) Effective teaching will be at least 14 weeks.
 - (4) Remaining periods will be utilised for revision etc.
 - (5) 4 weeks structured and supervised, branch specific, task oriented industrial/field exposure to be organised after IV Semester. Student will submit a report. There will be 60 marks for this exposure. These marks will be awarded by project examiner in the VI Semester. (Examination marks : 40, Sess. marks : 20).
 - (6) Field visit and extension lectures are to be organised and managed at least twice in a month at institute level.

STUDY AND EVALUATION SCHEME FOR
THREE YEAR (SIX SEMESTER) DIPLOMA COURSE IN LEATHER TECHNOLOGY (Tanning)
(Effective From Session)

V Semester

| Curriculum | | | | | | Scheme of Examination | | | | | | | | | |
|--|-----|----|------|------|-----|--|------------------|-------------|-------------|------------------|-------------|-------------|-----------|-------------|--|
| Periods Per Week | | | | | | Theory | | | | Practical | | | | Grand Total | |
| Le | Tut | Dr | Lab | Work | Tot | S U B J E C T | Examination Dur. | Sess. Marks | Total Marks | Examination Dur. | Sess. Marks | Total Marks | | | |
| c. | ori | aw | Shop | al | | | | | | | | | | | |
| - | - | - | 4 | - | 4 | 5.1 Integrative Communicaton | 2.5 | -- | -- | 3 | 40 | 20 | 60 | 60 | |
| 6 | 2 | - | - | -- | 8 | 5.2 Industrial Management and Entrepreneurship Development | 2.5 | 50 | 20 | 70 | -- | -- | -- | 70 | |
| 6 | - | - | - | 7 | 13 | 5.3 Process of Leather Manufacture - III | 2.5 | 50 | 20 | 70 | 12 | 100 | 50 | 220 | |
| 6 | - | - | - | 7 | 13 | 5.4 Elements of Footwear & Leather Goods Manufacture | 2.5 | 50 | 20 | 70 | 4 | 100 | 50 | 220 | |
| 7 | 1 | - | - | -- | 8 | 5.5 Analytical Chemistry of Leather Manufacture | 2.5 | 50 | 20 | 70 | -- | -- | -- | 70 | |
| 25 3 - 4 14 46 | | | | | | | 200 | 80 | 280 | | 200 | 100 | 300 | 580 | |
| Games/NCC/Social and Cultural Activity/Community Development Work + Discipline (15 + 10) | | | | | | | | | | | | | 25 | | |
| | | | | | | | | | | | | | AGGREGATE | 605 | |

VI Semester

| | | | | | | | | | | | | | | |
|--|---|---|---|----|----|---|-----|----|-----|----|-----|-----|-------------------------------------|------|
| 4 | - | - | - | - | 4 | 6.1 Environmental Education* Disaster Management | 2.5 | 50 | -- | -- | - | -- | -- | -- |
| 6 | 2 | - | - | -- | 8 | 6.2 Financial, Cost & Management Accounting | 2.5 | 50 | 20 | 70 | -- | -- | -- | 70 |
| 6 | 2 | - | - | -- | 8 | 6.3 Tannery Waste Management | 2.5 | 50 | 20 | 70 | -- | -- | -- | 70 |
| - | - | - | 8 | -- | 8 | 6.4 Standardisation & Analysis of Leather/ Leather Manufactures | -- | -- | -- | 12 | 100 | 50 | 150 | 150 |
| 6 | 4 | - | - | -- | 10 | 6.5 International Business Management & TQM | 2.5 | 50 | 20 | 70 | -- | -- | -- | 70 |
| - | 4 | - | - | -- | 4 | 6.6 Project (i) Project Work (ii) Industrial Training | -- | -- | -- | 3 | 70 | 40 | 110 | 170 |
| | | | | | | | -- | -- | -- | | 40 | 20 | 60 | |
| 22 12 8 - 42 | | | | | | | 150 | 60 | 210 | | 210 | 110 | 320 | 530 |
| Games/NCC/Social and Cultural Activity/Community Development Work + Discipline (15 + 10) | | | | | | | | | | | | | 25 | |
| | | | | | | | | | | | | | AGGREGATE | 555 |
| | | | | | | | | | | | | | 30% Carry Over of I & II Semester | 342 |
| | | | | | | | | | | | | | 70% Carry Over of III & IV Semester | 833 |
| | | | | | | | | | | | | | 100% Carry Over of V & VI Semester | 1160 |

NOTE:-

- (1) Each period will be of 50 minutes duration.
- (2) Each session will be of 16 weeks.
- (3) Effective teaching will be at least 14 weeks.
- (4) Remaining periods will be utilised for revision etc.
- (5) Field visit and extension lectures are to be organised and managed well in advance at institute level as per need.
- (6) (*) It is compulsory to appear & to pass in examination, But marks will not be included for division and percentage of obtained marks.

2335

CONTENTS

| S.No. | Particulars | Page No. |
|--------------------------|---|----------|
| | Study and Evaluation Scheme | |
| I. | Main features of curriculum | 1 |
| II. | List of Experts | 2 |
| III. | Need analysis | 3 |
| IV. | Profile development | 4 |
| V. | Job potential/Job opportunities | 5 |
| VI. | Job activities | 6-7 |
| VII. | Analysis of activities into knowledge and skill. | 8-14 |
| VIII. | Course objectives | 15 |
| IX. | Deriving Subjects of study from course objective | 16-17 |
| DETAILED COURSE CONTENTS | | |
| 1 | I Semester | |
| 1.1. | Foundational Communication | 18-22 |
| 1.2. | Applied Mathematics-I(A) | 23-24 |
| 1.3. | Applied Physics-I | 25-26 |
| 1.4. | Applied Chemistry | 27-31 |
| 1.5. | Drawing & Workshop practice | 32-34 |
| 2 | II Semester | |
| 2.1. | Applied Mathematics-I(B) | 35-36 |
| 2.2. | Applied Physics-II | 37-39 |
| 2.3. | General Engineering-I | 40-41 |
| 2.4. | Organic chemistry | 42-46 |
| 2.5. | Theory of leather manufacture-I | 47-49 |
| 3. | III Semester | |
| 3.1. | Elementary Microscopy and Microbiology | 50-51 |
| 3.2. | Theory of Leather Manufacture-II | 52-53 |
| 3.3. | Theory of Leather Manufacture-III | 58-60 |
| 3.4. | General Engineering-II | 55-57 |
| 4. | IV Semester | |
| 4.1. | Functional Communication | 58-60 |
| 4.2. | Process of Leather Manufacture-I | 54 |
| 4.3. | Process of Leather Manufacture-II | 61 |
| 4.4. | Leather Trade Engineering | 62-64 |
| 4.5. | Introduction To Computer | 65-66 |
| 5. | V Semester | |
| 5.1. | Integrative Communication | 68-69 |
| 5.1. | Industrial Management and Entrepreneurship | 68-69 |
| 5.2. | Process of Leather Manufacture III | 70 |
| 5.3. | Elements of Footwear and Leather Goods Manufacture | 71-72 |
| 5.4. | Analytical Chemistry of Leather Manufacture Development | 73 |

| | | |
|-------|--|---------|
| 6. | V Semester | |
| 6.1 | Environmental Education & Disaster Mgt. | 74-76 |
| 6.2 | Financial, Cost & Management Accountancy | 77-79 |
| 6.3 | Tannery waste Management | 80 |
| 6.4 | Standardisation and Analysis of Leather & Leather Manufacture | 81-82 |
| 6.5 | International Business Management & TQM | 83-84 |
| 6.6 | Project | 85 |
| XI. | Staff Structure | 86 |
| XII. | Space Requirement | 87 |
| XIII. | List of Equipments | 88-102 |
| XIV. | Learning Resource Material | 103 |
| XV. | Annexure-I. Questionnaire | 104-106 |
| | Annexure-II. Summer Training Schedule | 107-108 |
| XVI. | Recommended Books | 109-114 |

I. MAIN FEATURES OF THE CURRICULUM

1. Title of the Course : Diploma in Leather Technology (Tanning)
2. Duration of the Course : Three Years (Six Semester)
3. Type of the Course : Full Time Institutional
4. Pattern of the Course : Semester System
5. Intake : 60
6. Entry Qualification : Passed High School with 35% Marks
7. Admission Criteria : State Joint Entrance Examination

LIST OF EXPERTS

List of experts who contributed in the Semester System of curriculum for Three Years (Six Semester) Diploma Course in Leather Technology at I. R. D. T., U. P., Kanpur dated 22-4-2015

1. Shri Bharat Singh H.O.D.
Govt. Leather Institute, Agra
2. Shri D. N. Swami Lecturer (Shoe Design)
Govt. Leather Institute, Kanpur
3. Shri Rajjan lal Pal Lecturer
G. G. P., Lucknow
4. Shri N. K. Singh Instructor
Govt. Leather Institute, Kanpur
4. Shri Pankaj Yadav Professor
I.R.D.T.,U.P., Kanpur

List of experts who contributed in the Review/Revision curriculum for Three Years (Six Semester) Diploma Course in Leather Technology at I. R. D. T., U. P., Kanpur dated 24-10-2016

1. Shri Anurag Sachan Deputy Manager, Lanxes Pvt. Ltd., Kanpur
2. Shri Narendra Kumar Technical Officer, CLRI, Jajmau, Kanpur
3. Shri Ashok Yadav B.T.E., Lucknow
4. Shri Bharat Singh H.O.D., Govt. Leather Institute, Agra
5. Shri Jitendra Kumar H.O.D., G.L.I., Kanpur
6. Shri D. N. Swami Lecturer (Shoe Design)
Govt. Leather Institute, Kanpur
7. Shri Satyendra Singh Lecturer, G.L.I., Kanpur
8. Shri M. K. Singh Instructor Govt. Leather Institute, Kanpur
9. Dr. Kshama Mishra Assistant Professor, I.R.D.T.,U.P., Kanpur

III. NEED ANALYSIS :

Various types of leather articles are in use in every day life. There is continuous demand for such articles in the world market. Our country is third richest country in cattle stock. Therefore raw material in the form of leather is available in sufficient quantity.

Processing of leather for different purposes is an specialised job. Procurement of raw leather is a technical job which requires knowledge of Microscopy & Microbiology, Organic chemistry, Standardisation and quality control techniques, testing etc.

The student is supposed to have basic knowledge of different methods of leather processing. Knowledge of computers will be additional advantage to handle statistical information. There are bright prospects for external revenue generation through leather export.

Keeping in view the above factors, curriculum for three year diploma course in Leather Technology has been revised to suit the need of the industry. Environmental pollution and its control and Entrepreneurship development has also been included in the curriculum.

It is hoped that this new curriculum will prove useful for the students. The demand for middle level technical man power can be fulfilled in the industries through diploma passouts of Leather Technology.

IV. PROFILE DEVELOPMENT :

A tool in the form of questionnaire for getting information about job potential, job opportunities, manpower requirements and job activities of Diploma holder in Footwear and Leather Goods Technology was designed and sent to various organisations, industries and higher technological Institutions and Polytechnics. The response was not very much encouraging. So efforts were made to get feed back through mutual interaction with the experts of above organisations, industries, higher technological institutes and polytechnics. The feed back received was discussed and analysed in a workshop and a draft curriculum was prepared adopting the following procedure.

1. Listing job potential and job activities.
2. Analysing activities into acknowledge and skill.
3. Determining course objectives.
4. Planning horizontal and vertical organisation of the subjects.
5. Developing study and evaluation scheme.
6. Development of detailed course content and coverage time keeping in view the knowledge and skill requirement.
7. Determination of resource input in the form of human resource, space, equipment etc.

The draft curriculum so prepared was sent for comments of experts in various higher technological institutions and senior personnel in industries. The suggestions thus received and those through personal contacts were incorporated where found suitable. Finally revised curriculum was put before an expert Committee approved by the "Government of Uttar Pradesh" for its final approval. The Committees suggestions though very nominal too were respectfully incorporated to give it its final shape.

It is hoped that revised curriculum of Diploma in Footwear and Leather Goods Technology will be useful in producing middle level manpower for world of work.

V. 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. As assistant/ Deputy Director leather in Govt. departments.
12. As a design/planning supervisor in leather goods manufacturing and allied industries.
13. As a maintenance supervisor in leather industry.

VI. JOB ACTIVITIES OF DIPLOMA HOLDERS IN LEATHER TECHNOLOGY

1. Activities connected with leather Manufacturing
 - 1.1 Examines hides and skins for various defects.
 - 1.2 Analyses various chemicals such as water, commonsalt, lime, sulphides, acids, dyes, vegetable and synthetic used in leather industry.
 - 1.3 Tests tanned and finished leathers at every stage for conformity to prescribed standards and quality.
 - 1.4 Determine correct and economical methods of tanning of hides and skins for various leathers.
 - 1.5 Assessment and assortment of raw hides and skins for processing into different kinds of leathers.
 - 1.6 Supervises curing beam house, tanning and finishing processes.
 - 1.7 Selection and grading of finished leathers.
 - 1.8 Measurement, weighment and yield of leather at various stages of manufactures.
 - 1.9 Packing of finished leathers.
2. Activities connected with leather Manufacturing
 - 2.1 Selects and installs new equipment and machinery
 - 2.2 Maintains and under takes minor repairs of the machinery installed in a tannery.
 - 2.3 Assists in the selection of site, layout and construction of tanneries.
 - 2.4 Demonstrates correct procedures for operating various machinery.
 - 2.5 Handles and uses various instruments.
3. Management Activities
 - 3.1 Plans and schedules production
 - 3.2 Allocates duties to various workers.
 - 3.3 Imparts training to workers engaged in the unit.

- 3.4 Supervises the work of various sections in the tanneries.
 - 3.5 Estimates the unit cost of leather produced under his charge.
 - 3.6 Supervises the receiving , packing and forwarding of goods.
 - 3.7 Controls inventory of chemicals and raw materials and makes out a schedule of such materials to be kept in stock for continuous production.
 - 3.8 Accounting and maintaining records.
 - 3.9 Assists in ensuring working conditions in tanneries in accordance with labour and factory laws.
 - 3.10 Supervises labour welfare schemes.
 - 3.11 Marketing of leather.
 - 3.12 Assists in conducting techno-economic surveys and preparing project reports for starting tanneries.
4. Activities connected with research and development
- 4.1 Assists in research and development in the fields of:
 - Curing and preservation;
 - Leather manufacture;
 - Auxillaries;
 - Utilization of bye-products
 - Treatment of effluents;
 - Utilizing local tanning resources;

VII. ANALYSIS OF ACTIVITIES INTO KNOWLEDGE AND SKILL

| ACTIVITY | KNOWLEDGE | SKILLS |
|---|---|---|
| 1.1 Examines, hides and skins for various defects | Histology of hides and skins | Flaying practice |
| | Anatomical structure | Curing and preservation practicals |
| | Different kinds of hides and skins | |
| | Different breeds of ovines and bovines and their characteristic grains. | Study of defects in hides and skins in the raw hide market |
| | Post mortem and ante-mortem defects on hides and skins and their effects on finished leather. | Microscopic and bacteriological examination of (At an elementary level) |
| | Remedial measures to overcome defects | |
| | Seasonal and regional variations | |
| | Raw hide and skin prices, weights, areas and yield | |
| | Proper trimming and utilization. | |
| | Strength properties of skin fibres Proper flaying of hides and skins Purification and bacteria Storage, handling and transportation of raw hides and skins Assorting and grading of raw hides and skins | |

| ACTIVITY | KNOWLEDGE | SKILLS |
|--|---|--|
| 1.2 Analyses various chemicals such as water, common salt, lime, sulphides, acids, dyes, oils and fats, tanning materials-mineral vegetable and synthetic used in leather industry | <p>Sources of availability of various chemicals. Impurities present</p> <p>Minimum acceptable standards of</p> <p>Composition and properties of various chemicals</p> <p>Chemical reactions.</p> <p>Methods of Chemical analysis.</p> | <p>Experiments in the Laboratory concerned with qualitative and quantitative methods of chemical analysis involving these chemicals</p> |
| 1.3 Tests tanned and finished leather at every stage for conforming to prescribed standards of quality. | <ul style="list-style-type: none"> - Different methods of tanning and finishing - Analysis of vegetable tanned leather, sampling, preparation of the sample, analysis in full Determination of adulteration, acidity of vegetable tanned leathers - Analysis of chrome salts and chrome tanned leather. Determination of percentage basicity, distribution of acid in chromium complexes, chromium in chrome leather - Preparation of various types of chrome liquors and their analysis and tanning test, with them - Analysis of aluminium and zirconium tanning agents, systems and formaldehyde | <p>Analysis of all chemical used in leather manufacture except dyes</p> <p>Analysis of vegetable and mineral tanning agents</p> <p>Analysis of vegetable, chrome other mineral and oil tanned leathers</p> <p>Physical testing of leathers</p> |

| ACTIVITY | KNOWLEDGE | SKILLS |
|----------|--|--------|
| | <ul style="list-style-type: none"> - Dyes and dye stuffs preparation and systematic tests comparative dyeing tests with various types of leathers. - Types of oil fats and waxes <p>Analysis of oils and fats. Iodine value saponification values theory of saturation and maturation</p> <p>Analysis of oil tanned leathers.</p> <ul style="list-style-type: none"> - Tests for sulphonated oils, analysis of soaps and fat liquors - Analytical study and control of tanning process - Water analysis temporary and permanent hardness, methods of softening study of suitability of water for tanning purposes. - Analysis of curing materials. <p>Analysis of soaps liquors and soaking materials, analysis of lime in full, analysis of sodium sulphide, defects of lime and sulphide and other unhairing agents in liming</p> <ul style="list-style-type: none"> - Analysis of limed pelt <p>Analysis of used lime liquor, Bata liquor, Deliming liquors and the chemicals used in bating and deliming</p> <ul style="list-style-type: none"> - Analyses of pickle liquor used and unused. | |

| ACTIVITY | KNOWLEDGE | SKILLS |
|---|--|--|
| | <ul style="list-style-type: none"> - Analysis of vegetable tanning materials, methods of sampling; grinding and extraction, qualitative and quantitative analysis of vegetable tanning materials - Sampling and analysis of extracts, liquids or solids; comparative tannery tests with different blends of hydrolysisable and condensed tannins - Pigments, binders (Synthetic and natural); Nitrocellulose lacquers, lacquer emulsions, polyurethanes, plasticizers, solvents thinners, PVC lacquers etc. - Physical testing of leathers: Sampling and conditioning for tensile strength, tear and bursting strength, abrasion resistance, stretchiness, crack index apparent and real density, air and water vapour permeability water proofness, resilience and flexibility, wet and dry rub fastness, water absorption etc. | |
| 1.4 Determine correct and economical method of tanning of hides and skins for various leathers. | -Principles and methods of manufacture of different types of heavy, light and sportsgoods leather such as sole, harness, bolting, saddlery, leather for carriage and automobiles packing band leather, buffers, pickers, washers, hydraulic leathers, shoe upper leathers, lining leathers, gloving and clothing leathers, chamois leather, upholstery book | -Practical exercise to manufacture important types of heavy, light and sportsgoods leather their working on various machinery. |

binding and morocco
leathers.

| ACTIVITY | KNOWLEDGE | SKILLS |
|---|---|--|
| | <p>Glazed kid leather, buff, calf, upper, softy upper suede and sambhur leather, ammunition boot upper and sarunken grain leather, E.I. tanned sheep, goat, cow and buff leather, Reptile leather, game skins leather, semichrome and fullchrome football leather, hockey and cricket ball leather, batting/wicket keeping glove leather, shuttle cock leather, grip leather etc.</p> <p>Dressing of EII leathers /bag tanned leathers/wet blues.crust leather into finished leathers working of various tanning maching and their production machines, Alignment etc. Performance exercise. characteristics maintenace and replacement factors foundations for machine and erection.</p> <p>-Probable defects and repairs. Power load requirements of machinery. Schematic drawinds and flow charts (ISI symbols and conventions).</p> | <p>-Blue print reading, Free Hand skeepching charts.</p> |
| 2.3 Assists in the selections of site, layout and construction of tanneries | <p>-Factors to be considered in site selection, water supply, distributin and disposal system, sanitary fittings factory layout Power and steam piping, Biolers, fire protection safety measures.</p> | <p>-Reading of Typical layouts and re-drawing them.</p> |
| 2.4 Demonstrates correct procedures for operating various machinery | | <p>-Same as 2.1 & 2.2 + dismantling and assembling tanning machine + renewal of belts length</p> |

and sizes of belts,
checking of slackness of
belts, their remedie,
checking of pulleys and

| ACTIVITY | KNOWLEDGE | SKILLS |
|---|---|--|
| | | setting them right; Tightening loose shafts, couplings bearings and other alignments, speed and strockes of machine. |
| 2.5 Handles and uses various instruments | -Hydrometers, pressure meters, vaccum gauges, Hydrometers, Ammeters, Voltmeters, pH meter, Calorimeter, thermostats, Ovens, Muffle furnaces, Balances, Glassware viscometer; microscope; sterilizer distillation and gasplants etc. | -Practical in using these instruments. |
| 3.1 Plans and schedules production | -Stock of raw materials. Availability of workers, various production, capacities of machines and men; Bar charts and networking techniques. | |
| 3.2 Allocates duties to workers | -Individual and group skills Elements of industrial psychology; Time and motion study. | |
| 3.3 Imparts training to workers engaged in the unit | -Processes and machinery, training needs, methods of training and assessment. Qualities of leadership. | - Group discussion skills. - Demonstration skills - Visit to industries |
| 3.4 Supervises the work of various sections in the tanneries | -Coordination, Economic and technical decision making. Selection of alternatives, Principles of supervision human ralation | |
| 3.5 Estimating the unit cost of leather produced under his charge | -Use of money credit, depreciation, earning and returns. Breakeven point, costing and book-keeping, competitions (Elements of economics with special reference to leather industry) Exercises in estimating the cost of production of some important types of leather. | |
| 3.6 Supervises the | -Book-keeping; Receiving and | |

receiving, packing and forwarding of goods despatching procedures.
 -Import-Export regulations; F.O.B., C.I.F. values and invoices methods of packing; handling and transportation.

| ACTIVITY | KNOWLEDGE | SKILLS |
|--|---|--------|
| 3.7 Controls inventory of chemicals and raw materials and makes out a suitable schedule such materials to be kept in stock for continuous productions. | -Principle of materials management; stores management and reordering level | |
| 3.8 Accounting and maintaining records. | -Commerical accounting maintenance of job cards; stock registers | |
| 3.9 Assists in ensuring working conditions in tanneries in accordance with labour and factory laws | -Factory rules workers welfare schemes, Trade unions, Minimum wages act, ESI, Gratuity, Retirement benefits, workmen compensation Act, Workers coop. stores schools, canteens etc. | |
| 3.10 Supervises labour welfare schemes | | |
| 3.11 Marketing of leather | -Communication and public relations; Advertising quality control; competitions ; Internal price Export trade, sales promotion; Marketing intelligence. | |
| 3.12 Assists in conducting technological surveys and preparing project reports for starting tanneries | -Sampling; Methods of Collecting data; Elementary Statistics, capital structure, capital structure; Loans from financial institution and banks; Govt. policy and concessions, Entrepreneurship and technology schemes, production; profitability and balance sheet; leather economics; practical exercises in preparing project report. | |
| 4.1 Assists in R&D in fields of curing | -As in all the activities Above | |

and preservation,
leather manufacture
auxiliaries, utili-
zation of bye Project work
products, treatment
of effluents
utilizing local
tanning resorces

VIII. COURSE OBJECTIVES:

After completion of the course the student should be able to

1. Understand the physical, chemical and biological properties of raw hides and skins, finished leather and materials that go into leather manufacture.
2. Select and grade raw hides and skins for manufacture of different types of finished leather;
3. Select the most appropriate tanning method for various types of leathers;
4. Estimate the unit cost of manufacture of leather;
5. Plan, schedules, organises, direct, controls and co-ordinate operations and men involved in the manufacture of leather;
6. Test tanned and finished leathers at various stages to prescribed standards of quality;
7. Selects, instals, maintains and undertake minor repairs of machinery in a tannery;
8. Assists in selection of site, layout and construction of tannery.
9. Assists in conducting tecnho-economic surveys and preparing project reports for starting tanneries.

IX. DERIVING SUBJECTS OF STUDY FROM COURSE OBJECTIVES:

| COURSE OBJECTIVES | SUBJECTS |
|--|--|
| 1. Understand the physical, chemical and biological properties of raw hides and skins and finished leather and materials that go into leather manufacture. | Mathematical, Physical, Inorganic and Organic chemistry, Microbiology, Theory of leather manufacture, Theory & practice of deying and finishing. |
| 2. Select and grade raw hides and skins for manufacture of different types of finished leather. | Microscopy and Microbiology Theory of leather manufacture Process of leather manufacture. |
| 3. Select the most appropriate tanning method for various types of leathers. | Theory of leather manufacture Process of leather manufacture Theory and Practice of deying and finishing General engineering Leather Trades Engineering Footwear and Leather goods manufacture. |
| 4. Estimates the unit cost of manufactured leathers. | Theory and Practice of Leather manufacture, Leather Machinery Estimating and Costing. |
| 5. Plans, Schedules organises, directs, controls and coordinates operations and men involve in the manufacture of leather. | Leather Trades Engineering Industrial Management Production Management |
| 6. Test tanned and finished leathers at various stages to prescribed standards of quality. | Analytical chemistry of leather manufacture and testing. |
| 7. Selects, instals, maintains and undertakes minor repairs of machinery in a tannery. | General Engineering, Workshop practice, Drawing and Blueprint reading, Maintenance of machinery, Leather Trades Engineering. |

- | | |
|---|--|
| 8. Assist in selection of site, layout and construction of tannery. | Leather Trades Engineering Theory & Process of Leather Manufacture |
| 9. Assist in conducting techno-economic surveys and preparing project reports for starting tanneries. | All the above subjects - Elementary economics and statistics - English language course (For report writing as well as for oral communication) |

SUBJECTS AND CURRICULUM AREAS

| SUBJECT | CURRICULUM AREA |
|--|---------------------------------|
| Communication Technique | Language & Communication |
| Mathematics-I | Basic Sciences |
| Physics | |
| Chemistry (Inorganic, Physical and Organic) | |
| Microscopy and Microbiology | |
| General Engineering (Mech., Elect.) Workshop Drawing | Basic Engineering |
| Theory of Leather Manufacture Process of Leather Manufacture (Heavy, Light, Industrial, Sportgoods) Theory and Practice of deying and finishing Elements of Footwear Manufacture Leather Goods Manufacture Leather Trade Engineering Maintenance of Machinery Analytical Chemistry of Leather Manufacture Analysis of materials and products of leather manufacture Project work | Leather Technology |
| Industrial Management and entrepreneurship development | Management and Entrepreneurship |
| Introduction to Computers | Computer awareness |

**1.1 FOUNDATIONAL COMMUNICATION
SECTION "A" (ENGLISH)**

L T P
4 - -

TOPIC WISE DISTRIBUTION OF PERIODS

| Sl.No. | Units | Coverage Time | | |
|--------------------------|---|---------------|---|---|
| | | L | T | P |
| Section A English | | | | |
| 1. | PARTS OF SPEECH | 12 | - | - |
| 2. | VOCABULARY BUILDING | 05 | - | - |
| 3. | Grammar | 15 | - | - |
| 4. | DEVELOPMENT OF EXPRESSION (Composition) | 12 | - | - |
| Section B Hindi | | | | |
| 5. | Topic 5 | 2 | - | - |
| 6. | Topic 6 | 5 | - | - |
| 7. | Topic 7 | 5 | - | - |
| | | 56 | - | - |

DETAILED CONTENTS

1. **PARTS OF SPEECH :**
 - a. Noun
 - b. The pronoun : Kinds and Usage
 - c. The adjective : Kinds and Degree
 - d. Determiner : Articles
 - e. The verb : Kinds
 - f. The Adverb : Kinds, Degree and Usage
 - g. Prepositions
 - h. Conjunctions
 - i. The Interjections
 - j. Subject: Verb Agreement (Concord)

2. **VOCABULARY BUILDING :**
 - a. Antonyms and Synonyms
 - b. Homophones
 - c. One word substitutions
 - d. Idioms and Phrases
 - e. Abbreviations

3. **Grammar**
 - a. Sentence & its types
 - a. Tenses
 - b. Punctuations
 - c. Active and Passive voice

- d. Transformation of Sentences
- e. Synthesis of Sentences
- f. Direct and Indirect Narrations

4. **DEVELOPMENT OF EXPRESSION (Composition) :**

- a. Paragraph Writing
- b. Essay Writing
- c. Proposal Writing
- d. Letter Writing (Formal, Informal, Business, official etc.)
- f. Report Writing
- g. Note Making
- h. News Making
- i. Application Writing
- j. Minute Writing
- k. Invitation Letter Writing

SECTION "B" (Hindi)

- 5& I k] l oLke] fo'ksk.k] fdz k fo'ksk.k] o.kz l ekl] l f/k] vydj] j l] mi l xz i R ; ; A
6& i = ys[ku] fufonk l fonk] nj vke=k %dk/s ku½ vihy] LorU= vfHk; fDr] ifronu ys[ku] id
foKflrA
7& okD; @okD; k k ds fy, 'kcn] i ; k; okph ; k l ekukFkhz 'kcn] foyke 'kcn] vusdkFkhz 'kcn] 'kcn; e ; k
l eppkfjr 'kcn l eg] okD; 'k() ¼ kq) v'kq) okD; ¼ egkojs , oa ykcdkDr; k

1.2 APPLIED MATHEMATICS I(A)
[Common to All Engineering Courses]

L T P
3 2/2 -

Rationale:

The study of mathematics is an important requirement for the understanding and development of any branch of engineering. The purpose of teaching mathematics to diploma engineering students is to impart them basic knowledge of mathematics which is needed for full understanding and study of engineering subjects.

| S.N. | Units | Coverage Time | | |
|------|--------------------------|---------------|----|---|
| | | L | T | P |
| 1. | Algebra- I | 8 | 3 | - |
| 2. | Algebra- II | 8 | 3 | - |
| 3. | Trigonometry | 6 | 2 | - |
| 4. | Differential Calculus-I | 10 | 3 | - |
| 5. | Differential Calculus-II | 10 | 3 | - |
| | | 42 | 14 | - |

DETAILED CONTENTS:

1. ALGEBRA-I : (10 Marks)
 - 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:(10 Marks)
 - 2.1 Vector algebra : Dot and Cross product, Scaler and vector triple product.
 - 2.2 Complex number.

Complex numbers, Representation, Modulus and amplitud
Demoivre theorem, its application in solving algebraic
equations, Mod. function and its properties..
3. TRIGONOMETRY :(8 Marks)
 - 3.1 Relation between sides and angles of a triangle : Statement of various formulae showing relation ship between sides and angle of a triangle.

- 3.2 Inverse circular functions : Simple case only
- 4. DIFFERENTIAL CALCULUS - I : (12 Marks)
 - 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, - Function of a function, Logarithmic differentiation, Differentiation of implicit functions.
- 5. DIFFERENTIAL CALCULUS -II :(10 Marks)
 - 5.1 Higher order derivatives, Leibnitz theorem.
 - 5.2 Special functions (Exponential, Logarithmic, Inverse circular and function), Definition, Graphs, range and Domain and Derivations of each of these functions.
 - 5.3 Application - Finding Tangents, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration, Errors and approximation.

1.3 APPLIED PHYSICS-I

[Common to All Engineering Courses]

L T P
3 2/2 -

Rationale:

Engineering physics is a foundation Course. Its purpose is to develop proper understanding of physical phenomenon and scientific temper in the students. While teaching the subject, teachers should make maximum use of demonstrations to make the subject interesting to the students.

TOPIC WISE DISTRIBUTION OF PERIODS

| Sl.No. | Topics | L | T | P |
|--------|--|----|----|---|
| 1. | Units & Dimensions | 3 | 1 | - |
| 2. | Errors in Measurement | 3 | 1 | - |
| 3. | Circular Motion | 4 | 1 | - |
| 4. | Motion of Planets | 4 | 1 | - |
| 5. | Dynamics of rigid body (Rotational Motion) | 5 | 1 | - |
| 6. | Fluid Mechanics and Friction | 4 | 1 | - |
| 7. | Friction | 4 | 1 | - |
| 8. | Harmonic Motion | 5 | 2 | - |
| 9. | Heat & Thermodynamics | 6 | 4 | - |
| 10. | Acoustics | 4 | 1 | - |
| | | 42 | 14 | - |

DETAILED CONTENTS:

1. Units and Dimensions (4 Marks)

S.I. Units & Dimensions of physical quantities, Dimensional formula and dimensional equation. Principle of homogeneity of dimensions and applications of homogeneity principle to:

- i) Checking the correctness of physical equations,
- ii) Deriving relations among various physical quantities,
- iii) Conversion of numerical values of physical quantities from one system of units into another. Limitations of dimensional analysis.

2. ERRORS AND MEASUREMENT (4 Marks)

Errors in measurements, accuracy and precision, random and systematic errors, estimation of probable errors in the results of measurement (Combination of errors in addition, subtraction, multiplication and powers). Significant figures, and order of accuracy in respect to instruments,

3. Circular Motion (5 Marks)

Central forces. Uniform Circular motion (Horizontal and Vertical cases), angular velocity, angular acceleration and centripetal acceleration. Relationship between linear and angular velocity and acceleration. Centripetal and centrifugal forces. Practical applications of centripetal forces. Principle of centrifuge.

4. MOTION OF PLANETS AND SATELLITES :(5 Marks)

Gravitational force, Acceleration due to gravity and its variation w.r. to height and depth from earth, Kepler's Law, Escape and orbital velocity, Time period of satellite, Geostationary, Polar satellites (Concept Only)

5. Dynamics of Rigid Body (Rotational Motion) (6 Marks)

Rigid body, Rotational motion, Moment of inertia, Theorems (Perpendicular and Parallel axis) of moment of inertia (Statement). Expression of M.I. of regular bodies (Lamina, Sphere, Disc, Cylindrical), Concept of Radius of gyration, angular momentum, Conservation of angular momentum, Torque, Rotational kinetic energy. Rolling of sphere on the slant plane. Concept of Fly wheel.

6. Fluid Mechanics :(5 Marks)

Surface tension, Capillary action and determination of surface tension from capillary rise method, Equation of continuity ($A_1V_1=A_2V_2$), Bernoulli's theorem, and its application stream line and Turbulent flow, Reynold's number.

7. Friction :(4 Marks)

Introduction, Physical significance of friction, Advantage and disadvantage of friction and its role in every day life. Coefficients of static and dynamic friction and their measurements. viscosity, coeff. of viscosity, & its determination by stoke's method.

8. Harmonic Motion (6 Marks)

Periodic Motion, characteristics of simple harmonic motion; equation of S.H.M. and determination of velocity and acceleration. Graphical representation. Spring-mass system. Simple pendulum. Derivation of its periodic time. Energy conservation in S.H.M.. Concept of phase, phase difference, Definition of free, forced, undamped and damped vibrations, Resonance and its sharpness, Q-factor.

9. Heat & Thermodynamics: (6 Marks)

Modes of heat transfer (Conduction, Convection and Radiation), coefficient of thermal conductivity Isothermal and adiabatic process. Zeroth First, Second Law of Thermodynamics and Carnot cycle, Heat Engine (Concept Only).

10. Acoustics (5 Marks)

Definition of pitch, loudness, quality and intensity of sound waves. Echo, reverberation and reverberation time. Sabine's formula without Derivation. Control of reverberation time (problems on reverberation time). Acoustics of building defects and remedy.

1.4 APPLIED CHEMISTRY

[Common to All Engineering Courses]

L T P
6 - 4

Rationale:

Engineering Chemistry has profound and deep relationship with the industrial and environmental technology. This curriculum intends to impart technical knowledge alongwith productive practice to the students of the diploma engineering. The teachers are expected to guide the students in the classroom and the laboratories according to the curriculum by demonstrations and by showing relevant materials and equipments to inculcate interests in learning among students.

TOPIC WISE DISTRIBUTION OF PERIODS

| Sl.No. | Topics | L | T | P |
|--------|-------------------------------|----|---|----|
| 1. | Atomic Structure | 4 | - | - |
| 2. | Chemical Bonding | 6 | - | - |
| 3. | Classification of Elements | 4 | - | - |
| 4. | Electro Chemistry-I | 7 | - | - |
| 5. | Electro Chemistry-II | 8 | - | - |
| 6. | Chemical Kinetics | 4 | - | - |
| 7. | Catalysis | 4 | - | - |
| 8. | Solid State | 4 | - | - |
| 9. | Fuels | 4 | - | - |
| 10. | Water Treatment | 6 | - | - |
| 11. | Colloidal State | 4 | - | - |
| 12. | Lubricants | 4 | - | - |
| 13. | Hydrocarbons | 7 | - | - |
| 14. | Organic Reactions & Mechanism | 8 | - | - |
| 15. | Polymers | 4 | - | - |
| 16. | Synthetic Materials | 6 | - | - |
| | | 84 | - | 56 |

DETAILED CONTENTS:

1. ATOMIC STRUCTURE :(3 MARKS)

Basic concept of atomic structure, Matter wave concept, Quantum number, Haisenberg's Uncertainty Principle, Shaples of orbitals.

2. CHEMICAL BONDING :(4 MARKS)

Covalent bond, Ionic & Co-ordinate, Hydrogen bonding, Valence bond theory, Hybridisation, VSEPR theory, Molecular orbital theory.

3. CLASSIFICATION OF ELEMENTS :(3 MARKS)

Modern classification of elements (s,p,d and f block elements), Periodic properties : Ionisation potential, electro negativity, Electron affinity.

4. ELECTRO CHEMISTRY-I:(3 MARKS)

Arrhenius Theory of electrolytic dissociation, Transport number, Electrolytic conductance, Ostwald dilution law. Concept of Acid and bases : Bronsted, Arrhenius and Lewis theory. Concept of pH and numericals. Buffer solutions, Indicators, Solubility product, Common ion effect with their application,

5. ELECTRO CHEMISTRY-II:(3 MARKS)

Redox reactions, Electrode potential(Nernst Equation), Electro-chemical cell (Galvanic and Electrolytic). EMF of a cell and free energy change. Standard electrode potential, Electro chemical series and its application. Chemical and Electrochemical theory of corrosion, Galvenic Series. Prevention of corrosion by various method.

6. CHEMICAL KINETICS :(3 MARKS)

Law of mass action, order and molecularity of rection. Activation energy, rate constants, Ist order reactions and 2nd order reactions.

7. CATALYSIS :(2 MARKS)

Definition Characteristics of catalytic reactions, Catalytic promotors and poison , Autocatalysis and Negative catalysis, Theory of catalysis, Application.

8. SOLID STATE :(2 MARKS)

Types of solids (Amorphous and Crystalline), Classification (Molecular, Ionic, Covalent, Metallic), Band theory of solids (Conductors, Semiconductors and Insulators), types of Crystals, FCC, BCC, Crystal imperfection.

9. FUELS :(3 MARKS)

Definition, its classification, high & low Calorific value.Determination of calorific value of solid and liquid fuels by Bomb calorimeter.

Liquid fuel - Petroleum and its refining, distillate of petroleum (Kerosene oil, Disel and Petrol), Benzol and Power alchol. Knocking, Anti-knocking agents, Octane number and

Cetane number.

Cracking and its type, Gasolining from hydrogenation of coal (Bergius process and Fischer tropesch's process)

Gaseous Fuel - Coal gas, Oil gas, Water gas, Producer gas, Bio gas, LPG and CNG.

Numerical Problems based on topics

10. WATER TREATMENT :(3 MARKS)

Hardness of water, Its limits and determination of hardness of water by EDTA method. Softening methods (Only Sods lime, Zeolote and Ion exchange resin process). Disadvantage of hard water in different industries, scale and sludge formation, Corrosion, Caustic embrittlement, primming and foarming in biolers.

Disinfecting of Water By Chloramine-T, Ozone and Chlorine. Advantage and disadvantage of chlorinational, Industrial waste and sewage, Municipality waste water treatment, Definition of BOD and COD. Numerical Problems based on topics.

11. COLLOIDAL STATE OF MATTER :(3 MARKS)

Concept of collidal and its types, Different system of colloids, Dispersed phase and dispersion medium. Methods of preparation of colloidal solutions, Dialysis and electrodialysis. Properties of colloidal solution with special reference to absorpction, Brownian Movement, tyndal effect, Electro phoresis and coagulation. relative stability of hydrophillic and hydrophobie colloids. Protection and protective colloids. Emulsion, Types, preparation,properties and uses. Application of colloids chemistry in different industries.

12. LUBRICANTS :(3 MARKS)

Definition, classification, Necessasity and various kinds of lubricants. Function and mechanism of action of lubricants and examples. Properties of lubricants, Importance of additive compunds in lubricants, Synthetic lubricants and cutting fluids. Industrial application, its function in bearing.

13. HYDROCARBONS:(4 MARKS)

A. Classification and IUPAC nomeuclature of organic compounds hamologous series (Functional Group)

- B. Preparation, properties and uses of Ethane, Ethene, Ethyne (Acetylene), Benzene and Toluene.
14. ORGANIC REACTIONS & MECHANISM:(4 MARKS)
1. Fundamental aspects -
 - A. Electrophiles and nucleophiles, Reaction Intermediates, Free radical, Carbocation, Carbanion
 - B. Inductive effect, Mesomeric effect, Electromeric effect.
 - 2.A. Mechanism of addition reaction (Markonikov's Rule, Cyanohydrin and Peroxide effect),
 - B. Mechanism of Substitution reactions; (Nucleophilic) hydrolysis of alkyl halide, electrophilic substitution halogenation, Sulphonation, Nitration and Friedel-Craft reaction.
 - C. Mechanism of Elimination reaction - Dehydration of primary alcohol, Dehydrohalogenation of primary alkyl halide.
15. POLYMERS :(3 MARKS)
1. Polymers and their classification. Average degree of polymerisation, Average molecular weight, Free radical polymerisation (Mechanisms)
 2. Thermosetting and Thermoplastic resins -
 - A. Addition polymers and their industrial application- Polystyrene, PVA, PVC, PAN, PMMA, Buna-S, Buna-N, Teflon.
 - B. Condensation polymer and their industrial application : Nylon 6, Nylon 6,6, Bakelite, Melamine formaldehyde, Urea formaldehyde, Terylene or Decron, Polyurethanes.
 3. General concept of Bio polymers, Biodegradable polymers and inorganic polymers(Silicon)
16. SYNTHETIC MATERIALS :(4 MARKS)
- A. Introduction - Fats and Oils
 - B. Saponification of fats and oils , Manufacturing of soap.
 - C. Synthetic detergents, types of detergents and its manufacturing.
 3. EXPLOSIVES: TNT, RDX, Dynamite.
 4. Paint and Varnish

LIST OF PRACTICALS

1. To analyse inorganic mixture for two acid and basic radicals from following radicals
 - A. Basic Radicals :
NH₄⁺, Pb⁺⁺, Cu⁺⁺, Bi⁺⁺⁺, Cd⁺⁺, As⁺⁺⁺, Sb⁺⁺⁺,
Sn⁺⁺, Al⁺⁺⁺, Fe⁺⁺⁺, Cr⁺⁺⁺, Mn⁺⁺, Zn⁺⁺, Co⁺⁺
Ni⁺⁺, Ba⁺⁺, Sr⁺⁺, Ca⁺⁺, Mg⁺⁺
 - B. Acid Radicals :
CO₃⁻⁻, S⁻⁻, SO₃⁻⁻, CH₃COO⁻, NO₂⁻,
NO₃⁻, Cl⁻, Br⁻, I⁻, SO₄⁻⁻
2. To determine the percentage of available Chlorine in the supplied sample of Bleaching powder.
3. To determine the total hardness of water sample in terms of CaCO₃ by EDTA titration method using Eriochroma black-T indicator.
4. To determine the strength of given HCl solution by titration against NaOH solution using Phenolphthalein as indicator.
5. To determine the Chloride content in supplied water sample by using Mohr's methods.
6. Determination of temporary hardness of water sample by O-Henry's method.

1.5 DRAWING & WORKSHOP PRACTICE PRACTICALS
(Common with Leather Technology, Footwear (CASD))

L D P
- 10 10

Rationale:

Drawing is called the language of engineering. The pass out can hold independent responsibility of any nature if he is equipped with sufficient knowledge of engineering drawing. Workshop practice introduces a sense of self confidence in the students for shopflore supervision of work. Practice in various machine operations and processes are given to make the student fit for shopflore working and supervision. A well skilled middle level man power can have effective control over skilled workers.

DRAWING

| Sr. No. | Units | Coverage Time | | |
|---------|--|---------------|---|-----|
| | | L | T | P |
| 1. | Free hand sketching | - | - | 18 |
| 2. | Principles of projection | - | - | 17 |
| 3. | Missing surfaces | - | - | 18 |
| 4. | Sketching of pictorial views | - | - | 17 |
| 5. | Three views of given objects | - | - | 18 |
| 6. | Shapes of inclined surface | - | - | 17 |
| 7. | Plan, Clevation, side views and Isometric views | - | - | 18 |
| 8. | Dimensioning technique | - | - | 18 |
| | | - | - | 140 |

WORKSHOP

Rationale:

Workshop practice introduces a sense of self confidence in the students for shopflore supervision of work. Practice in various machine operations and processes are given to make the student fit for shopflore working and supervision. A well skilled middle level man power can have effective control over skilled workers.

| Sr. No. | Units | Coverage Time | | |
|---------|---|---------------|---|-----|
| | | L | T | P |
| 1. | Filing practice | - | - | 09 |
| 2. | Use of marking & measuring tools | - | - | 09 |
| 3. | Hack sawing practice | - | - | 09 |
| 4. | Brazing practice | - | - | 09 |
| 5. | Soldering practice | - | - | 08 |
| 6. | Heat treatment of tools | - | - | 08 |
| 7. | Grinding practice | - | - | 08 |
| 8. | Plane turning | - | - | 12 |
| 9. | Practice on turning lathe | - | - | 12 |
| 10. | Practice on band saw & circular saw | - | - | 08 |
| 11. | Wooden utility articles for leather industry | - | - | 08 |
| | | - | - | 100 |

DETAILED CONTENTS:

DRAWING

1. Freehand sketching.
Basic principles, freehand sketching of components used in leather machinery and leather goods.
2. Principles of projection:
Recognition of objects from given pictorial view
identification of surfaces from different objects and pictorial view.
Exercise on missing surfaces.
Sketching practice of pictorial views from objects.
Principles of orthographic projections
Three views of a given object.
Some shapes of inclined surfaces.
Invisible liner, centre lines, extension lines and dimensioned lines.
Simple exercises in drawing plans, elevations and side views of components used in footwear and leather goods machinery.
3. Dimensioning technique.
Principles and methods of dimensioning.
Exercise on dimensioning a given drawing.
4. ISI standards, symbols and conventions.

Workshop Practice :
 1. Description of work bench, holding device, files and hand tools. Specification of files, precautions while filing a Job.

Job No. 1; Filing practice (Production of flat surfaces)
Checking by straight edge.
 2. Marking of jobs, use of marking and measuring tools,

Job No. 2; Filing a dimensioned rectangle of square piece to an accuracy of + 0.25 mm.
 3. Simple operation of hacksawing, description of various types of blades, their uses and how to fit the blade.

Job No. 3: Hacksawing practice.
 4. Description of drills, selection of drills, tapping types, taps drilling, reaming tapping and dieing operations.

- Job No. 4: Practice of drilling and dieing operations.
5. Brazing practice : Preparation of brazing joints.
- Job No. 5 : Brazing of two mild steel plates.
6. Job No. 6 : Soldering and welding : Preparation of soldering joints.
joints- Preparation of welding joints,
7. Job No. 7: Heat treatment of tools.
8. Job No. 8: Grinding of blades, shears and knives used in leather machineries.
9. Job No. 9: Preparation of a steel turning job on a centre lathe.
10. Demonstration of wood working machines:
- (i) Demonstration on wood turning lathe.
 - (ii) Demonstration on circular saw.
 - (iii) Demonstration on bend saw.
 - (iv) Grinding of saws on circular saw grinder.
11. Job No. 10: Simple exercises involving making of wooden components for use in leather industries.

Rationale:

The study of mathematics is an important requirement for the understanding and development of any branch of engineering. The purpose of teaching mathematics to diploma engineering students is to impart them basic knowledge of mathematics which is needed for full understanding and study of engineering subjects.

| S.N. | Units | Coverage Time | | |
|------|-------------------------------------|---------------|----|---|
| | | L | T | P |
| 1. | Integral Calculus-I | 12 | 4 | - |
| 2. | Integral Calculus-II | 12 | 4 | - |
| 3. | Coordinate Geometry (2 Dimensional) | 10 | 3 | - |
| 4. | Coordinate Geometry (3 Dimensional) | 8 | 3 | - |
| | | 42 | 14 | - |

DETAILED CONTENTS:

1. INTEGRAL CALCULUS - I : (14 Marks)
 - 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.
2. INTEGRAL CALCULUS -II :(14 Marks)
 - 2.1 Meaning and properties of definite integrals, Evaluation of definite integrals. Integration of special function.
 - 2.2 Application : Finding areas bounded by simple curves, Length of 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.
3. CO-ORDINATE GEOMETRY (2 DIMENSION):(14 Marks)
 - 3.1 CIRCLE :

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

3.2 Standard form and simple properties

Parabola $x^2=4ay$, $y^2=4ax$,

Ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

Hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

4. CO-ORDINATE GEOMETRY (3 DIMENSION):(8 Marks)

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 and Plane (Different Forms),

4.2 Sphere $x^2 + y^2 + z^2 + 2gx + 2fy + 2wz=d$ (Radius, Centre and General Equation)

2.2 APPLIED PHYSICS-II

[Common to All Engineering Courses]

L T P
3 2/2 4

Rationale:

Engineering physics is a foundation Course. Its purpose is to develop proper understanding of physical phenomenon and scientific temper in the students. While teaching the subject, teachers should make maximum use of demonstrations to make the subject interesting to the students.

TOPIC WISE DISTRIBUTION OF PERIODS

| Sl.No. | Topics | L | T | P |
|--------|---------------------------------------|----|----|----|
| 1. | Optics | 4 | 1 | - |
| 2. | Introduction To Fiber Optics | 4 | 1 | - |
| 3. | Laser & its Application | 4 | 1 | - |
| 4. | Electrostatics | 4 | 1 | - |
| 5. | D.C. Circuits | 4 | 1 | - |
| 6. | Magnetic Materials & Their Properties | 4 | 1 | - |
| 7. | Semi Conductor Physics | 4 | 1 | - |
| 8. | Introduction Diode & Transistors | 4 | 2 | - |
| 9. | Introduction To Digital Electronics | 4 | 2 | - |
| 10. | Non-conventional energy sources | 6 | 3 | - |
| | | 42 | 14 | 56 |

1. Optics (4 Marks)

Nature of light, Laws of Reflection and Refraction, Snell's Law, Interference (Constructive and Destructive), Diffraction and Polarization (Concept Only), Law of Malus and Polaroids.

2. Introduction To Fibre Optics :(5 Marks)

Critical angle, Total internal reflection, Principle of fibre optics, Optical fibre, Pulse dispersion in step-index fibres, Graded index fibre, Single mode fibre, Optical sensor.

3. Lasers and its Applications (4 Marks)

Absorption and Emission of energy by atom, Spontaneous and Stimulated Emission, Population inversion, Main component of laser and types of laser- Ruby Laser, He-Ne laser and their applications. Introduction to MASER.

4. Electrostatics :(4 Marks)

Coulomb's Law, Electric field, Electric potential, Potential

energy, Capacitor, Energy of a charged capacitor, Effect of dielectric on capacitors.

5. D.C. Circuits (5 Marks)

Ohm's Law, Kirchoff's Law and their simple application, Principle of Wheat Stone bridge and application of this principle in measurement of resistance (Meter bridge and Post Office Box); Carey Foster's bridge, potentiometer.

6. Magnetic Materials and Their Properties: (5 Marks)

Dia, Para and Ferro-magnetism, Ferrites, Magnatic Hysteresis Curve and its utility. Basic idea of super conductivity, Meissner's effect.

7. Semiconductor Physics (4 Marks)

Concept of Energy bands in soldis, classification of solids into conductors, insulators and semiconductors on the basis of energy band structure. Intrinsic and extrinsic semi conductors, Electrons and holes as charge carriers in semiconductors, P-type and N-type semiconductors.

8. Junction Diode and Transister : (6 Marks)

Majority and Minority charge carriers, P-N junction formation, barrier voltage, Forward and reverse biasing of a junction diode, P-N junction device characteristics, Formation of transistor, transistor-action, Base, emitter and collector currents and their relationship LED's.

9. Introduction To Digital Electronics : (6 Marks)

Concept of binary numbers, Interconversion from binary to decimal and decimal to binary. Concepts of Gates (AND, NOT, OR).

10. Non-conventional energy sources: (7 Marks)

(a) Wind energy : Introduction, scope and significance, measurement of wind velocity by anemometer, general principle of wind mill.

(b) Solar energy: Solar radiation and potentiality of solar radiation in India, uses of solar energy: Solar Cooker, solar water heater, solar photovoltaic cells, solar energy collector.

PHYSICS LAB

Note: Any 4 experiments are to be performed.

1. Determination of coefficient of friction on a horizontal plane.
2. Determination of 'g' by plotting a graph T^2 versus l and using the formula $g = 4\pi^2 / \text{Slope of the graph line}$
3. Determine the force constant of combination of springs in case of 1. Series 2. Parallel.
4. To verify the series and parallel combination of Resistances with the help of meter bridge.
5. To determine the velocity of sound with the help of resonance tube.
6. Determination of viscosity coefficient of a lubricant by Stoke's law.
7. Determination of E_1/E_2 of cells by potentiometer.
8. Determination of specific resistance by Carey Foster bridge.
9. Determination of resistivity by P.O.Box.
10. Verification of Kirchoff's Law.
11. To draw Characteristics of p-n Junction diode.
12. To measure instantaneous and average wind velocity by indicating cup type anemometer/hand held anemometer.

NOTE :

Students should be asked to plot a graph in experiments (where possible) and graph should be used for calculation of results. Results should be given in significant figures only.

2.3 GENERAL ENGINEERING -I

(Common with Leather Technology (CASD))

L T P
6 2 -

Rationale:

The purpose of introducing this paper in the first year of three years diploma course in Leather Technology is to expose the student with the fundamental knowledge about some main engineering materials used in the leather industry, Transmission of power by belt's and gears, machine components like Cams, Gears, Coupling and bearing. Basic workshop processes like brazing, soldering, welding, fitting and machine operations like turning, shaping, grinding and drilling and working of wood working machine will further enrich the knowledge of student for practical application in the world of work.

| Sr. No. | Units | Coverage Time | | |
|---------|-----------------------------|---------------|----|---|
| | | L | T | P |
| 1. | Engineering Materials | 09 | 03 | - |
| 2. | Drives In Machineries | | | |
| | A. Cams | 09 | 03 | - |
| | B. Transmission | 09 | 03 | - |
| | C. Gear Drives | 09 | 03 | - |
| | D. Couplings | 06 | 02 | - |
| | E. Bearings | 09 | 03 | - |
| 3. | IC Engines | 04 | 02 | - |
| 4. | Basic Workshop Technology | 06 | 02 | - |
| 5. | Civil Engineering Materials | 06 | 02 | - |
| 6. | Foundation | 12 | 04 | - |
| 7. | Air conditionaing System | 05 | 01 | - |
| | | 84 | 28 | - |

DETAILED CONTENTS:

1. ENGINEERING MATERIALS:-

An introduction to mechanical properties of materials. Types of wood and their uses in leather machinery. Ferrous and nonferrous metals; CI types and properties; carbon steel and alloy steel, stainless steel; Non-ferrous metals brass, bronze, copper, aluminium and magnisium alloys.

Tool materials cutting tools, blades, shears, and knives - Heat treatment tools and sharpening and grinding of tools.

An introduction to different mechanisms in machines.

2. DRIVES IN MACHINERIES:

(a) Cams;

Cams as means of producing given type of motion:
types of cams and their applications in machines.

(b) Transmission of Power ;

Power transmission by chain, belt and gear drives.
Specific applications, safety provisions, slipping of
belts. Different types of pulleys and their application.

(ii) Gear drives.

Types - Feature of spur gears, helical gears, bevel gears
and worm gears, Hydraulic pumps and hydraulic drive
mechanisms.

(c) Couplings:

Flange coupling - Universal coupling - Fluid couplings.

(d) Bearings:

Bush bearings, ball and roller bearings - Lubrication of
bearings -- types.

(e) Pneumatic Systems

3. I.C. ENGINES :

Classification and working of I.C. engines

4. BASIC WORK SHOP TECHNOLOGY:

Brazing, soldering and welding : Fitting and machine shop
operations such as shaping, milling, lathework, drilling,
reaming and grinding machine tools used for above work
limits, Fits and tolerances - Fabrication of components
for repair and maintenance,
Principles of working of wood working machines.

5. CIVIL ENGINEERING MATERIALS:

General idea of raw materials, manufacturing process,
properties and uses of Bricks, lime, cement and
Timber.

6. FOUNDATION

- (i) Bearing capacity of soil and its importance, need of
foundation for electrical machines.
- (ii) Foundations for heavy, light and vibrating machines.

(iii) Concrete proportion, mixing w/c ratio, workability
RCC and its use.

7. AIR-CONDITIONING SYSTEM :

Brief concept of Refrigeration and Air-conditioning systems.

2.4 ORGANIC CHEMISTRY

L T P
5 1 8

Rationale:

Basic knowledge of organic chemistry is very much useful for diploma holders in leather technology. The student gets fundamental knowledge about purification of organic compounds, distillation and sublimation estimation of nitrogen, halogen and sulphur, unsaturated hydrocarbons and alkylhalides. Preparation and properties of Chloroform, Iodoform, Petroleum, and Petroleum Products, Alcohols, Glycols, Glycerol, Ether, Aldehydes, Ketones, Acids, Ester, Amines, Amino Acid, Coal, Aromatic Compounds also enrich knowledge of the student. Knowledge of lubrication and plastics will be useful for industry life.

| Sr. No. | Units | Coverage Time | | |
|---------|--|---------------|----|-----|
| | | L | T | P |
| 1. | Introduction, Classification and Nomenclature of organic compounds | 06 | 02 | - |
| 2. | Purification of organic compounds | 05 | 02 | - |
| 3. | Qualitative and Quantitative Elemental analysis | 03 | 02 | - |
| 4. | Empirical, Molecular and Structural Formula | 04 | 03 | - |
| 5. | Structure of organic compounds | 04 | 03 | - |
| 6. | Saturated and unsaturated Hydrocarbons | 03 | 01 | - |
| 7. | Alcohols | 03 | 01 | - |
| 8. | Ether | 02 | 01 | - |
| 9. | Aldehyde and Ketones | 03 | 01 | - |
| 10. | Acids | 04 | 01 | - |
| 11. | Esters | 03 | 01 | - |
| 12. | Amines | 03 | 01 | - |
| 13. | Carbohydrates | 03 | 01 | - |
| 14. | Amino acids, Proteins and Peptides | 04 | 01 | - |
| 15. | Fats, Oils and Waxes | 04 | 01 | - |
| 16. | Aromatic Compounds | 05 | 02 | - |
| 17. | Enzyme Chemistry | 02 | 01 | - |
| 18. | Petroleum and Petrochemicals | 05 | 02 | - |
| 19. | Introduction | 04 | 01 | - |
| | | 70 | 28 | 112 |

DETAILED CONTENTS:

1. INTRODUCTION, CLASSIFICATION AND NOMENCLATURE OF ORGANIC COMPOUNDS:

Introduction, definition and origin, importance of organic compounds. Sources of organic compounds, Classification of organic compounds, Classes of organic compounds, Homologous series. Nomenclature of organic compounds, rules for IUPAC nomenclature.

2. PURIFICATION OF ORGANIC COMPOUNDS :
Criteria of purity, methods of purification - crystallisation, sublimation, distillation, solvent extraction, Different aspects of chromatography.
3. QUALITATIVE AND QUANTITATIVE ELEMENTAL ANALYSIS :
Detection of elements (N, S and Halogens), estimation of hydrogen, Nitrogen, Halogen and sulphur.
4. EMPIRICAL, MOLECULAR AND STRUCTURAL FORMULA :
Determination of Empirical formula, Determination of Molecular formula, Determination of structural formula.
Note :- Numericals based on above topic
5. STRUCTURE OF ORGANIC COMPOUNDS :
Atomic structure, Nature of chemical bonding, arrangement of electrons in orbitals, shapes of s and p orbitals, orbital theory of chemical bonding, factors affecting a covalent bond, inductive effect, mesomeric effect, conjugation, mesomerism, resonance, hydrogen bonding.
6. SATURATED AND UNSATURATED HYDROCARBONS :
General, nomenclature, isomerism, occurrence, general methods of formation, general physical characteristics, general chemical characteristics, preparation and properties of methane and ethane, ethylene and acetylene.
7. ALCOHOLS :
A monohydric alcohols, Dihydric and trihydric alcohol, nomenclature, isomerism. General methods of formation, General physical characteristics, General chemical characteristics, Distinction between primary, secondary and tertiary alcohols. Preparation of ethyl alcohol by fermentation of molasses. Preparation, properties and uses of ethyl alcohol, glycol and glycerol.
8. ETHER :
General nomenclature and isomerism, Preparation, Properties and uses of diethyl ether.
9. ALDEHYDE AND KETONES :

General, nomenclature and isomerism, general physical and chemical characteristics, Preparation, properties and uses of formaldehyde, acetaldehyde and acetone.

10. ACIDS :

Monocarboxylic and dicarboxylic acids, nomenclature and isomerism, General chemical and physical characteristics, Preparation, properties and uses of acetic acid, Lactic acid, Citric acid, tartaric acid, oxalic acid, malonic acid, succinic acids, Substituted acids - acetyl chloride, acetic anhydride, higher fatty acids, members from C12 to C18 (Saturated and unsaturated) sources, properties and uses (Saponification and acid value).

11. ESTERS :

Esters and Esterification, ethyle acetate - preparation, properties and uses.

12. AMINES :

Primary, secondary and tertiary amines, Preparation, properties and uses of methyle and ethyle amines.

13. CARBOHYDRATES :

Introduction, classification, monosaccharide carbohydrate glucose, fructose - Preparation, properties and uses. Disaccharide carbohydrate - Sucrose or can sugar - preparation, properties and uses. Polysaccharide - starch - preparation, properties and uses.

14. AMINO ACIDS, PROTEINS AND PEPTIDES :

Methods and synthesis of α -amino acids (glycine), properties and uses of glycine, Composition of protein, Structure of protein, classification of proteins, physical and chemical characteristics of protein, uses of protein.

15. FATS, OILS AND WAXES :

Introduction to fats and oils, occurrence and extraction, analysis of oils and fats, chemical composition and uses of oils, fats and waxes.

16. AROMATIC COMPOUNDS :

A. Introduction, sources of aromatic compounds. Structural presentation of benzene and other benzenoid compounds, classification and nomenclature, benzene and its homologous,

Difference between Aliphatic and aromatic compounds-
Aromaticity, orientation and aromatic substitution,
Preparation of benzene from coaltar and its uses,
substitution in benzene ring and in side chain.

- B. Some useful reactions - Friedel Crafts reaction, Kolbe synthesis, Reimer Tiemann reaction, Benzoin condensation, Cannizzaro reaction, Perkin reaction.

17. ENZYME CHEMISTRY :

Knowledge of enzymes, simple application of different biological reactions.

18. PETROLEUM AND PETROCHEMICALS :

Occurrence, composition of petroleum, fractional distillation, Different petroleum products and their uses, Petrochemicals, Properties of chloroform and iodoform.

19. Introduction to Bio-technology and its application.

PRACTICALS

1. Estimation of amount of the Copper-volumetrically.
2. Estimation of Calcium in solution using EDTA solution.
3. Estimation of chlorides by using standard solution of silver nitrate and potassium chromate indicator.
4. Estimation of SO_4 & BaSO_4 (Gravimetrically).
5. Estimation of calcium as calcium oxalate (gravimetrically).
6. Estimation of lead as lead chromate (gravimetrically).

7. Detection of Cl, Br, I, S and N present in organic compounds.
8. Detection of functional groups like aldehyde, ketone, carbohydrate, amino, carboxylic groups
9. Identification of enzymes.

2.5 THEORY OF LEATHER MANUFACTURE-I

L T P
4 1 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 syntans etc which will prove very useful in real industrial atmosphere.

| Sr. No. | Units | Coverage Time | | |
|---------|-------------------------|---------------|----|----|
| | | L | T | P |
| 1. | Introduction | 4 | 01 | - |
| 2. | Protiens | 4 | 01 | - |
| 3. | Raw Hides | 9 | 02 | - |
| 4. | Water Quality | 3 | 01 | - |
| 5. | Curing and Preservation | 5 | 01 | - |
| 6. | Pretanning Operations | 10 | 02 | - |
| 7. | Types of Tannages | 5 | 02 | - |
| 8. | Types of Leather | 10 | 02 | - |
| 9. | Cleaning Process | 10 | 02 | - |
| | | 56 | 14 | 84 |

DETAILED CONTENTS:

1. INTRODUCTION :

History of leather manufacture and its uses.

2. PROTIENS:

Nature and types of protiens, physical and chemical composition, Properties of hide protens.

3. RAW HIDES :

- i. Raw stock : Mainly used raw hides and skins, General structural conditions for raw hides, Skin defects
- ii. Anatomical structure of hides and skins.
- iii. Chemical composition and constituents of hides and skins.

4. WATER QUALITY :

Classification according to sources, Possible defects due to substances contained water.

5. CURING AND PRESERVATION:

Methods and chemistry of curing of hides and skins.
Merits and demerits of each method. Code of practice for curing and preservation of cattle hides as per I.S. 7656(1995).

6. PRETANNING OPERATIONS:

Principles and objectives involved in

- (a) Soaking
- (b) Liming
- (c) Deliming
- (d) Bating
- (e) Pickling
- (f) Depickling
- (g) Bleaching
- (h) Degreasing.

7. TYPES OF TANNAGES :

Introduction of vegetable tannage, mineral tannage aldehyde and Chrome Tanning, oil tannage, etc.

8. TYPES OF LEATHER:

Chrome tanned leather, vegetable tanned leather, Aluminium tanned leather, Zirconium, tanned leather, Oil tanned leather, Iron tanned leather, Sulphur tanned leather. According to the nature of finishes/products, Aniline leather, semi aniline tanned leather, Portant leather, Corrected grain leather, Nubuck leather, Suede leather, Nappa leather, Upper Leather, Upholstery leather, Belting leather, Saddlery leather, Harness, Bridle leather.

9. CLEANING PROCESSES:

Hair shaving process, Sulphide free unhairing process, Cleaner process in Beam House/Tan Yard Practices, Role of enzymes of pretanning operation.

PRACTICALS

1. Microscopic examination of hides and skins as per Indian/Inter-National Standard
2. Quantitative chemical analysis of Sodium Chloride, Sodium Sulphide, Lime, Ammonium Chloride, Ammonium Sulphate, Boric Acid, Formic Acid, Hydrochloric Acid, Sulphuric Acid, Ascectic acid and Oxalic acid.
3. Analysis of Chrome Tanning materials and Wet Blue Leathers.
4. Tannery Practice :-

Practice in all Beam House and Chrome Tanning Operations.
5. Glossary of terms relating to Hides and Skins as per Indian/Inter-National Standard.
6. Grading of raw Hides and Skins as per Indian/Inter-National Standard. Identification of defects of raw hides
7. Knowledge of pH and indicators.
8. List of standard tannery chemical suppliers.

NOTE :

All the above noted operations should be prectically 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 lether 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 tanneires should be guided be the subject teacher and technical observations, etc. may be observed and verified by the subject teacher

III Semester

3.1-ELEMENTARY MICROSCOPY AND MICROBIOLOGY

L T P
6 1 4

Rationale:

The scientific study of hides and skins requires microscopic observations. Hence diploma students in leather technology can only effectively analyse the raw materials if they are equipped with practical working knowledge of microscopes, bacteriology and moulds etc. Life cycle of small micro organisms bacteria provides scientific handling and treatment of leather and leather goods.

| Sr. No. | Units | Coverage Time | | |
|---------|---|---------------|----|----|
| | | L | T | P |
| 1. | Microscopy | 15 | 04 | - |
| 2. | Anatomical structure of hair and skin | 8 | 02 | - |
| 3. | Role of Micro organism in different Processes | 8 | 02 | - |
| 4. | Bacteriology | | | - |
| | i. Fundamentals | 8 | 02 | - |
| | ii. Action of Bacteria on hides and skins | 8 | 02 | - |
| 5. | Moulds | 12 | 04 | - |
| | | 84 | 14 | 50 |

DETAILED CONTENTS:

1. Microscopy:
 - (i) Different types of microscopes-mechanical and optical parts in microscope.
 - (ii) Slide preparation for microscopic study:
Preparation of materials, fixing, embedding, section cutting, staining and mounting.
 - (iii) Application of microscopy:
2. Anatomical structure of hair and wool, grain patterns of hides and skins-Fibre structure of leather-microscopic assessment of leather, application of microscopy to note the changes that may take place in processing i.e. curing, soaking, liming, deliming, bating, pickling, tanning and finishing.
3. Role of micro-organism in different processes.

4. BACTERIOLOGY:

(i) Fundamentals of Bacteriology:

Microscopic forms of life, recognition under microscope their culture, preparation of various culture media-sterilisation 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 mod heat and its cure-Bacterial analysis of various tannery substrates in the prevention of growth by use of preservatives as bacteriostatic and bacteriocida agents, determination of productive activity of bacteria.

5. MOULDS:

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/bed blue chrome. Study of preservative in leather science, Action of fungus on leather, Different types of fungus.

PRACTICALS

1. Setting up of microscope.
2. Examination of hides, skins and leather under microscope.
3. Preparation of slides and assessment of leathers.
4. Preparation of culture, staining and identification.
5. Observation of insects, ticks, mites and mite, etc.

| | | |
|---|---|---|
| L | T | P |
| 6 | 1 | - |

Rationale:

Various methods are used for tanning of leather like Vegetable tanning, Oil tanning, Aldehyde tanning, Alum tanning and Zirconium tanning. A thorough study of various tanning techniques and tannages decide the suitability of particular process and selection of tannages for the under consideration.

| Sr. No. | Units | Coverage | | |
|---------|------------------------|----------|----|---|
| | | L | T | P |
| 1. | Chrome Tanning | 10 | 02 | - |
| 2. | Vegetable tanning | 10 | 01 | - |
| 3. | Oil tanning | 10 | 01 | - |
| 4. | Aldehyde tanning | 10 | 02 | - |
| 5. | Alum tanning | 10 | 02 | - |
| 6. | Zirconium tanning | 10 | 02 | - |
| 7. | Miscellaneous tannages | 10 | 02 | - |
| 8. | Combination tannages | 10 | 02 | - |
| 9. | Reactive tannage | 2 | - | - |
| 10. | Tannage with polymers | 2 | - | - |
| | | 84 | 14 | |

DETAILED CONTENTS:

1. CHROME TANNING:

Werners coordination theory of chrome compounds, Chemistry of chromium complexes, Preparation of chrome liquors, Self basifying chrome powder-Hydrolysis, Olation, Oxolation, Polymerization, Theory of Valancey.

Factors influencing chrome tanning like pH, concentration time, temperature and neutral salts. Basification and Basicity principles and chemistry of various chrome tanning methods, mechanism of chrome tanning. Mechanism of chrome tranning, Basic knowledge and cheome recovery and its use. Toxilogical aspect and Hazards of chrome tanning, Defects Caused by chrome tanning. Standards for wet-blue.

2. VEGETABLE TANNING:

Classification, identification, physical and chemical properties-Study of vegetable tanning materials. Preparation of tanning liquors by leaching and preparation of extract,

Types of extracts, sulphitation of tan liquors. Factors involved in vegetable tanning, mechanism of vegetable tanning. Crushers and grinders for bark and nuts, etc. Bleaching, Filling, Fixation of vegetable tanned leather, Controls of vegetable tannage, Defects of vegetable tannage.

3. OIL TANNING:

Types of oils based, their properties, mechanism of oil tanning. Chamois tannage, tannage with Sulpha Chlorides, Tannage with fatty alcohols sulphites.

4. ALDEHYDE TANNING:

Reactions of formaldehyde with proteins, mechanism of aldehyde tanning. Use of glutaraldehyde and dialdehyde in leather manufacture. Hazardous behaviour of Formaldehyde, Glutaraldehyde with leather during processing.

5. ALUM TANNING :

Chemistry of aluminium salts (chlorides and sulphates) hydrolysis, oxidation, oxolation and basification effect of masking salts mechanism of aluminium tanning. Aluminium Silicate Tanning.

6. ZIRCONIUM TANNING :

Zirconium sulphates and chlorides hydrolysis, basification and mechanism of zirconium tanning. Use of zirconium salts in tanning.

7. MISCELLANEOUS TANNAGES :

Application of iron and silicon salts in tanning processes, Sulphur tannages.

8. COMBINATION TANNAGES |

Application of the vegetable oil and synthetic tannins in various combinations in the production of semi chrome and chrome retanned and alum, chrome and alum retan, sulphur, oil-vegetable tannage, chrome zirconium tannage, oil aldehyde tannage their mechanisms (in brief), Sources of effluent of different tannages.

9. Reactive Tannages : Reactive Tannage, Resin Tanning agent.

10. Tannage with Polymer : Polymer tanning agent, Polyphosphates

3.3 THEORY OF LEATHER MANUFACTURE-III

L T P
8 - 6

Rationale:

Several processing steps are involved in obtaining finished leather for manufacturing of leather goods from wet blue leather. This involves selection of wet blue leather, neutralisation, dyeing, fat liquoring, stuffing, stripping and bleaching and water proofing. The knowledge of post tanning operations like sammying, setting and drying, sawdusting, buffing, snuffing is also essential for diploma students in leather technology. Awareness about pigments and binders will provide an aided advantage to the students.

| Sr. No. | Units | Coverage Time | | |
|---------|---------------------------------|---------------|---|----|
| | | L | T | P |
| 1. | Selection, Wet Back, Rechanging | 10 | - | - |
| 2. | Neutralisations | 10 | - | - |
| 3. | Dyeing | 10 | - | - |
| 4. | Retanning | 08 | - | - |
| 5. | Fat Liquoring | 10 | - | - |
| 6. | Stuffing, Stripping & Bleaching | 10 | - | - |
| 7. | Stripping and Bleaching | 08 | - | - |
| 8. | Water Repellant Agents | 08 | - | - |
| 9. | Machine Operations | 14 | - | - |
| 10 | Finishes | 24 | - | - |
| | a. Pigments | | | |
| | b. Binders | | | |
| | c. Compact finishes | | | |
| | | 112 | - | 84 |

DETAILED CONTENTS:

1. Selection of Wet blue leather, Sammying, Splitting and shaving operation, Wet back rechroming.

2. NEUTRALISATION (Deacidification):

Principle of neutralisation and the reactions, Different chemicals used in neutralisation and their application in order to preference. Controls of Neutralisation.

3. DYEING:

Various types of dyes including natural dyes, light, fastness, penetration, washing and colour matching of dyes and their elementary chemistry and behaviour towards leathers. Different types of dyeing auxiliary (leveling, fixing agents and mordents, etc.). Principle and methods of dyeing and uses for different end products with different

recipes. Restricted/Banned Aryle Amine base dyes,
Toxilogical Hazardous aspects of dyes.

4. RETANNING :

Various types of retanning agents including their properties and uses. Types of retanning.

Classification, general methods of preparation, reactions with skin protiens, use in leather manufacture. Types and use of various Resin tanning agents. Syntans used in trade, Phenol free syntans.

5. FAT LIQUORING:

Oils,fats, waxes and their sources, emulsion and their types; Different types of fat and liquors including synthetic gat liquers and new development and their uses.Preparation of fat liquors and their properties and formulation in the manufacture of different types of leathers. Factors effecting choice of fat liquor, mechanism of fat liquoring. Propreity fat liquers and their uses. Water repellent and water proof fat liquors. Controls, errors and possible defects of fat liquoring.

5. STUFFING:

Various types of fats, oil and waxes used their properties, recipes and uses. Application of stuffing.

6. STRIPPING AND BLEACHING:

Principle involved in stripping and bleaching of leathers, effect of bleaching and stripping chemicals in their order of perference, Methods of bleaching.

7. WATER REPELLANT AGENTS:

Different water repellent agents including propriety products and their application.

8. FINISHING:

MACHINE OPERATIONS:

(A) Sammying, setting drying, Vaccume and Toggle:

Object of sammying and setting. Drying process and method of drying with reference to vegetable tanned leather, chrome tanned leather and softy leathers. Vaccum drying-Elementary mechanism and application.

(B) Sawdusting Or Conditioning:

Method and object of conditioning-Nailing and toggling.
Object of nailing and toggling, staking.

(C) Buffing And Snuffing:

Object of buffing and snuffing. Use of emery paper for different purpose.

FINISHES, TYPES OF FINISHES:

(A) Basic products for finishing

(B) Composition And Classification:

General structure and composition of different types of finishes and finishing agents. Classification of finishes. Eco-friendly finishes

(C) Materials:

(i) PIGMENTS:

Classification of pigments, their properties and uses in leather finishing. Preparation of pigments and applications including colour matching (Inorganic and Organic colour lakes).

(ii) BINDERS

Type of binders (casein, shellac, mucilage and gums) properties and use.

Plasticizers, lusters, names of various materials used and method of their application. Resin binder or polymer binders-Types and classification of different binders available in the market and its propriety effect. Waxes and PU finishes.

Filling and impregnation agents and methods.

Nitro cellulose lequer properties and use.

N.C. Lacquer emulsion, classification formulation, dilutable with water or organic solvent with reference to fastness to wet rubbing. Elementary knowledge of PVC lacquer, polyvinyl acetateco-polymer lacquer and polyurethane their applications.

Solvents and diluents.

iii. Compact finishing materials.

(C) Techniques:

Seasons, their formulation and method of applications.

1. Brushing
2. Padding
3. Roller coating
4. Spraying and Polishing
5. Glazing, Burnishing and Brushing
6. Hot Plating.
7. Measuring.
8. Packaging
9. Sources of effluents of post tanning operation.

PRACTICALS

1. Exercises involving dyeing and finishing operations.
2. Guide lines for identification of finished leather for export as per Indian/International Standard.

3.4 GENERAL ENGINEERING II

(Common with Leather Technology, Footwear(CASD))

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

Rationale:

Electrical energy is presently most convenient, neat and clean source of energy. The students when engaged in the industry will require to handle different types of electrical equipment and machines. A fundamental knowledge of terms associated with electricity, tariff system and working of motor's generators, measuring instruments and electric heating will be very useful in day to day working.

| Sr. No. | Units | Coverage Time | | |
|---------|--------------------------------|---------------|---|----|
| | | L | T | P |
| 1. | Advantages of electricity | 6 | - | - |
| 2. | Basic qualities of electricity | 15 | - | - |
| 3. | Electrical tariffs | 15 | - | - |
| 4. | Motor's and Transformer | 15 | - | - |
| 5. | Measuring Instruments | 15 | - | - |
| 6. | Electrical Heating | 12 | - | - |
| 7. | Electrical Safety | 06 | - | - |
| | | 84 | - | 56 |

DETAILED CONTENTS:

1. Application and advantages of electricity :
Various applications of electricity, advantages of electrical energy over other forms of energy.
2. Basic qualities of electricity :
Idea of voltage, current, power, energy - their units; conversion of mechanical units into corresponding electrical units and vice versa : difference between A.C. and D.C., frequency time period, maximum and RMS value, concept of phase and phase difference, power factor, practical importance of power factor.
3. Electrical Tariff System :

Different type of tariffs, effect of low power factor, on tariffs, economics of power factor improvement.
4. Electrical Motors :

Single phase and three phase motors, equipment for starting

and protection of motors, rating of motors. Working Principle of transformer and brief concept of constructional details.

5. Electrical Measuring Instruments :

Working principles and use of the following electrical measuring instruments : Ammeter, Voltmeter, Wattmeter, Energymeter, Multimeter.

6. Electrical Heating :

Advantages of Electric heating : Various methods of heating : Simple description of electric oven.

7. Electrical Safety Measures :

Importance of earthing, safety provisions in Indian Electricity Rules, Treatment of electric shock.

PRACTICALS:

1. Starting of a three phase induction motor :
 - (i) Direct on lines
 - (ii) Through star-delta starter
2. (a) Practical instructions of safety precautions while handling electrical apparatus and live circuits.

(b) Demonstration of treatment against electric shock.
3. Connection of lamp, ceiling fan, socket outlets, Fluorescent tube, etc.
4. Reversing the direction of rotation of a:
 - (i) Single phase induction motor
 - (ii) Three phase induction motor
5. Measurement of voltage, current, power and power factor of a single phase A.C. circuit.
6. Measurement of resistance of the following by ammeter voltmeter method by a multimeter :
 - (i) Winding resistance of an electrical motor
 - (ii) Resistance of a high value rheostat
7. Trouble shooting on a three phase motor.
Note : The students should be able to detect most common

faults like loose connections, blown fuse, single phasing, incorrect direction of rotation etc. which may occur in a three phase motor.

8. Study of a transformer and determination of its turn ratio by measurement of primary and secondary voltage.
9. Preparing the layout plan of electrical supply system of an institute starting from the indoor substation by actual observation.
10. Starting and reversing the direction of rotation of a single phase induction motor.

4.1 Functional Communication

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

TOPIC WISE DISTRIBUTION OF PERIODS

| Sl.No. | Units | Coverage Time | | |
|--------------------------|------------------------------|---------------|---|---|
| | | L | T | P |
| Section A English | | | | |
| 1. | On Communication | 04 | - | - |
| 2. | Exploring Space | 04 | - | - |
| 3. | Sir C.V. Raman | 04 | - | - |
| 4. | Professional Development | 04 | - | - |
| 5. | Buying a Second Hand Bicycle | 04 | - | - |
| 6. | Leadership and Supervision | 04 | - | - |
| 7. | First Aid | 03 | - | - |
| 8. | The Romanance of Reading | 03 | - | - |
| 9. | No Escape from Computers | 03 | - | - |
| 10. | Bureau of Indian Standards | 03 | - | - |
| Section B Hindi | | | | |
| 1. | Topic 1 | 02 | - | - |
| 2. | Topic 2 | 02 | - | - |
| 3. | Topic 3 | 02 | - | - |
| 4. | Topic 4 | 02 | - | - |
| 5. | Topic 5 | 02 | - | - |
| 6. | Topic 6 | 02 | - | - |
| 7. | Topic 7 | 02 | - | - |
| 8. | Topic 8 | 01 | - | - |
| 9. | Topic 9 | 02 | - | - |
| 10. | Topic 10 | 02 | - | - |
| 11. | Topic 11 | 01 | - | - |
| | | 56 | - | - |

Section "A" (English)

Text Lessons

| | |
|-----------|---|
| Unit I. | On Communication |
| Unit.II | Exploring Space |
| Unit.III | Sir C.V. Raman |
| Unit.IV | Professional Development of Technicians |
| Unit.V | Buying a Second Hand Bicycle |
| Unit.VI | Leadership and Supervision |
| Unit.VII | First Aid |
| Unit.VIII | The Romanance of Reading |
| Unit.IX | No Escape from Computers |
| Unit.X | Bureau of Indian Standards |

Section "B" Hindi

1& Lojstxkj
2& Hkkjrh; oSkfudka , oa rduhfd; ka dk Hkkjr ds fodkl ea ; ksnku
3& xkE; fodkl
4& ifjokj fu; kstu
5& I kekftd I l Fkk; a
6& fu; kstu vkj tu dY; k.k
7& Hkkjr ea i kSj ffxdh ds fodkl dk bfrgkl
8& gfjr dkkflr
9& i ; kbj.k , oa ekuo i nllk.k
10& Jfed dY; k.k
11& Hkkjr ea Jfed vllnksyu

4.2 PROCESS OF LEATHER MANUFACTURE-I

L T P
7 - 7

Rationale:

Before manufacture of footwear and leather goods processing of leather is required. Processing technique for heavy and industrial leathers involve many steps. The students must be conversant with the processing techniques of different types of leathers used in the industry. This is very much useful for maintaining export quality of leathers in the international market.

| Sr. No. | Units | Coverage Time | | |
|---------|--------------------------------|---------------|---|----|
| | | L | T | P |
| 1. | Industrial Leathers | | | |
| a. | Selection of hides & skins | 10 | - | - |
| b. | Manufactur of textile leather | 14 | - | - |
| c. | Manufacture of roller leather | 10 | - | - |
| d. | Pickers and packing | 10 | - | - |
| e. | Combing | 10 | - | - |
| f. | Gill box leather | 10 | - | - |
| g. | Indian standards | 10 | - | - |
| h. | Hydraulic & mechanical leather | 10 | - | - |
| i. | Oil seal & Diaphragm leather | 12 | - | - |
| | | 96 | - | 96 |

DETAILED CONTENTS:

1. INDUSTRIAL LEATHERS:

Selection of Hides and Skins, Manufacture of textile leather, Roller leathers, Pickers and Picking band leathers, Buffer and Check strap leathers, Combing, Condenser tape, Gillbox leathers and their uses with Indian standards, Hydraulic and mechanical leathers, Cup and Pump, Hydraulic ram, Oil seal Leather, Diaphragm Leather, Gas meter leather with their uses and Indian Standards. Leather for musical instruments.

PRACTICAL

Manufacture of some important industrial leathers.

4.3 PROCESS OF LEATHER MANUFACTURE-II

L T P
5 - 6

Rationale:

Before manufacture of footwear and leather goods processing of leather is required. Processing technique for heavy and industrial leathers involves many steps. The students must be conversant with the processing techniques of different types of leathers used in the industry. This is very much useful for the maintaining export quality of leathers in the international market.

| Sr. No. | Units | Coverage Time | | |
|---------|-----------------------------------|---------------|---|----|
| | | L | T | P |
| 1. | Heavy Leathers | | | |
| | a. Selection of hides | 8 | - | - |
| | b. Manufactur of sole leather | 8 | - | - |
| | c. Safety Shoe Leather | 8 | - | - |
| | d. Manufacture of harness | 8 | - | - |
| | e. Manufacture of belting leather | 8 | - | - |
| 2. | Sports goods leathers | | | |
| | a. Lace & Strap leather | 15 | - | - |
| | b. Industrial glove leather | 15 | - | - |
| | | 70 | - | 84 |

DETAILED CONTENTS:

1. HEAVY LEATHERS

Selection of hides and skin , Manufacture of vegetable and chrome sole leather and water Replent leather and Non water replent leather; manufacture of harness and saddlery leather, Belting leather etc..

2. SPORTS GOODS LEATHER:

Leathers for inflated balls (Football, Basketball, Volleyball, Handball, Rugby ball etc.) hockey and cricket ball leather, grip leather, batting and wicket keeping glove leather, golf glove leather and industrial glove leather. Lace and strap leather for legguards, Bag Tanning.

PRACTICALS

Manufacture of some important sports & heavy leathers.

4.4 LEATHER TRADE ENGINEERING

L T P
3 - 3

Rationale:

Different types of machinery and machine components are used in leather industry. Awareness of selection of site and equipments used in tannery is very much useful for diploma student in leather technology. The leather trade engineering is directly utilised in industrial atmosphere. The students are supposed to possess knowledge about selection of site, water and power, transmission of power, drums, paddles, pits and tannery machinery.

| Sr. No. | Units | Coverage Time | | |
|---------|----------------------------------|---------------|---|----|
| | | L | T | P |
| 1. | Selection of site and layout | 6 | - | - |
| 2. | Water & Power | 6 | - | - |
| 3. | Drums, Paddles and Pits | 6 | - | - |
| 4. | Tannery Machinery | 6 | - | - |
| 5. | Finishing Machines | 6 | - | - |
| 6. | Conservation of energy and water | 6 | - | - |
| 7. | Plant Maintenance | 6 | - | - |
| | | 42 | - | 42 |

DETAILED CONTENTS:

1. SELECTION OF SITE AND LAYOUT :

Location of tannery, factors influencing the selection of the site, geographical background, soil and water, power, transport facilities, facilities for disposal of effluents, port facilities for export and import of tannery goods.

Location of Tannery: Ground and size of the tannery, layout of different sections with various pots, drums and other machinery, a general idea of the construction of building for free air, light and ventilators, window, doors, roof natural and artificial lighting arrangements.

2. WATER AND POWER:

Sources of water supply and its storing, distribution of water by pipe lines, valves etc. Production of steam for power, steam boilers, different types of boilers, their main components and functions, advantages and disadvantages of

machine power and electrical power.

3. DRUMS, PADDLES AND PITS:

Size and description of drums, paddles along with their weight and cost, their rection and construction. Drives for drums and paddles, routine maintenance and repair arrangement of different pits, construction details of pits size and cost of pits, preparation of estimate for the construction of the pits, building, total cost of tannery yards with and without machinery.

4. TANNERY MACHINERY

General construction, descriptive idea of various tanning machinery like flashing, Hair trimming, Vaccume, Toggle, Samming, Wet mollisha scudding, setting, shaving splitting, buffing, stacking etc. Mode of working, fuel and speed, power required, types of driver for each machine, total power in kw, general maintenance and repair; repair, size weigth and cost of each machine and its availability.

5. FINISHING MACHINES:

Principle of working of various finishing machines Buffring, Spray, Embossing, Milling, Rollor, Cotter, Hydraulic Press Contiles Press with free hand drawing, weight, cost and capacities power required, total power for finishing yard, maintenance and repair of machinery, safety precautions to be observed in case of each machine.

6. Conservation of energy and water.

7. PLANT MAINTENANCE :

1. Functions of maintenance department.

2. Maintenance Procedure-Preventive maintenance, Routine maintenance and breakdown maintenance of leather machineries and accessories.

3. Lubrication and Oiling procedure in rotine maintenance and developement of lubrication charts.

4. Fabrication and repair of components for breakdown maintenance.

5. Estimating the repair and maintenance cost.

6. Safety - Definition, Importance, Causes of Accidents,

Accident Prevention rules, General safety devices.

PRACTICALS

1. Study of various working parts of the tanning machines, their make, function etc. Checking alignment and rectifying defects therein,
2. Removal of parts for general maintenance and routine service repair, renewal and reassembly.
3. Replacement of worn out knives of splitting machine and their renewal.
4. Adjustment of grinding wheels and other attachments of splitting, shaving and fleshing machines.
5. Removal and refixing of the glazing glass, rollers and seaks in the stacking machines shafts in buffing machine and old grinder in the shaving machine;
6. General check up of all the electrical equipment motors, starters, switches, fuses etc.
7. Replacement of belts, fastening, checking slacknes of belts. their remedies, checking of pullies, tightening loose shafts, bearing and other alignments.
8. Study of spray guns and drying chambers.
9. Demonstration of correct methods of operating machines first aid training.
10. Blue print reading of tannery layout and installation drawing.

4.5 INTRODUCTION TO COMPUTER

[Common with Civil Engg., Civil (Spl. With Rural), Mechanical Engg., (Specialisation in Production, Automobile, Refrigeration and Air conditioning), Electronics Engg., Instrumentation and Control Engg., Dairy Engg., Leather Technology, Footwear and Leather Goods Tech., Ceramics, Chemical Engg. (Four year Sandwich), Chemical Tech. (Rubber & Plastic), Chemical Tech. (Fertilizer)]

L T P
2 - 5

Rationale:

Computers are being used for design and information processing in all branches of engineering. An exposure to fundamentals of computer programming is very essential for all diploma holders. This subject has been included to introduce students in the use and application of computers in engineering.

TOPIC WISE DISTRIBUTION OF PERIODS

| Sl.No. | Units | Coverage Time | | |
|--------|--|---------------|---|----|
| | | L | T | P |
| 1. | Introduction to Computer | 4 | - | - |
| 2. | Introduction To Operating System (MS DOS/Windows) | 3 | - | - |
| 3. | Word Processing | 4 | - | - |
| 4. | Worksheet | 4 | - | - |
| 5. | Presentation | 4 | - | - |
| 6. | Data Base Operation | 3 | - | - |
| 7. | Introduction to Internet | 2 | - | - |
| 8. | Introduction to advance tools | 4 | - | - |
| | | 28 | - | 70 |

DETAILED CONTENTS

1. Introduction to Computer:
 - A. Block Diagram of Computer.
 - B. Types Of Computer
 - C. Types of Input and Output devices
 - D. Memories Devices (Its Types and Basic).
2. INTRODUCTION TO OPERATING SYSTEMS (MS-DOS/MS-WINDOWS:)

What is operating system, its significance, Commands of DOS, Features/Application of window.
3. WORD PROCESSING:

File : Open, Close, Save, Save as, Search, Send to, Print Preview, Print and Page Setup

Edit : Cut, Copy, Paste, Office Clipboard, Select All, Find, replace, Goto, etc.
View : Normal/Web Layout/Print Layout; Tool Bars; Header/Footer; Zoom, etc.
Insert: Break, Page Number, Date & Time, Symbol, Comment, Reference, etc.
Format: Font, Paragraph, Bullets & Numbering, Borders & Shading, Column, Change case, Back ground, etc.
Tools : Spelling & Grammer, Language, Word Count, Letters & Mailing, Options, Customize, etc.
Table : Draw, Insert, Delete, Select, Auto Format, AutoFit, Convert, Sort, Formula, etc.
Mail Merge

4. WORKSHEET:

Introduction, Use of Tools/Icons for preparing simple Mini Project.

5. PRESENTATION :

Introduction, Use of Tools/Icons for preparing simple presentation on Power Point.

6. DATABASE OPERATION :

Create database using MS Access, Create Table and Creating Reports.

7. Introduction to Internet:

What is Network, How to send & receive messages, Use of Search Engines, Surfing different web sites. Creating Mail ID, Use of Briefcase, Sending./replying emails.

8. INTRODUCTION TO ADVANCE TOOLS :

I. Steps requires to solving problems.
A. Flow Chart
B. Algroithm
C. Programming

II. Use of advance Tools such as Skype, Teamviewer, Installation of Modem, use of WiFi, Etc.

INTRODUCTION TO COMPUTER LAB

List Of Practicals

1. Practice on utility commands in DOS.
2. Composing, Correcting, Formatting and Article (Letter/Essay/Report) on Word Processing tool Word and taking its print out.
3. Creating, editing, modifying tables in Database tool.
4. Creating labels, report, generation of simple forms in Database tool.
5. Creating simple spread sheet, using in built functions in Worksheet tool..
6. Creating simple presentation.
7. Creating mail ID, Checking mail box, sending/replying e-mails.
8. Surfing web sites, using search engines.

Note : In the final year, related students have to use the concept of MS Word/MS Excel/MS Access/ MS Power Point in their respective branch's project work such as creating project report through MS Word/Creation of statistical data in MS Excel/Creation of database in MS Excel/ Demonstration of project through Power Point Presentation.

TOPIC WISE DISTRIBUTION OF PERIODS

| Sl.No. | Units | Coverage Time | | |
|--------|---|---------------|---|----|
| | | L | T | P |
| 1. | Introduction to Personality Development | - | - | 02 |
| 2. | Factors Influencing / Shaping Personality | - | - | 02 |
| 3. | Self Awareness - 1 | - | - | 03 |
| 4. | Self Awareness - 2 | - | - | 02 |
| 5. | Self Awareness - 3 | - | - | 02 |
| 6. | Change Your Mind Set | - | - | 02 |
| 7. | Interpersonal Relationship and Communication | - | - | 03 |
| 8. | Non-Verbal communication Communication Skills | - | - | 02 |
| 9 . | Communication Skills ACTIVITIES | - | - | 06 |
| 10. | Body Language skills | - | - | 03 |
| 11. | Leadership Traits & Skills | - | - | 03 |
| 12. | Attitude | - | - | 03 |
| 13. | Analyzing & Solving a Problem skills | - | - | 02 |
| 14. | Time Management skills | - | - | 03 |
| 15. | Stress Management Skills | - | - | 02 |
| 16. | Interview Skills | - | - | 04 |
| 17. | Conflict Motives | - | - | 02 |
| 18. | Negotiation / Influencing Skills | - | - | 02 |
| 19. | Sociability | - | - | 03 |
| 20. | Importance of Group | - | - | 03 |
| 21. | Values / Code of Ethics | - | - | 02 |
| | | - | - | 56 |

PERSONALITY DEVELOPMENT

1 Introduction to Personality Development

AIM, Skills, Types of Skills, LIFE SKILLS VS OTHER SKILLS, Concept of Life Skills. Ten core Life Skills identified by

WHO

2. Factors Influencing / Shaping Personality :

Introduction, Physical and Social Factors Influencing / Shaping

Personality (Hereditary, Self-Development, Environment, Education, Life-situations) Psychological AND Philosophical Factors Influencing / Shaping Personality (Past Experiences, Dreams and Ambitions, Self-Image, Values)

3. Self Awareness - 1

DIMENSIONS OF SELF AWARENESS (Self Realization, Self Knowledge or Self Exploration, Self Confidence, Self Talk, Self

Motivation, Self Esteem, Self Image, Self Control, Self

Purpose, Individuality and Uniqueness, Personality, Values, Attitude, Character), SELF REALIZATION AND SELF EXPLORATION THROUGH SWOT ANALYSIS AND JOHARI WINDOW,

4. **Self Awareness - 2**

SYMPATHY VS EMPATHY AND ALTRUISM,
Importance of Empathizing with Others,

5. **Self Awareness - 3**

Self-Awareness through Activity, Body Image (What is Body Image, What Decides our Body Image, What is Poor Body Image, What are the Harmful Effects of Poor Body Image), Tackling Poor Body Image(Enhance Self-Esteem, Build Up Critical Thinking, Build up Positive Qualities, Understand Cultural Variation, Dispel Myths, Utilize Life Skills)

6. **Change Your Mind Set**

What is Mindset, HOW TO CHANGE YOUR MINDSET (Get the Best Information Only, Make the best people your Role Model, Examine Your Current Beliefs, Shape Your Mindset with Vision and Goals, Find Your Voice, Protect Your Mindset, Let Go of Comparisons, Put An End To Perfectionism, Look At The Evidence, Redefine What Failure Means, Stop Worrying About What "People" Think)

INTERPERSONAL SKILLS

7. **Interpersonal Relationship and Communication**

INTERPERSONAL RELATIONSHIP , Forms of Interpersonal Relationship, Must Have in an Interpersonal Relationship, Interpersonal Relationship between a Man and a Woman (Passion, Intimacy, Commitment), Relationship Between Friends, ROLE OF COMMUNICATION IN INTERPERSONAL RELATIONSHIP (Take Care Of Your Tone And Pitch, Choice of Words is Important in Relationships, Interact Regularly, Be Polite, Try To Understand The Other Person's Point Of View As Well, Individuals Can Also Communicate Through Emails,

8. **NON-VERBAL COMMUNICATION Communication Skills**

Non-Verbal Communication,
We Communicate with Our Eyes, Communication with Facial Expression, A Good Gesture, Appearance, Posture and Gait, Proximity and Touch), IMPORTANCE OF LISTENING, Characteristics of Good and Effective Listener(Is Attentive,

Do

Not Assume, Listen for Feelings and Facts, Concentrate on the Other Speakers Kindly and Generously, Opportunities)

9. **Communication Skills ACTIVITIES -**

Activities in Making Collages, Making Advertisements, PPT Preparation & Presentation, Speaking -Seminars, Group Discussions, Debates, Extempore Speeches, Listening to an audio clip and telling its

gist, Answering a telephone call, Making enquiries, General tips-
Pronunciation, Tone, Pitch, Pace, Volume, relevance, brief, simple Reading Newspaper, Magazines (Current Affairs, Economic magazines, Technical magazines), How to read a report, article, Writing- Resume Writing, Writing joining report,
Notice writing, Report making, Proposal writing, Advertisement,
Notice for tender, Minutes writing, E-Mail writing, Listening News, Listening to audio clips.(Lecture, poetry, speech, songs),

10. Body Language skills

Introduction, What is Body Language , Body Language Parts, Personal Space Distances (Intimate Distance, Personal Distance,
Social Distance, Public Distance), IMPORTANT BODY LANGUAGE SIGNS AND THEIR MEANING

UNDERSTANDING OTHERS

11. Leadership Traits & Skills :

Introduction, Important Leadership Traits (Alertness, Bearing,
Courage, Decisiveness, Dependability, Endurance, Enthusiasm, Initiative, Integrity, Judgment, Justice, Knowledge, Loyalty, Sense
of Humour), Other Useful traits (Truthfulness, Esprit-de-corps,
Unselfishness, Humility and sympathy, Tact without loss of moral
courage, Patience and a sense of urgency as appropriate, Selfconfidence,
Maturity, Mental including emotional stability)

12. Attitude

Types of Attitude, Components of Attitudes (Cognitive Component, Affective Component, Behavioral Component),
Types of Attitudes (Positive Attitude, Negative Attitude, Neutral
Attitude, Rebellious Attitude, Rational and Irrational Attitudes,
Individual and Social Attitudes), Kinds of Attitude, ASSERTIVENESS, How to Develop Assertiveness (Experiment and Try New Things, Extend Your Social Circle, Learn to Make Decisions for Yourself, Indulge in Knowledge, Admire Yourself
&
Others), Negotiation (Be Sensitive to The Needs Others, Be Willing To Compromise, Develop Your Problem-Solving Skills, Learn to Welcome Conflict, Practice Patience, Increase Your Tolerance For Stress, Improve Your Listening Skills, Learn To

Identify Bottom-Line Issues Quickly, Be Assertive, Not Aggressive)

PROBLEM SOLVING

13. Analyzing & Solving a Problem skills

Critical Thinking, Creative Thinking, Decision Making, Goal Setting & Planning, Problem Solving

14. Time Management skills

Need of Time Management, TIME WASTERS (Telephone, Visitors , Paper work, Lack of Planning & Fire Fighting , Socializing , Indecision , TV , Procrastination), PRINCIPLES

OF

TIME MANAGEMENT - Develop a Personal Sense of Time (Time Log , value of other people's time), Identify Long-Term Goals ,

Concentrate on High Return Activities , Weekly & Daily Planning

(The Mechanics of Weekly Planning , Daily Planning), Make the

Best Use of Your Best Time , Organize Office Work

(Controlling

Interruptions , Organizing Paper Work), Manage Meetings, Delegate Effectively, Make Use of Committed Time, Manage Your Health,

15. Stress Management Skills

INTRODUCTION, Understanding Stress and its Impact, Expected Responses (Physical, Emotional, Behavioral), stress signals(thoughts, feelings, behaviors and physical), STRESS MANAGEMENT TECHNIQUES (Take Deep Breath, Talk It Out, Take A Break, Create a Quiet Place in Your Mind, Pay

Attention

to Physical Comfort, Move, Take Care of Your Body, Laugh, Manage Your Time, Know Your Limits, Do You Have To Be Right Always, Have A Good Cry, Look for the Good Things Around You, Talk Less, Listen More), UNDERSTANDING EMOTIONS AND FEELINGS-through Activity

16. Interview Skills (2 sessions from Industry Expert is Compulsory)

Curriculum Vitae (When Should a CV be Used, What Information Should a CV Include, personal profile, Covering Letter, What Makes a Good CV, How Long Should a CV Be, Tips on Presentation), Different Types of CV (Chronological, Skills-Based), BEFORE THE INTERVIEW , CONDUCTING YOURSELF DURING THE INTERVIEW , FOLLOWING THROUGH AFTER THE INTERVIEW , Interview Questions To Think About , MOCK INTERVIEW - Activity (MOCK INTERVIEW EVALUATION - NON-VERBAL BEHAVIORS, VERBAL BEHAVIORS, General Etiquettes to face the Board , Telephonic interview

17. Conflict Motives -Resolution

Motives of Conflict(Competition for Limited Resources, The Generation Gap and Personality Clashes, Aggressive Personalities, Culturally Diverse Teams, Competing Work and Family Demands, Gender Based Harassment), Merits and Demerits of Conflict , Levels of Conflict (Interpersonal Conflict, Role Conflict, Inter-group Conflict, Multi-Party Conflict, International Conflict), Methods of Conflict Resolution (The Win-Lose Approach, The Lose-Lose Strategy, The Win-Win Approach), Techniques for Resolving Conflicts (Confrontation and Problem Solving Leading to Win-Win, Disarm the Opposition, Cognitive Restructuring, Appeal to Third Party, The Grievance Procedure)

18. Negotiation / Influencing Skills

Why Influencing, What Is Influencing, TYPES OF INFLUENCING SKILLS (Probing And Listening, Building Rapport, Sign Posting, Pacing, Selling, Assertiveness), LAWS AND PRINCIPLES OF INFLUENCE, The Six Laws of Influence (The Law of Scarcity, The Law of Reciprocity, The Law of Authority, The Law of Liking, The Law of Social Proof, The Law of Commitment and Consistency), Influencing Principles (Making a Start, Buy Yourself Thinking Time, Dealing With Disagreement, Difficult And Sensitive Situations)

19. Sociability : Etiquettes And Mannerism & Social Skills

Need for Etiquette , Types of Etiquettes (Social Etiquette, Bathroom Etiquette, Corporate Etiquette, Wedding Etiquette, Meeting Etiquette, Telephone Etiquette, Eating Etiquette, Business Etiquette, E-Mail Etiquettes,), MANNERISMS, HOW TO IMPROVE YOUR SOCIAL SKILLS (Be Yourself, Be Responsible, Be Open & Approachable, Be Attentive, Be Polite, Be Aware, Be Cautious)

20. Importance of Group / Cross Cultural Teams / Team Work skills

Introduction, Types and Characteristics of Groups (Definition of a Group, Classification / Types of Groups, Friendship Group, Task Group, Formal Groups, Informal Group, Effective Group), Importance of a Group, Characteristics of a Mature Group, TYPES AND CHARACTERISTICS OF A TEAM (Definition of a Team, Types of Teams, Functional Teams, Problem Solving Teams, Cross - Functional Teams, Self - Managed Teams), Importance of a Team, Characteristics of a Team

21. VALUES / CODE OF ETHICS

Meaning, A FEW IMPORTANT VALUES (Honesty, Integrity, Purity, Discipline, Selflessness, Loyalty, Fairness, Equality, Trust, Support, Respect, etc)

Note : One Orientation module for the faculty is must.
Involvement of Industry Experts is necessary for Interview Skills

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

RATIONALE

The knowledge of this subject is required for all engineers/technicians who wish to choose industry/field as their career. This course is designed to develop understanding of various functions of management, role of workers and engineers and providing knowledge about industrial and tax laws.

TOPIC WISE DISTRIBUTION OF PERIODS

| Sl.No. | Units | Coverage Time | | |
|--------|--------------------------------|---------------|---|---|
| | | L | T | P |
| 1. | Principles of Management | 8 | - | - |
| 2. | Human Resource Development | 10 | - | - |
| 3. | Wages and Incentives | 4 | - | - |
| 4. | Human and Industrial Relations | 6 | - | - |
| 5. | Professional Ethics | 2 | - | - |
| 6. | Sales and Marketing management | 10 | - | - |
| 7. | Labour Legislation Act | 10 | - | - |
| 8. | Material Management | 8 | - | - |
| 9. | Financial Management | 8 | - | - |
| 10. | Entrepreneurship Development | 8 | - | - |
| 11. | Fundamental of Economics | 5 | - | - |
| 12. | Accidents and Safety | 5 | - | - |
| | | 84 | - | - |

DETAILED CONTENTS**1. Principles of Management**

- 1.1 Management, Different Functions: Planning, Organising, Leading, Controlling.
- 1.2 Organizational Structure, Types, Functions of different departments.
- 1.3 Motivation: Factors, characteristics, methods of improving motivation, incentives, pay, promotion, rewards, job satisfaction, job enrichment.
- 1.4 Need for leadership, Functions of a leader, Factors for accomplishing effective leadership, Manager as a leader, promoting team work.

2. Human Resource Development

- 2.1 Introduction, objectives and functions of human resource development (HRD) department.
- 2.2 Recruitment, methods of selection, training strategies and career development.
- 2.3 Responsibilities of human resource management - policies and functions, selection - Mode of selection - Procedure - training of workers, Job evaluation and Merit rating.

3. Wages and Incentives

- 3.1 Definition and factors affecting wages, methods of wage payment.
- 3.2 Wage incentive - type of incentive, difference in wage, incentive

- and bonus; incentives of supervisor.
- 3.3 Job evaluation and merit rating.
- 4. **Human and Industrial Relations**
 - 4.1 Industrial relations and disputes.
 - 4.2 Relations with subordinates, peers and superiors.
 - 4.3 Characteristics of group behaviour and trade unionism.
 - 4.4 Mob psychology.
 - 4.5 Grievance, Handling of grievances.
 - 4.6 Agitations, strikes, Lockouts, Picketing and Gherao.
 - 4.7 Labour welfare schemes.
 - 4.8 Workers' participation in management.
- 5. **Professional Ethics**
 - 5.1 Concept of professional ethics.
 - 5.2 Need for code of professional ethics.
 - 5.3 Professional bodies and their role.
- 6. **Sales and Marketing management**
 - 6.1 Functions and duties of sales department.
 - 6.2 Sales forecasting, sales promotion, advertisement and after sale services.
 - 6.3 Concept of marketing.
 - 6.4 Problems of marketing.
 - 6.5 Pricing policy, break even analysis.
 - 6.6 Distribution channels and methods of marketing.
- 7. **Labour Legislation Act (as amended on date)**
 - 7.1 Factory Act 1948.
 - 7.2 Workmen's Compensation Act 1923.
 - 7.3 Apprentices Act 1961.
 - 7.4 PF Act, ESI Act.
 - 7.5 Industrial Dispute Act 1947.
 - 7.6 Employers State Insurance Act 1948.
 - 7.7 Payment of Wages Act, 1936.
 - 7.8 Intellectual Property Rights Act
- 8. **Material Management**
 - 8.1 Inventory control models.
 - 8.2 ABC Analysis, Safety stock, Economic ordering quantity.
 - 8.3 Stores equipment, Stores records, purchasing procedures, Bin card, Cardex.
 - 8.4 Material handling techniques.
- 9. **Financial Management**
 - 9.1 Importance of ledger and cash book.
 - 9.2 Profit and loss Account, Balance sheet.
 - 9.3 Interpretation of Statements, Project financing, Project appraisal, return on investments.
- 10. **Entrepreneurship Development**
 - 10.1 Concept of entrepreneur and need of entrepreneurship in the context of prevailing employment conditions.
 - 10.2 Distinction between an entrepreneur and a manager.
 - 10.3 Project identification and selection.
 - 10.4 Project formulation.
 - 10.5 Project appraisal.

- 10.6 Facilities and incentives to an entrepreneur.
- 11. **Fundamental of Economics**
 - 11.1 Micro economics.
 - 11.2 Macro economics.
- 12. **Accidents and Safety**
 - 12.1 Classification of accidents based on nature of injuries, event and place.
 - 12.2 Causes and effects of accidents.
 - 12.3 Accident-prone workers.
 - 12.4 Action to be taken in case of accidents with machines, electric shock, fires and erection and construction accidents.
 - 12.5 Safety consciousness and publicity.
 - 12.6 Safety procedures.
 - 12.7 Safety measures - Do's and Don'ts and god housing keeping.

5.3 PROCESS OF LEATHER MANUFACTURE-III

L T P
6 - 8

Rationale:

Leather for specific purpose like book Binding, Box, Morocco leather, Corrected grain leather, glazed kid leather, Suede upper leather, Leather for gloves and Garments, Num bulk leather and Chamois leather require different type of treatment. A student is supposed to possess knowledge and skill of treatment for these specific leathers. The knowledge will be further reenforced if he is familiar with fancy leathers.

| Sr. No. | Units | Coverage Time | | |
|---------|--|---------------|---|-----|
| | | L | T | P |
| 1. | Selection of Hide & skins, Processing Effect | 9 | - | - |
| 2. | E.I & Vegetable Tanned Leathers | 9 | - | - |
| 3. | Leather for Special Purposes | 15 | - | - |
| 4. | Garment, Gloves and Hat Leather | 9 | - | - |
| 5. | Fancy & Fine Leather | 9 | - | - |
| 6. | Leathers with Hair | 9 | - | - |
| 7. | Orthopaedic Leather | 9 | - | - |
| 8. | Chrome & Chrome Free | 9 | - | - |
| 9. | Raw Skin Products | 6 | - | - |
| | | 84 | - | 112 |

DETAILED CONTENTS:

1. Selection of hides and skins, Processing Effect.
2. Manufacture of E.I. and vegetable tanned leathers from sheep, Goat skins and cow hides.
3. Book binding and Morocco leather. Manufacture of box and willow shoe upper, shoe inside leather, Shoe under side leather leathers, corrected grain leathers, glazed kid leather, suede upper leathers, Leather for sports equipment, Furniture and Upholstery, Nu-Buck leathers upholstery leather. Manufacture of chamois leather. Manufacturing of lining leather. Manufacture of oil pull-up. Brush-off, Burnish and shrunken grain leather.
4. Gloving and grain garment leathers, suede garment leathers.
5. Manufacture of fancy and fine leathers, leathers from splits, patent leathers, Leather for softy and work protection,
6. Leathers with hair,
7. Orthopaedic Leather.
8. Chrome & Chrome Free Tanned Leather
9. Raw Skin products.

PRACTICALS
Manufacture of some important leathers.

5.4-ELEMENTS OF FOOTWEAR AND LEATHER GOODS MANUFACTURE

L T P
6 - 8

Rationale:

Some times the diploma holders in leather technology have to bear dual responsibility of holding positions as leather and leather goods manufacturing technician. To deal with such circumstances knowledge of leather goods and footwear manufacture is very much essential. Direct on the job training is necessary to develop skill component along with knowledge components

| Sr. No. | Units | Coverage Time | | |
|---------|---|---------------|---|-----|
| | | L | T | P |
| 1. | Anatomy of Human Foot | 8 | - | - |
| 2. | Footwear Designing, Styling and Pattern Cutting | 8 | - | - |
| 3. | Machines and Tools | 8 | - | - |
| 4. | Layout, Casting and Marketing | 8 | - | - |
| 5. | Importance of Leather Goods | 10 | - | - |
| 6. | Materials for Leather Goods | 10 | - | - |
| 7. | Leather Based Sports Goods | 10 | - | - |
| 8. | Quality Assurance | 12 | - | - |
| | | 84 | - | 112 |

DETAILED CONTENTS:

1. FOOTWEAR:

Brief knowledge of foot anatomy, foot care and foot comfort and their relation to footwear.

Different types of footwear designing, styling and pattern cutting characteristics of various materials used for upper, lining and bottom parts. Modern methods of construction and machinery, Standardisation of footwear grinders, hand tools and quality control. Elementary knowledge of layout, costing and marketing.

2. LEATHER GOODS:

Leather goods industry, its impact and importance in modern life. Classification of leather goods such as travelling goods, hand bags and other pretty articles.

Characteristics of materials and their selection. Modern methods of fabrication and machinery. Standardisation of materials, fitting, hand, tools, quality assurance and Planning and Production control. Designing, styling and

pattern cutting, layout costing and marketing (only elementary). Study of manufacture of leather based sports goods (elementary).

3. Grading of leathers, common defects in leather, sorting.

PRACTICALS

1. FOOTWEAR:

(i) Exercises in disinging and pattern cutting, visual examination of materials and grinderies.

(ii) Fabrication of simple types of footwear such as chappal, sandal, derby shoe.

2. LEATHER GOODS:

Exercise in desigining and pattern cutting. Visual examination of fittings. Fabrication of simple types of leather goods, Manufacture of leather based sports goods.

5.5-ANALYTICAL CHEMISTRY OF LEATHER MANUFACTURE

L T P
8 2 -

Rationale:

Some chemicals are required for the analysis of water, curing and pretanning process. The knowledge of PH measurement, degree of tannage and mineral oxide content is helpful in quality control of tanned leather. Physical testing helps in analysing qualities of leather. The knowledge about some common instruments which are necessary in routine working is necessary to create self confidence in the students.

| Sr. No. | Units | Coverage Time | | |
|---------|----------------------------------|---------------|----|---|
| | | L | T | P |
| 1. | Water Analysis | 12 | 3 | - |
| 2. | Curing & Pretanning Chemicals | 12 | 3 | - |
| 3. | Tanning Materials | 12 | 3 | - |
| 4. | PH Measurement | 12 | 3 | - |
| 5. | Indicators | 12 | 3 | - |
| 6. | Tanned Leather Characteristics | 12 | 3 | - |
| 7. | Testing of tanned Leathers | 12 | 3 | - |
| 8. | Testing Instruments | 15 | 4 | - |
| 9. | Conservation of Chemical & Water | 08 | 3 | - |
| | | 112 | 28 | - |

DETAILED CONTENTS:

Principle and methods (in brief) employed for the analysis of water, curing and pretanning chemicals including spent liquors, vegetable tanning materials and extracts, chrome liquors and extracts, aluminium and zirconium tanning salts, PH measurements indicators and their uses in testing. Vegetable, mineral and combination tanned leathers for characteristics like degree of tannage, mineral oxide contents etc.

Physical testing of various types of leathers for tensile strength, elongation, dynamic water absorption, abrasion resistance rub fastness, shrinkage etc.

Use of instruments such as spectrophotometer, colorimeter, ion exchange resins etc. in testing of tanning chemicals.

Conservation of chemicals and water in the tannery.

Different practice and quality control of different methods of pretanning process as applied to light and heavy leather process control in pretanning and post tanning operation.

6.1 ENVIRONMENTAL EDUCATION & DISASTER MANAGEMENT

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

RATIONALE:

A diploma student must have the knowledge of different types of pollution caused due to industrialisation and construction activities, so as he may help in balancing of eco-system and control pollution by providing controlling measures. They should be also aware of the environmental laws for effectively controlling the pollution of environment. The topics are to be taught in light of legislation Para-3.

TOPIC WISE DISTRIBUTION OF PERIODS:

| SL. NO. | TOPIC | L | T | P |
|---------|---------------------------------|----|---|---|
| 1. | Introduction | 6 | | |
| 2. | Pollution | 4 | | |
| 2.1 | Water Pollution | 8 | | |
| 2.2 | Air Pollution | 8 | | |
| 2.3 | Noise Pollution | 4 | | |
| 2.4 | Radio Active Pollution | 6 | | |
| 2.5 | Solid Waste Management | 6 | | |
| 3. | Legislations | 4 | | |
| 4. | Environmental Impact Assessment | 4 | | |
| 5. | Disaster Management | 6 | | |
| TOTAL | | 56 | - | - |

DETAILED CONTENTS

1. INTRODUCTION :

- Basics of ecology, Ecosystem, Biodiversity Human activities and its effect on ecology and eco system, different development i.e. irrigation, urbanization, road development and other engineering activities and their effects on ecology and eco system, Mining and deforestation and their effects.
- Lowering of water level , Urbanization.
- Biodegradation and Biodegradability, composting, bio remediation, Microbes .Use of biopesticides and biofungicides.
- Global warning concerns, Ozone layer depletion, Green house effect, Acid rain,etc.

2. POLLUTION :

Sources of pollution, natural and man made, their effects on living environments and related legislation.

2.1 WATER POLLUTION :

- Factors contributing water pollution and their effect.
- Domestic waste water and industrial waste water. Heavy metals, microbes and leaching metal.
- Physical, Chemical and Biological Characteristics of waste water.
- Indian Standards for quality of drinking water.
- Indian Standards for quality of treated waste water.
- Treatment methods of effluent (domestic waste water and industrial/ mining waste water), its reuse/safe disposal.

2.2 AIR POLLUTION :

Definition of Air pollution, types of air pollutants i.e. SPM, NOX, SOX, CO, CO₂, NH₃, F, CL, causes and its effects on the environment.

- Monitoring and control of air pollutants, Control measures techniques. Introductory Idea of control equipment in industries i.e.
 - A. Settling chambers
 - B. Cyclones
 - C. Scrubbers (Dry and Wet)
 - D. Multi Clones
 - E. Electro Static Precipitations
 - F. Bog Fillers.
- Ambient air quality measurement and their standards.
- Process and domestic emission control
- Vehicular Pollution and Its control with special emphasis of Euro-I, Euro-II, Euro-III and Euro IV.

2.3 NOISE POLLUTION :

Sources of noise pollution, its effect and control.

2.4 RADISACTIVE POLLUTION :

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

2.5 SOLID WASTE MANAGEMENT :

Municipal solid waste, Biomedical waste, Industrial and Hazardous waste, Plastic waste and its management.

3. LEGISLATION :

Preliminary knowledge of the following Acts and rules made thereunder-

- The Water (Prevention and Control of Pollution) Act - 1974.
- The Air (Prevention and Control of Pollution) Act - 1981.
- The Environmental Protection (Prevention and Control of Pollution) Act -1986. Rules notified under EP Act - 1986 Viz.
 - # The Manufacture, Storage and Import of Hazardous Chemical (Amendment) Rules, 2000
 - # The Hazardous Wastes (Management and Handling) Amendment Rules, 2003.
 - # Bio-Medical Waste (Management and Handling) (Amendment) Rules, 2003.
 - # The Noise Pollution (Regulation and Control) (Amendment) Rules, 2002.
 - # Municipal Solid Wastes (Management and Handling) Rules, 2000.
 - # The Recycled Plastics Manufacture and Usage (Amendment) rules, 2003.

4. ENVIRONMENTAL IMPACT ASSESSMENT (EIA) :

- Basic concepts, objective and methodology of EIA.
- Objectives and requirement of Environmental Management System (ISO-14000) (An Introduction).

5. DISASTER MANAGEMENT :

Definition of disaster - Natural and Manmade, Type of disaster management, How disaster forms, Destructive power,

Causes and Hazards, Case study of Tsunami Disaster, National policy- Its objective and main features, National Environment Policy, Need for central intervention, State Disaster Authority- Duties and powers, Case studies of various Disaster in the country, Meaning and benefit of vulnerability reduction, Factor promoting vulnerability reduction and mitigation, Emergency support function plan.

Main feature and function of National Disaster Management Frame Work, Disaster mitigation and prevention, Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination and communication.

6.2 FINANCIAL, COST & MANAGEMENT ACCOUNTING

L T P
6 2 -

Rationale:

Knowledge of raw hides and skins their availability, marketing, storing, packing and dispatch is necessary for foreign trade of raw hides and skins. Terms associated with consumption, distribution, demand and supply, budget and revenue in relation to Indian economy are useful to the students. Knowledge of book keeping and accountancy, material management and marketing techniques is an aided advantage to the diploma student in leather technology.

| Sr. No. | Units | Coverage Time | | |
|--|---|---------------|----|---|
| | | L | T | P |
| A. FINANCIAL ACCOUNTING | | | | |
| 1. | Book Keeping & Accountancy | 6 | 2 | - |
| 2. | Concepts & Conventions of Accounting | 6 | 2 | - |
| 3. | Journal, Ledger & Trail Balance | 6 | 2 | - |
| 4. | Cash Book & Other Books | 6 | 2 | - |
| 5. | Final Accounts with Adjustment | 6 | 2 | - |
| 6. | Banking Transactions | 6 | 2 | - |
| B. COST & MANAGEMENT ACCOUNTING | | | | |
| 1. | Introduction & Need of Cost Management Accounting | 6 | 2 | - |
| 2. | Elements of Cost & Production Expenses | 6 | 2 | - |
| 3. | Material & Materials Control | 6 | 2 | - |
| 4. | Indirect Expenses and their Allocation | 6 | 2 | - |
| 5. | Unit or Output Costing System | 6 | 2 | - |
| 6. | Budget & Budgetary Control | 6 | 2 | - |
| 7. | Standard Costing and Various Analysis | 6 | 2 | - |
| 8. | Marginal Costing and Break Even Analysis | 6 | 2 | - |
| | | 84 | 28 | - |

DETAILED CONTENTS:

A. FINANCIAL ACCOUNTING

1. BOOK KEEPING & ACCOUNTANCY :

Meaning, characteristics, difference, advantages of book keeping and accountancy, Meaning, characteristics and advantages of double entry system.

2. CONCEPTS AND CONVENTIONS OF ACCOUNTANCY :

Concepts of accounting, conventions of accounting.

3. JOURNAL, LEDGER AND TRIAL BALANCE :

Journal, rules for journaling, Ledger, Need of ledger, Rules of posting, Trial balance, Methods of preparing trial balance, Disclosed and undisclosed errors in trial balance, suspense A/c.

4. CASH BOOK AND OTHER BOOKS :

Meaning, Advantages and classification of cash book, Contra entry, Petty cash book. Purchase book, Purchase return book, Sales book, Sales return book, Bills receivable book, Bills payable book.

5. FINAL ACCOUNTS WITH ADJUSTMENTS :

Trading A/c, Manufacturing A/c, Profits and loss A/c, Balance sheet with all adjustments.

6. BANKING TRANSACTIONS :

Meaning and functions of bank, Bank account opening methods, Cheque, Kinds of cheque, Crossing and Indorsement of cheque, Dishonoured cheque.

B. COST & MANAGEMENT ACCOUNTING

1. INTRODUCTION AND NEED OF COST AND MANAGEMENT ACCOUNTING:

Introduction, meaning, need, functions of cost of management accounting, Emergence of management accounting, Difference between management and financial accounting, Different methods of cost finding.

2. ELEMENTS OF COST AND PRODUCTION EXPENSES :

Production expenses and their classification, Direct and indirect expenses, Direct and indirect material, Direct and indirect labour, Classification of indirect expenses, Components of total cost.

3. MATERIALS AND MATERIAL CONTROL :

Importance of materials, Objects of material control, Kinds of materials, Management and organisation of stores, Purchasing, Storing and issuing of materials, receipt of materials, Issue of materials, returns and transfer of materials, Methods of pricing the materials, LIFO and FIFO methods, Inventory systems, Inventory control, Stock levels, Economic order quantity, ABC techniques of inventory control, Bin card.

4. INDIRECT EXPENSES AND THEIR ALLOCATION :
Indirect expenses and their kinds, Classification of overheads, Difference between oncost and overheads.
5. BUDGETS AND BUDGETARY CONTROL :
Meaning of unit costing system, Preparation of statement of cost, Cost sheet and tender statement.
6. BUDGETS AND BUDGETARY CONTROL :
Budget and budgetary control, Essential of effective budgeting, type of budgets, Preparation of production budget, Material budget, Sales budget, Sales and distribution overhead budget, Master budget, Flexible budget, Computation of semi-variable expenses.
7. STANDARD COSTING AND VARIANCE ANALYSIS :
Standard cost, Standard costing, Essentials for success of standard costing system, Objects, Advantages and disadvantages, Difference between standard costing and budgetary control, Variance analysis, Calculation of material variances, Labour variances and overhead variances.
8. MARGINAL COSTING AND BREAK-EVEN ANALYSIS :
Marginal costing and marginal cost, Advantages, Limitations, Cost volume-profit analysis, Break-even analysis, Contribution, Profit volume ratio, Break-even point, Margin of safety, Variable cost.

6.3 TANNERY WASTE MANAGEMENT

L T P
6 2 -

Rationale:

The control of environmental pollution is very essential to establish healthy working atmosphere in tanneries. The student should have knowledge of tannery wastes treatment and disposal to check atmospheric pollution. Tannery wastes can also be utilised for manufacturing of certain products.

| Sr. No. | Units | Coverage Time | | |
|---------|--|---------------|----|---|
| | | L | T | P |
| 1. | Sources, Composition, Types & Characteristics | 10 | 3 | - |
| 2. | Environmental Problems caused by Pollutants | 14 | 5 | - |
| 3. | Recovery & Reuse of Chrome | 14 | 5 | - |
| 4. | Treatment Methods, Awareness of Clean Technology | 12 | 5 | - |
| 5. | Sludge Treatment & Disposal | 10 | 3 | - |
| 6. | Solid Wastes | 14 | 4 | - |
| 7. | Utilization of Solid waste | 8 | 2 | - |
| 8. | Visit | 2 | 1 | - |
| | | 84 | 28 | - |

DETAILED CONTENTS:

- 1 Sources, Composition, Types and Characteristics of tannery wastes.
- 2 Environmental problems caused by various pollutants. Methods of disposal, B.I.S./C.P.C.B./S.P.C.B standards for disposal.
- 3 Recovery and reuse of chrome from waste chrome liquor.
4. Different treatment methods-Primary, Secondary and Tertiary.
5. Sludge treatment and disposal, Model treatment plants. Awareness of clean technology. Flow sheet diagram from NEERI/CLRI.
6. Various solid wastes their composition and characteristics.
Environmental problems in handling tannery solid wastes.
Utilization and disposal of tannery solid wastes.
7. Utilization of Solid Waste by making tannery by product Glue

and Gelatin, Leather Boards, Dog chew leather.

8. Visit - Effluent Treatment Plant (ETP), Common Effluent Treatment Plant (CETP).

NOTE: Special Guest Lectures of experts may be arranged at suitable times.

L T P
-- -- 8

Rationale:

The purpose of introducing Standardisation and Analysis of Leather is to equip the diploma student with the necessary knowledge and skill component for maintaining and testing the quality of leather produced in the tanneries. Certain standard norms are required for maintaining export quality of the leather as per B.I.S.. A diploma holder must be aware of norms and standards required for quality maintenance in production.

| Sr. No. | Units | Coverage Time | | |
|---------|--|---------------|---|-----|
| | | L | T | P |
| 1. | Analysis of Chemicals | - | - | 20 |
| 2. | Chemical Analysis/Chemical Testing of Leathers | - | - | 46 |
| 3. | Physical Testing of leathers | - | - | 46 |
| | | - | - | 112 |

DETAILED CONTENTS:

1. Analysis of different types of chemicals used in the manufacture of leather such as water and sodium bichromate, chrome powder and extracts, basicity of chrome liquors, oil and fats in fat Liquors.
2. CHEMICAL TESTING :
 - (a) Analysis of chrome leather and other mineral tanned leather for chrome content and other mineral contents, total ash , oil and fats, PH of water solubles differential numbers, hide substance, moisture etc. analysis of spent liquors.
 - (b) Analysis of vegetable tanning material, extracts and spent liquors for tannins and non tannins etc.
 - (c) Analysis of vegetable tanning leathers. Fixed tannins, oils and fats, hide substance, total ash, water soluble, soluble and insoluble ash and degree of tannage.
 - (d) Analysis of combination tanned leather for their constituents.
 - (e) Indian Standard of Leathers
3. PHYSICAL TESTING:

Measurement of thickness, water absorption, apparent density, tensile strength, elongation at break and specified load, stitch tear resistance, abrasion, shrinkage, air and water vapour, permeability wet rub fastness cracks in leather, shower proofing flexural endurance, grain crack index, Rubber testing (Physical) (i) Sole Adhesion, Full shoe flex test, Ross flexing, Hardness test, Finish adhesion test .

NOTE

Sampling for physical and chemical analysis of leathers should be in accordance with Bureau of India Standards.

(Common with Diploma In Saddlery Technology & Export Management)

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

1. INTERNATIONAL BUSINESS :An Overview:

Introduction, Modes of international business, External influences on international business, Evolution of strategy in the Internationalization Processes

2. FOREIGN DIRECT INVESTMENT :

Introduction, The Meaning of foreign direct investment, The relationship of trade and factor mobility, Motivations for handling international business through direct investment, Market expansion- Investment versus trade, Resource-Acquisition investment, Diversification- Oriented investments, Political motives, Buy-versus build decision, Advantages of foreign direct investment, The strategy of direct investment in the internationalization process, direct investment patterns.

3. FOREIGN EXCHANGE :

Introduction, Terms and definitions, How the foreign exchange market works, Convertibility, Exchange restriction, The use of foreign exchange, Market in internationalization process.

4. THE DETERMINATION OF EXCHANGE RATES :

Introduction, The international monetary system, Exchange rate arrangements, The determination of exchange rate, Forecasting exchange rate-movements, Business implications of exchange rate changes.

5. MARKETING :

Introduction, Market size analysis, Product policy, Marketing in internationalization process, Pricing, Promotion, Branding, Distribution.

6. EXPORT AND IMPORT STRATEGIES :

Introduction, Export strategy, Export intermediaries, Foreign freight forwarders, Export financing, Counter trade, The import strategy.

7. GLOBAL OPERATION MANagements AND SOURCING STRATEGIES:

Introduction, Global manufacturing, Strategies in the

Internationalization process, Quality, Global sourcing, Purchasing and supplier relations, Inventory systems, Product design.

8. HUMAN RESOURCE MANAGEMENT :

Introduction, Management qualification and characteristics, Internal managerial transfers, Management recruitment and selection, International development of managers, Human resource management in the internationalization process

9. TOTAL QUALITY AND QUALITY MANAGEMENT :

What is quality, Total quality approach, Key element of total quality, Contribution of Deming and Juran, Why Total Quality efforts sometimes fail, The future of Quality Management.

10. QUALITY CULTURE :

Understanding what a quality culture is ? Activating Cultural Change, Laying the Groundwork for Quality Culture, Learning What a Quality Culture looks like, Countering Resistances to Cultural Change, Establishing a Quality Culture.

11. QUALITY TOOLS :

Total Quality defined , Pareto chart, Cause and effect diagram, Check sheet.

12. JUST IN TIME :

Just in time defined, rationale for JIT, Development of JIT, Relationship of JIT to Total quality and World Class Manufacturing, Benefits of JIT, Requirements of JIT, Automation and JIT.

13. AN OVERVIEW OF ISO CERTIFICATION :

ISO- 9K Series (Quality), ISO-14K Series (Environment), ISO-18K Series (Occupational Health and Safety), Six Sigma and Its Impact on Business Operation.

6.6 -PROJECT

The purpose of introducing project is to enable the students to apply the knowledge, skills and attitudes acquired during the entire course to the solution of specific problem. Some suggested problems are listed below.

1. Preparation of a project report for setting up a tannery.
2. Improvement in flaying, collection, curing and preservation of raw hides and skins available in the country side.
3. Problems associated with the development of rural tanning industry.
4. Evaluation of locally available tanning materials.
5. Work study in tanneries and suggesting measurement for increasing productivity.
6. Problems connected with the development of leather auxiliaries.
7. Problems in marketing of leather and leather goods.
8. Case study on implementation of standardisation and its benefits in Leather industries.
9. Group discussion, seminars, debate and interaction with industry.

Problems suggested by industry may also be considered for project work. The student will have to go through all the steps in problem solving such as defining the problem, analysis of the problem, collection of required information and materials, formulation of alternative solution to the problems, selecting the best solution and reduction in practice.

Student will be assessed on the basis of the project report and viva voce examination.

DIPLOMA IN LEATHER TECHNOLOGY
STAFF STRUCTURE

XI.

| | |
|--|----------------------------------|
| Intake of the course | 60 |
| Pattern of the course | 3yrs (Six Semester) |
| 1. Principal | 1 |
| 2. H.O.D. | 1 |
| 3. Lecturer (Lether Technology) | 3 |
| 4. Lecturer (Lether Microbiology) | 1 (Part Time) |
| 5. Lecturer Maths/Physics | 1 |
| 6. Lecturer Chemistry | 1 |
| 7. Lecturer Language | 1 part time |
| 8. Lecturer In Mechanical Engg. cum Workshop Incharge | 1 |
| 9. Lecturer In Commerce/Accountancy | 1 |
| 10. Computer Programmer | 1 |
| 11. Instructor In Electrical Engg. | 1 |
| 12. Foreman | 1 |
| 13. Instructor Lether Technology | 3 |
| 14. Instructor (Fitting Shop) | 1-- |
| 15. Instructor (Welding Shop) | 1 |
| 16. Instructor (Machine Shop) | 1 |
| 17. Instructor (Carpentry Shop) | 1 Common With |
| 18. Drawing Instructor | 1 Footwear Tech. |
| 19. Steno typist | 1 |
| 20. Accountant/Cashier | 1 |
| 21. Student/Library Clerk | 1 |
| 22. Store Keeper | 1 |
| 23. Class IV | 6-- |
| 24. Sweeper | Part time as per requirement. |

The posts of Choukidar and Mali will be sanctioned according to the justification of institution. Services for existing staff in other disciplines of the institute may be utilised if possible.

Staff qualifications will be as given in the service rules.

Staff development for teaching industrial management and entrepreneurship development may be done by the institute.

The post of "Computer Programmer" is not needed in the institutions where diploma in "Electronics Engineering" is running.

Guest lectures may be organised at suitable time.

XII.

SPACE REQUIREMENT

| A. Total Land Area | No | M2 |
|--|-----|-----------------------------|
| B. Administrative Block | | |
| 1. Principal's room | 1 | 30 |
| 2. Steno room | 1 | 6 |
| 3. Confidential room | 1 | 10 |
| 4. Office room | 1 | 80 |
| 5. Library (common with other disciplines) | 1 | 150 |
| 6. Common room | 1 | 80 |
| 7. Class rooms | 3 | 225 |
| 8. Store | 1 | 100 |
| 9. Model room | 1 | 90 |
| C. Laboratories/Workshops | | |
| 1. Drawing Hall @ 8 sq.m. per student | 1X2 | 120 |
| 2. General Engineering-II Lab @ 5 Sq.m. per student. | 1X2 | 75 |
| 3. Workshop @ 8 Sq.m. per student. | 1X2 | 120 |
| 4. Microscopy & Microbiology Lab @ 5 Sq. m. per student. | 1X2 | 75 |
| 5. Testing Lab. (Standardisation & Analysis Lab) @ 5 Sq.M. per student | 1X2 | 75 |
| 6. Process of Leather Manufacture Shop (Experimental Tannery/Leather Trade Engg.) @ 8 Sq.m. per student. | 1X2 | 120 |
| 7. Footwear & Leather Goods Manufacture Shop @ 5 Sq.m. per student. | 1X2 | 75 |
| 8. Computer room @ 4 Sq.m. per student. | 1X2 | 60 |
| Note: Labs of physics, chemistry and computer science will be common for all disciplines in the institute. | | |
| D. Common Facilities | | |
| 1. Dispensary | 1 | 40 |
| 2. Canteen & tuck shop | 1 | 50 |
| 3. Parking space/cycle stand with garrage | 1 | 200% student 50% student |
| 4. N.C.C. block | 1 | 70 |
| 5. Guest room | 1 | 30 |
| E. Residential Facilities | | |
| 1. Hostel for students | 1 | for 40% student |
| 2. Staff quarters | | |
| Principal | 1 | Type IV |
| HOD/Warden | 2 | Type IV |
| Sr. Lect./Lect. | 2 | Type IV |
| Technical/Ministerial staff | 2 | Type II |
| Class IV | 6 | Type I |
| 3. Play ground (common) | 1 | _____ |

LIST OF EQUIPMENTS

Only those of the equipments given below which are essentially required for the conduction of practicals mentioned in the curriculum are to be procured by the institutions.

"Machine/Equipments/Instruments of old BTE list which are not included below are to be retained in the Lab/Shop for Demonstration purpose but not to be demanded fresh for purchase."

NOTE : Equipment for different shop and lab of latest version should be purchased.

I. APPLIED PHYSICS LAB

| S.No. | Name of Equipment | No. | @ Rs. Aprox. | Amt.in Rs. Aprox. |
|-------|--|-------|-----------------|----------------------|
| 1. | Brass ball with hook dia 1.8 Cm to 2 Cm diameter | 2 | 50 | 100 |
| 2. | Stop watch least count Least Count 0.1 Sec.(non-magnetic) 0.01 sec to 0.001 sec (Electronic Desirable) | 4 | 750 | 3000 |
| 3. | Wall bracket with clamping arrangement 8" to 10" length | 2 | 50 | 100 |
| 4. | Meter scale Least count 0.1cm, wooden 1meter | 5 | 40 | 200 |
| 5. | Meter scale Least count 0.1cm, wooden 50 Cm | 5 | 40 | 200 |
| 6. | Searl's conductivity apparatus with copper & steel rods 25 cm length 4 cm.diameter with all accessaries | 2 set | 1500 | 3000 |
| 7. | Constant Level Water Flow Container of one liter capacity vertical stand & rubber tubing | 2 | 250 | 500 |
| 8. | Thermometer 0-110°C(Least count 0.1°C desirable) | 4 | 100 | 400 |
| 9. | Potentiometer - 10 wires (1 meter length of each wire) with jockey, sunmoical top | 4 | 750 | 3000 |
| 10. | Moving coil galvanometer 30-0-30 with moving mounting | 5 | 300 | 1500 |
| 11. | Rheostat 50 ohm., 100 Ohm., 150 Ohm. 16 capacity | 2 | 300 | 4800 |
| 12. | Lead Accumulator 2V, 6V (1 No. Each) | 2 | 250 | 500 |
| 13. | Meterbridge 1 meter length, sunmica top copper strips fitted with scale | 2 | 300 | 600 |
| 14. | Resistance Coil (Standard) 1 ohm. to 10 ohm. | 10 | 50 | 500 |
| 15. | Moving coil ammeter 0-1 amp., 0-2 amp., 0-5 amp. with mounting | 8 | 250 | 2000 |
| 16. | Moving coil voltmeter 0-1 V., 0-2V 0-5 V., 0-10 V. with mounting | 8 | 250 | 2000 |

| | | | | |
|-----|--|---|-----|-----|
| 17. | Denial cell with complete accessories | 2 | 250 | 500 |
|-----|--|---|-----|-----|

| S.No. | Name of Equipment | No. | @ Rs. Aprox. | Amt.in Rs. Aprox. |
|-------|---|----------|-----------------|----------------------|
| 18. | Leclanche Cell with complete accessories | 2 | 250 | 500 |
| 19. | Standard Cadmium Cell with complete accessories | 2 | 250 | 500 |
| 20. | Battery Charger with complete accessories | 1set | 1800 | 1800 |
| 21. | Battery Eliminator Multi range | 2set | 750 | 1500 |
| 22. | Multimeter(Digital) | 1set | 800 | 800 |
| 23. | Carey Foster Bridge (With all accessories) | 2set | 4500 | 9000 |
| 24. | Resistance Box (2 No. Each) 0-1 Ohm, 0-100 Ohm. | 4 | 850 | 3400 |
| 25. | Fractional Resistance Box 0-1 Ohm. | 2 | 1200 | 2400 |
| 26. | Post office box Key type | 2 | 1200 | 2400 |
| 27. | Post office box Dial type | 2 | 1200 | 2400 |
| 28. | Resistance Wire(100 Gm.) (Constanton/Maganin) | 1 lacchi | 100 | 100 |
| 29. | Connecting Wire Copper(1/2 Kg.) (Cotton Insulated) | 1 lacchi | 700 | 700 |
| 30. | Screw gauge L.c 1/100 mm | 5set | 150 | 750 |
| 31. | Vernier Callipers L.c. 1/10 mm | 5set | 100 | 500 |
| 32. | Appratus for determining character- stics of P-N junction diode complete with all accessaries | 2 set | 1500 | 3000 |
| 33. | Resonance Column of steel One Meter length and 3-4 Cm diameter fitted with scale & water level arrangement | 2 | 1600 | 3200 |
| 34. | App. for determining coefficient of friction on a horrizontal plane (Complete with all accessories) | 2 set | 700 | 1400 |
| 35. | Tuning Fork's Sets Set of different frequency (with rubber pad) | 3set | 350 | 1050 |
| 36. | Physical balance with weight box Complete with Fractional weight | 2 | 800 | 1600 |
| 37. | Anemometer with counter cup type | 1 | 1000 | 1000 |
| 38. | Spring Force Constant Apparatus with graduated mirror & pointer, weight set with hanger | 2 | 1200 | 2400 |
| 39. | Viscosity Apparatus (Stock law) with steel balls and viscous liquid & timer | 2set | 1600 | 3200 |
| 40. | Thermometer of different range Mercury thermometer 0-50oC to 0-110oC | 10set | 100 | 1000 |
| 41. | Wall Thermometer Alcohol Filled 0-50oC | 2set | 20 | 40 |
| 42. | Sprit Level Technical Type | 1set | 60 | 60 |
| 43. | Drilling Machine Electric with different size bits | 1set | 800 | 800 |

| | | | | |
|-----|--|------|-----|-----|
| 44. | LPG Gas Burner with Cylinder | 1set | 800 | 800 |
| 45. | Tool Kit with different tools Complete | 1set | 800 | 800 |
| 46. | Lab stools | 30 | | |

| S.No. | Name of Equipment | No. | @ Rs. Aprox. | Amt.in Rs. Aprox. |
|-------|------------------------------------|-----|--------------|-------------------|
| 47. | Lab tables | 8 | | |
| 48. | Plug Keys One Way | 5 | 50 | 250 |
| 49. | Plug Keys Two Way | 5 | 100 | 500 |
| 50 | Helical Springs - Soft, 10 cm each | 6 | 100 | 600 |

II. APPLIED CHEMISTRY LAB

| S.No. | Name of Equipment | No. | @ Rs. Aprox. | Amt. in Rs. Aprox. |
|-------|--|-------|-----------------|-----------------------|
| 1. | Test tube stand (Plastic/Tafflon) | 30 | 20 | 600 |
| 2. | Funnel stand (Plastic/Tafflon) | 30 | 20 | 600 |
| 3. | Burette stand Stainless Steel/Wooden/Iron | 30 | 50 | 1500 |
| 4. | Pipette stand Stainless Steel/Wooden/Plastic | 30 | 20 | 600 |
| 5. | Chemical balances with analytical weights 1gm -200gms | 5 | 1500 | 7500 |
| 6. | Fractional weights set with rider 10 mg to 500 mg with rider | 5sets | 25 | 125 |
| 7. | Kipp's apparatus 1000 ml. Plastic/ Tafflon | 2 | 500 | 1000 |
| 8. | Reagents bottles | | | |
| | 250ml | 120 | 20 | 2400 |
| | 500ml | 25 | 25 | 625 |
| | 1000ml | 5 | 30 | 150 |
| 9. | Wide mouth bottle 250 ml Glass | 50 | 15 | 750 |
| 10. | Winchester bottle 2.5 litre Plastic/Tafflon | 15 | 30 | 450 |
| 11. | Test tubes 1/4" x 6" | | | |
| | i. Corning or Borosil | 200 | 9 | 1800 |
| | ii. Glass | 200 | 2 | 400 |
| 12. | Boiling tube 1" x 6" | | | |
| | i. Corning or Borosil | 100 | 16 | 1600 |
| | ii. Glass | 100 | 5 | 500 |
| 13. | Pestle and mortar Dia 10 cms 15 cms (Ceramics) | 2 | 30 | 60 |
| 14. | Watch glass 5.0 cms, 7.5 cms glass | 15 | 5 | 75 |
| 15. | Beakers (Glass/Brosil/Corning Plastic) | | | |
| | 250 ml. | 50 | 20 | 1000 |
| | 500 ml. | 50 | 20 | 1000 |
| 16. | Weighing Tube 10 ml with lid (Plastic) | 30 | 10 | 300 |
| 17. | Wash bottles (Plastic/Tafflon) | 30 | 15 | 450 |
| 18. | Conical flask 250 ml. Glass (Brosil/Corning/Plastic) Transparnt | 100 | 30 | 3000 |
| 19. | Flat bottom flask 500 ml. Glass | 15 | 40 | 600 |
| 20. | Flat bottom flask 250 ml. Glass | 15 | 25 | 375 |
| 21. | Burette 50 ml. (Plastic/Tafflon) | 30 | 60 | 1800 |
| 22. | Pipette 25 ml. (Plastic/Tafflon) | 30 | 20 | 600 |
| 23. | Measuring flask 250 ml. with stopper | 30 | 50 | 1500 |
| 24. | Measring cylinder of various sizes (100 ml, 250 ml, 500 ml, 1000 ml) 3 no. of each | 12 | 30 | 360 |
| 25. | Bunsen's burner of brass | 30 | 50 | 1500 |
| 26. | Gas plant petrol/LPG 10 to 20 burners automatic | 1 | 5000 | 5000 |
| 27. | Spirit lamp (Brass) | 30 | 30 | 900 |
| 28. | Tripod stand (Steel/Iron) Large/Medium | 30 | 30 | 900 |
| 29. | Wire gauge 15 X 15 cm. with asbestos | 30 | 15 | 450 |
| 30. | Test tube holder wodden | 50 | 10 | 500 |

| S.No. | Name of Equipment | No. | @ Rs. Aprox. | Amt.in Rs. Aprox. |
|-------|--|--------|-----------------|----------------------|
| 31. | Porcelain plates Ceramic | 30 | 20 | 600 |
| 32. | Funnel 15 cm. Glass Borosil Corning/Plastic | 60 | 16 | 960 |
| 33. | Spatula hard & nickel/steel | 2 each | 50 | 100 |
| 34. | Distilled water units (electrical) | 1 | 10000 | 10000 |
| 35. | Distilled water units (solar) | 1 | 5000 | 5000 |
| 36. | Open balance 1000 gms./10 mg. | 1 | 600 | 600 |
| 37. | Brush for cleaning Hydro Fiber Acid & Alkali Resistant | 100 | 10 | 1000 |
| 38. | Jars 20 Lit. for keeping destilled water | 5 | 100 | 500 |
| 39. | Lab table 2 m. x 1.2 m. x 1 m. hight with central sink and cup boards (Teak wood) with drawers and two built in almirah on each side with reagent racks, better tile top | 4 | 8000 | 32000 |
| 40. | Exhaust fans 18" (GEC make/Crompton) | 4 | 2000 | 8000 |
| 41. | Side racks and selves for bench reagents made of teak wood for 24 bottels each set | 4 | 2000 | 8000 |
| 42. | Digital balance electronic Electronics upto 2 decimal places | 1 | 10000 | 10000 |
| 43. | Hot plates 7-1/2", 3" dia controled 2000 watts | 1 | 1000 | 1000 |
| 44. | Hot air oven thermostatically controled with selves and rotary switches 350 x 350 x 25 high | 1 | 8000 | 8000 |
| 45. | pH Meter (Digital) | 1 | 1000 | 1000 |
| 46. | Glass Electrode | 2 | 850 | 1700 |
| 47. | Reference Electro | 2 | 850 | 1700 |
| 48. | Weight Box 1gm,2gmX2, 5gm,10 gm 20gmX2, 50gm, 100gm with for cep Miscellaneous | LS | | 15000 |

III. WORKSHOP EQUIPMENT

A. MACHINE SHOP

| | | | | |
|-----|---|---------|-------|-------|
| 1. | Lathes 4.5 Ft. | 1 | -- | 35000 |
| 2. | Shaping M/C | 1 | -- | 20000 |
| 3. | Milling M/C | 1 | -- | 45000 |
| 4. | Universal Cutter & Tool Grinder | 1 | -- | 15000 |
| 5. | Cylindrical Grinder | 1 | -- | 15000 |
| 6. | Power hacksaw | 2 | 15000 | 30000 |
| 7. | Marking Tables | 1 | -- | 20500 |
| 8. | Surface Plates | 3 | 3000 | 9000 |
| 9. | Welding Set & Soldering Brazeing Kits. | One Set | | 40000 |
| 10. | Tools & Instruments | | L.S. | 30000 |

B. FITTING SHOP

| | | | | |
|----|--------------------------|---|-------|-------|
| 1. | Marking Table With Stand | 5 | 1000 | 5000 |
| 2. | Double Wheel Grinder | 2 | 4000 | 8000 |
| 3. | Bench Drilling M/C | 2 | 4000 | 8000 |
| 4. | Power Hacksaw | 2 | 15000 | 30000 |
| 5. | Different types of Tools | | L.S. | 15000 |

| S.No. | Name of Equipment | No. | @ Rs. | Amt.in Rs. |
|---|---|---------|-------|------------|
| C. CARPENTRY SHOP | | | | |
| 1. | Workbenches | 8 | 2500 | 20000 |
| 2. | Wood Turning Lathe | 2 | 20000 | 40000 |
| 3. | Circular Saw & Band Saw | One Set | 15000 | 15000 |
| 4. | Portable Band & Circular Saw Grinder. | 1 | -- | 15000 |
| 5. | Standard Tool Kit | 6 Set | 3000 | 18000 |
| 6. | Assorted Tools Etc. | | L.S. | 10000 |
| IV. GENERAL ENGINEERING LAB | | | | |
| 1. | Three Phase Induction Motor | 2 | 5000 | 10000 |
| 2. | Single Phase Induction Motor | 2 | 1000 | 2000 |
| 3. | Single Phase Transformer | 2 | 3000 | 6000 |
| 4. | A.C. Ammeters (0-5/10 A) | 6 | 500 | 3000 |
| | (0-1/2 A) | 2 | 500 | 1000 |
| | (10/20 A) | 3 | 500 | 1500 |
| 5. | D.C. Ammeters (0-3/5 A) | 2 | 500 | 1000 |
| 6. | A.C Voltmeters(0-300/600 V) | 4 | 500 | 2000 |
| | (150/300 V) | 2 | 500 | 1000 |
| 7. | D.C. Ammeter (0-15/30 V) | 2 | 500 | 1000 |
| 8. | Multimeter | 2 | 2000 | 4000 |
| 9. | Wattmeter (Single Phase) | 6 | 1500 | 9000 |
| 10. | Single Phase Energy Meter | 2 | 500 | 1000 |
| 11. | Starter for 3 Phase Induction Motor 3 H.P. | | | |
| 12. | DOL Starter | 1 | -- | 1000 |
| 13. | Star Delta Starter | 1 | -- | 150 |
| 14. | Rheostats | 6 | 500 | 3000 |
| V. TESTING LABORATORY (Standardisation & Analysis Lab) | | | | |
| A. Chemical Testing: | | | | |
| 1. | Single Pan Balance | 2 | -- | 20000 |
| 2. | Proctor Extractor | 1 | -- | 2000 |
| 3. | Muffle Furnace | 2 | -- | 16000 |
| 4. | Water distillation plant | 1 | -- | 5000 |
| 5. | Platinum Crucible | 2 | 3000 | 6000 |
| 6. | Gas Plant | 1 | -- | 2000 |
| 7. | Oven | 2 | 1000 | 2000 |
| 8. | Soxlet Apparatus | 2 | 10000 | 20000 |
| 9. | pH Meter | 2 | 5000 | 10000 |
| 10. | Magnetic Stirrer | 2 | 2000 | 4000 |
| 11. | Hot plate & Mantle Heater | 2 | 1000 | 2000 |
| 12. | Refrigerator | 1 | 6000 | 6000 |
| 13. | Fuming cup board | 1 | 1000 | 1000 |
| 14. | Mantle Heater set | 1 | 1000 | 1000 |
| b. Physical Testing Lab. | | | | |
| 1. | Shrinkage Tester | 2 | 2500 | 5000 |
| 2. | Humidity & Temperature Control | 1 | -- | 10000 |
| 3. | Thickness Measuring Gauge (Bench Type) | 2 | 2500 | 5000 |
| 4. | Hardness tester | 1 | -- | 10000 |
| 5. | Ross Flening M/C | 1 | -- | 27000 |

| | | | | |
|----|------------------------------|---|----|-------|
| 6. | Flexometer For Upper Leather | 1 | -- | 30000 |
| 7. | Colour Fastness Tester | 1 | -- | 15000 |

| S.No. | Name of Equipment | No. | @ Rs. | Amt.in Rs. |
|-------|---|-----|-------|------------|
| 8. | Precision Lasto Meter | 1 | -- | 20000 |
| 9. | SATRA Type Sole Adhesion Tester | 1 | -- | 10000 |
| 10. | SATRA Tensile Tester | 1 | -- | 25000 |
| 11. | Shoe Hardness Tester for Rubber | 1 | - | 5000 |
| 12. | Bally Cantrometer | 1 | -- | 60000 |
| 13. | Fibre Board Flexing M/C | 1 | -- | 45000 |
| 14. | Furniture & Fixture | | L.S. | 25000 |
| 15. | Water Absorption Machine Static (Kubelca Method) | 6 | -- | 70000 |
| 16. | Water Absorption Machine Dynamic (Heavy Leather) | 1 | -- | 80000 |
| 17. | Water vapour permeability tester | 1 | -- | 50000 |
| 18. | Flexometer | 1 | -- | 70000 |
| 19. | Abrasion Tester | 1 | -- | 90000 |
| 20. | Dynamic water Absorption tester | 1 | -- | 70000 |
| 21. | Tensile Testing machine (Computerised) | 1 | -- | 200000 |

VII. MICROSCOPY & MICROBIOLOGY LAB

| | | | | |
|----|-------------------------|---|-------|-------|
| 1. | Refrigerator (160 ltrs) | 1 | -- | 15000 |
| 2. | Optical Microscope | 6 | 500 | 6000 |
| 3. | Clintal Microscope | 2 | -- | 20000 |
| 4. | Microtome | 1 | -- | 1000 |
| 5. | Slide Cabinet | 1 | -- | 2500 |
| 6. | Stereo Microscope | 1 | -- | 10000 |
| 7. | Compount Microscope | 5 | 10000 | 50000 |

VIII. PROCESS OF LEATHER MANUFACTURE SHOP
(Experimental Tannery/Leather Trade Engg.)

| | | | Rs. In Lacs |
|-----|---|---|-------------|
| 1. | Wooden paddle | 2 | 0.70(Total) |
| 2. | Small experimental drum steel | 2 | 2.00(Total) |
| 3. | Spray booth with compressor & exhaust fan & guns etc. | 1 | 0.50 |
| 4. | Tubewell with pump & motor | 1 | 0.60 |
| 5. | Wooden houses | 8 | 0.10(Total) |
| 6. | Fleshing and scudling Knives | 6 | 0.20(Total) |
| 7. | Fleshing and scudling beams | 6 | 0.90 |
| 8. | Misc tools | | 0.30(Total) |
| 9. | Mini Auto spray with 4-6 guns | 1 | 15.00 |
| 10. | Auto toggling Humidily fixers | 1 | 7.00 |
| 11. | Shaving M/c | 1 | 12.00 |
| 12. | Dayana vac. drying M/C | 1 | 18.00 |
| 13. | Molissa staker | 1 | 10.00 |
| 14. | Finiflex | 1 | 12.00 |
| 15. | Dusting off M/C | 1 | 0.60 |
| 16. | Wooden Sample Drum | 1 | 1.50 |

Operated : 3 Phase Induction Motor
440 Volt Supply
Power :1.5 HP
Capacity : 5 Kg-50Kg Rawide
Size : 10 Fit Diameter

| | | | |
|-----|---|---|-------|
| 17. | Shaving Machine(Mechanical) | 1 | 2.00 |
| 18. | Splitting Machine | 1 | 5.00 |
| 19. | Sammying/Setting Machine | 1 | 2.50 |
| 20. | Togglng Frame with Toggles | 1 | 0.25 |
| 21. | Drying Chamber | 1 | 3.00 |
| 22. | Slowcon Staking Machine/Molisa Staker | 1 | 3.00 |
| 23. | Buffing Machine 1800 mm (Double Width) | 1 | 2.00 |
| 24. | Glazing Machine | 1 | 1.50 |
| 25. | Area Measuirng Machine | 1 | 1.70 |
| 26. | Dhakia Setting Machine (For Sole Leather) | 1 | 2.50 |
| 27. | Hydraulic Press (Ironing & Embossing) Operated :3 Phase Induction Motor 440 Volt Supply Power :1.5 HP At the Temp. up to 60oC embossing | 1 | 10.00 |
| 28. | Weigh Bridge/Balance | 1 | 0.10 |
| 29. | Baby Boiler | 1 | 0.20 |
| 30. | Vacuum Drying Machine | 1 | 5.00 |
| 31. | Compressor | 1 | 1.85 |
| 32. | Polishing Machine | 1 | 1.00 |
| 33. | Roller Coater (Small Size) | 1 | 2.00 |
| 34. | Hand Setting Mahcine | 1 | 0.50 |
| 35. | Seasoning Table-II | 1 | 0.50 |
| 36. | Aquamix (Rotomix) | 1 | 2.50 |
| 37. | Spray Gun Capacity 500 ml, Made of Stainless Steel | | |
| 38. | Thickness Measuring Gauge Capacity :1mm-35mm for thickness of raw hide Operated :Electronic Power :3 Phase Induction Motor: 1.5 HP | | |
| 39. | Electronic Balance Capacity:001 ml.gm to 1/2 mlg. Operated :Electrically, Non-Corrosive base | | |
| 40. | Experimental Drum Operated: 3 Phase Induction 440 Volt Supply Power: 1.5 HP Capacity: 250gm-1 Kg Rawhide Size: 03 Fit Diameter | | |
| 41. | Hand Flashing Knife Lenth: 1.5 Feet Length Width: 6 inches Use: For Flashing One Side (Sharp) and scudding one side(Blunt) | | |

X. FOOTWEAR & LEATHER GOODS MANUFACTURE SHOP

(Fig.in Lakhs Rs.)

| Sl.No. | Name of Equipment | Qty Regd. | Unit Cost |
|--------|---|-----------|-----------|
| 1. | Upper splitting M/C Feeding Speed : 4 Ele-Mec/Vario-Opz Installed Pauer : 2.7 KW Knife Dimensions : 0.7X50X3100mm Max. Splitting Thickness : 8mm Min. Splitting Thickness : 0.6/0.2mm Working width : 420mm | 1 | 6.50 |
| 2. | Clicking press Maximum Cutting Power : 20-30 Ton Maximum Stroke : 100 mm Cutting Table : 900X450 mm Arm width : 380mm Motor : 1.5 HP Net Weight (With Oil) : 780Kg. Size : 900X1000X1370 mm | 2 | 3.25 |
| 3. | Sewing Machine | | |
| | (a) Flat bed sewing M/C Stickiness Per Minute : 200-3200 Max. Stitch Length : 7mm Life To Presser Foot (Hand/Knee) 5.5/10mm(Standart) Max. 13mm Needle System : DBX1#21(#19-#23) Thickneww of the sewn products: Heavy | 10 | 0.15 |
| | (b) Zig Zag sewing M/C Stitches Per minute : 2000-2600 S.P.M. Stitch Length :5mm Width of Zig Zag : 8mm-12mm Needle : DPX17 Needle bar strocke : 34-35mm Thickness of the sewn products :Light- Medium upto 10mm | 1 | 0.50 |
| | (c) Post bed sewing M/C single needle Stitches Per minute : 2200-2600 S.P.M. Maximum Stitch Length :6mm Lift of pressure foot : 11mm (by knee) Needle : DPX5 Needle bar strocke : 36mm Hook Type : Vertical Rotating Hook Link Take Up Lever | 5 | 0.50 |
| | (d) Post bed sewing M/C double needle | 1 | 0.35 |
| | (e) Cording M/C | 1 | 0.50 |
| | (f) Stroebel Stitching Machine | 1 | 1.50 |
| | (g) G Heavy Duty Sewing M/c | 2 | 0.50 |

| | | | |
|-----|---|------|-------------|
| 4. | Mechanical clicking press for bottom components | 1 | 0.50 |
| 5. | Strap cutting M/C Cutting Width : 2-350 mm Cutting Thickness : 10mm Working Width : 350mm Dimensions : 1200X550X110mm Power : 550W, 220V | 2 | 0.80 |
| 6. | Glamping hand drive M/C | 1 | 1.20 |
| 7. | Binding M/C Stitches per minute 2500 S.P.M. Maximum Stitch Length : 5.5 mm Lift of pressure foot : 100 mm (by knee) Needle System : DP X 17 Niddle bar stroke : 34 mm Alternating Movement : 2-6 mm Feed Type : Unison Feed Diameter of cylinder Bed : 46mm | 1 | 0.90 |
| 8. | Pull over M/C | 1 | 0.50 |
| 9. | Heel lasting M/C | 1 | 1.00 |
| 10. | Pounding M/C Dimensions : 650X500X1300mm Power : 550W,220V Voltage : 440 V Production : 3000 pairs/8 hour | 1 | 0.80 |
| 11. | Roughing M/C | 1 | 0.60 |
| 12. | A. Edge trimming M/C (For Lining) Power : 0937 KW Net Weight : 64 Kg. Dimensions : 1100 X 530 X 1165 mm | 1 | 1.50 |
| | B. Edge trimming M/c (For Sole) Suitable for Flush Trimming for Sole Made of PU,TPR, EVA and Rubber Power : 0.37 KW Net Weight : 64 KG Dimensions : 1100 X 530 X 1165 mm | 1 | 1.00 |
| | C. Hell Attaching Machine (For Lining) | 1 | 0.40 |
| 13. | Heel trimming M/C | 1 | 0.40 |
| 14. | Ironing Machine | 1 | 2.00 |
| 15. | Working tables with stoob | 60 | 1.00(Total) |
| 16. | Decorative punching M/C | 1 | 0.15 |
| 17. | Dies, tooobs, moulds, lasts etc. | L.S. | 1.00(Total) |
| 18. | Tools boxes for students | 60 | 0.20(Total) |

| | | | |
|-----|----------------------------|---|------|
| 19. | Thickness measuring gauge | 2 | 0.03 |
| 20. | Pattern Shear | 2 | 1.50 |
| 21. | Pattern Binding M/c | 1 | 0.03 |
| 22. | Pattern Vaccum Forming M/C | 1 | 1.50 |

| Sl.No. | Name of Equipment | Qty Regd. | Unit Cost |
|--------|---|-----------|-----------|
| 23. | Pneumatic fusing M/C for ironing Fusible interlining drum type 60 mm | 1 | 1.20 |
| 24. | Taping & Seam Rubbing M/C complete with devices. | 1 | 1.25 |
| 25. | Top Cap applicator thermoplastic two stations. | 1 | 0.50 |
| 26. | Lining trimming M/C with storepening device | 1 | 0.40 |
| 27. | Automatic Eyeletting & punching M/C | 1 | 0.70 |
| 28. | Stitch marking M/C | 1 | 0.20 |
| 29. | Back part moulding M/C | 1 | 1.20 |
| 30. | Mocassion performing M/C | 1 | 2.50 |
| 31. | Mocassion performing M/C with one beating head (electric) | 1 | 5.00 |
| 32. | Vamp clapping M/C | 1 | 1.50 |
| 33. | Insole trimming & attaching M/C | 1 | 0.80 |
| 34. | Conditioning M/C | 1 | 0.30 |
| 35. | Forepart Lasting M/C with Adhesive tapes | 1 | 5.00 |
| 36. | Conditioning for back port | 1 | 0.25 |
| 37.A. | Heal setting plant with 4 chambers and single vaccum | 1 | 3.50 |
| B. | Reactivating plant for sales | 1 | 0.50 |
| 38. | Delasting (Slip Last) M/c | 1 | 0.25 |
| 39. | Spray booth with sprayer etc. Dimensions : 900 X 850 X 1900 mm Power : 0.55 KW Net weight : 300 Kg Voltage : 380V/50 Hz | 1 | 0.50 |
| 40. | DVP Two Station Machine | 1 | 1.50 |

Dimension : 1400 X 1150 X 2042 MM
 Mould Frame Size (LXWXH) 420X200X30mm
 Press Last Power : 6.5 Mpa
 Clamping Stroke : 130 mm
 Press Mould Stroke : 80mm
 Lift of core formation : 15mm
 Rotation Angle of Shoe Last 180 Degree
 Motor Power : 2.2 KW
 Heat Power : 8.6 KW

| | | | |
|-----|--|---|-------|
| 41. | Thickness Measuring Machine Capacity : 1mm-35mm For Thickness of raw hide Operated : Electronic Power : 3 Phase Induction Motor 1.5 HP | 1 | 0.50 |
| 42. | Compressor For Pneumatic machine Motor : 2HP Tank Capacity : 115 Lit. Air Delivery : 340L/min. Pressure : 10 Bar | 1 | 1.00 |
| 43. | Punching Machine Punching Width : 36 mm Feed : 0-60 mm Speed : 250-350/min. Motor : 200W Net Weight : 45 Kg. Dimension 365 X 370 X 360 mm OR Standard | 1 | 0.60 |
| 44. | Simplex Matie 33 mts. conveyor with 1 Mech. tier | 1 | 3.50 |
| 45. | Two colour hrizontal injection moulding M/C with moulds etc. | 1 | 20.00 |
| 46. | D.M.S. M/C 4 bed with moulds etc. | 1 | 8.00 |

INTRODUCTION TO COMPUTER (Common to all Trades)

COMPUTER CENTRE

| S.No. | DESCRIPTION | QTY. | APPROX. COST (in Rs.) |
|-------|---|-----------|--------------------------|
| 1. | Core-2 Quad Processor, 4GB RAM 1 GB SATA HDD, 19" TFT Monitor/ Server of Latest Specification OS-Windows 2007/2008/Latest Version | 02 Server | 1,20,000=00 |
| 2. | General Desktop Computer-Intel i5 60 node or Higher(with latest Specification Pre loaded latest Anti Virus with Life time Subscription, Licence Media and Manual with UPS 660 VA with latest window OS Including licence OR Computer of latest Specification With latest window os including licence | | 36,00,000=00 |
| 3. | Software :((Latest Version) | | |
| | i. MS OFFICE 2010/Latest Version | | LS LS |
| | ii. COMPILER 'C', C++, JAVA-7 | | LS LS |
| 4. | Hardware | | 4,50,000.00 LS |
| | i. Switch-32 Port | | 02 |
| | ii. Router | | 02 |
| | iii. Hub | | 04(8 Port) |
| | iv. Ext. Modem | | 02 |
| | v. Wireless N/W Adaptor | | 02 |
| | vi. Series Access Point | | 02 |
| | vii.LAN Cable Meter | | 05 |
| | viii. LAN Cable Analyzer | | 05 |
| | ix. Crimping Tool | | 15 |
| | and all other accessories related to Networking | | |
| 5. | Scanner- Flat Bed A4/Auto Lighter (Bit depth 48) | | 02 20,000 |
| 6. | 132 Column 600 CPS or faster 9 Pin dot matrix printer with 500 million character head life | | 02 50,000 |
| 7. | Laser Jet-A4 All In one 20 page per min (2 Each) | | 04 50,000 |
| 8. | Desk Jet-A4 Photo Smart (2 Each) | | 04 40,000 |
| 9. | 5 KVA on line UPS with minimum 30 minute battery backup along with sealed maintenance free batteries. Provision for connecting external batteries with network | | 04 8,00000 |

| | | | |
|-----|--|----|---------|
| | connectivity.(For 2 Labs) | | |
| 10. | Split Air Conditioner 1.5 tones capacity with ISI mark along with electronic voltage stabilizer with over voltage and time delay circuit | 08 | 35,0000 |
| 11. | Room preparation and furniture | LS | |
| 12. | 19" rack, 24-port switch. connector RJ-45 Cat-6 cabling for network | LS | 10,0000 |
| 13. | 2 KVA Inverter Cum UPS | 02 | 6,0000 |
| 14. | Fire Extinguisher (2 Kg.) | 04 | 15000 |
| 15. | Fire Extinguisher (5 Kg.) | 04 | 25000 |
| 16. | Vacuum Cleaner | 02 | 25000 |
| 17. | LCD Projector 3000 Lumen with all Accessories | 02 | 350000 |
| 18. | Pen Drive 16 GB | 10 | 10000 |
| 19. | DVD Writer External | 02 | 10000 |
| 20. | HDD External 500 GB | 02 | 15000 |
| 21. | PAD (Latest Configuration) | 02 | 15000 |
| 22. | Broadband For Internet(Speed Min. 8mbps) | 04 | LS |
| 23. | USB Modem | 02 | 8000 |
| 24. | Generator 15 KVA Water Coolant | 01 | 450000 |

LEARNING RESOURCE MATERIALS

| | | | | |
|----|--|---|----|-------|
| 1. | LCD Projector with Screen | 1 | -- | 20000 |
| 2. | Handicam | 1 | -- | 30000 |
| 3. | Cutting, Binding & Stitching equipment. | 1 | -- | 30000 |
| 4. | Desk Top Computer with Internet Core i5/i7- 760, Processor, Genuine Windiw 7, Professional 18 inch HD, Flat Panel Monitor Optical Mouse, Key Board & all related media or latest version | 1 | -- | 40000 |
| 5. | Home Theater Support Disc type CD. CDR/CDRW DVDR/DVDRW, VCD Supported with USB Port Support-DIVX/JPEG/MP3 | 1 | -- | 25000 |
| 6. | Commerical P A System 16 W-220W output, AC & 24V DC Operated, 5 Mic. & 2 Auxilary input, Speaker output 4 Ohm, 8 Ohm, 17 V & 100 V | 1 | -- | 20000 |
| 7. | Interactive Board | 1 | -- | 50000 |

ote :

1. This center will be only one at the institute level irrespective of all branches.

ANNEXURE- I QUESTIONNAIRE

INSTITUTE OF RESEARCH, DEVELOPMENT AND TRAINING U.P. KANPUR -208024

SUBJECT: Questionnaire for ascertaining the job potential and activities of diploma holder in Leather Technology.

PURPOSE: To design and develop diploma curriculum in Leather Technology.

NOTE: 1. Please answer the questions to the points given in the questionnaire.

2. Any other point or suggestion not covered in this questionnaire may be written on a separate paper and enclosed with the questionnaire.

1. Name of the organisation: _____

2. Name & Designation of the officer _____
filling the questionnaire _____

3. Name of the department/section/ _____
shop _____

4. Important functions of the _____
department/section/shop _____

5. Number of diploma holder employees _____
under your charge in the area of _____
Leather Technology.

6. Please give names of modern equipments/machines handled by a diploma holder in Leather technology.

- | | | |
|----|----|----|
| 1. | 2. | 3. |
| 4. | 5. | 6. |

7. What proficiencies are expected from a diploma holder in Leather Technology.

- | | | |
|----|----|----|
| 1. | 2. | 3. |
| 4. | 5. | 6. |

8. Mention the approximate percentage of the following desired in Diploma teaching.

1. Theoretical knowledge -----%

- 2. Practical knowledge -----%
- 3. Skill Development -----%

9. Do you think " on the job training" / Industrial training should form a part of curriculum. (Yes/ No)
if yes then

- (a) Duration of training -----
- (b) Mode of training
 - 1. Spread over different semesters
 - 2. After completion of course
 - 3. Any other mode

10. What mode of recruitment is followed by your organisation.

- 1. Academic merit
- 2. Written test
- 3. Group discussion
- 4. Interview
- 5. On the job test.

11. Mention the capabilities/ Qualities looked for while recruiting diploma holder in Leather Technology.

- (a) Technical knowledge -----
- (b) Practical skill -----
- (c) Etiquettes and behaviour -----
- (d) Aptitude -----
- (e) Health habit and social background -----
- (f) Institution where trained -----

12. Does your organisation have any system for the survey of Leather processing techniques of different countries/States. Yes/No

13. Does your organisation conducts field survey to know users views regarding. Yes/No

- 1. Use of different leather goods.
 - 2. Effect of climatic conditions
 - 3. Any other
- If yes ; please give brief account of each.

14. Which type of assignment do you suggest for an entrepreneur in Leather Technology.

15. In which types of organisations can a diploma holder in Leather Technology work ?

- | | | |
|---|---|---|
| 1 | 2 | 3 |
| 4 | 5 | 6 |

16. Job prospects for the diploma holder in Leather Technology the next ten years in the state / country.

17. In your opinion what should be the subjects to be taught to a diploma student in Leather Technology.

Theory

Practical

18. Kindly mention particulars regarding topics/areas which should be given more emphasis in the curriculum .

Theory

Practical

19. Kindly state whether your organisation can contribute towards improvement of curriculum in above field. Yes/ No
If yes : Pleas give names of experts in your organisation to whom contact.

20. Kindly give your valuable suggestions for being considered at the time of finilisation of curriculum.

21. What changes in technologies or to be incorporated in the development of curriculum on Leather Technology.

(Signature)

Kindly mail the above questionnaire duly filled to:-

Dr. Kshama Mishra
Assistant Professor
Institute of Research,Development & Training,U.P.
Govt. Polytechnic Campus
Kanpur-208024

(Please note that all information in this survey is confidential for the use of curriculum design only)

ANNEXURE- II SUMMER TRAINING SCHEDULE

4 weeks structured, supervised, branch specific, task oriented industrial/field exposure to be organised during summer vacation after second year annual examination.

The student during the vocational training must undertake training in any one of the following.

1. Raw hide collection, storage, curing and preservation methods including various types of transportaion in common use.
2. Students are required to gather full details regarding different sections of a tannery including its layout, machines used with specification, source of supply of spare parts and maintenance schedule.
3. Beam house operations, process involved in making leather upto wet blue. Full details including processing etc. are to ne onserved during training period.
4. Tanning and finishing operations of a tannery including dyeing, measuring etc.
5. Effluent treatment methods adopted in a tannery including primary and secondary treatment, tannery waste mangement.
6. Chemical and physical testing of leather, marketing of leather and exoprt documentation practice.

The students will work and focus their attention during the training on the following points which will be incorporated by them in their reports.

1. Name & Address of the unit
2. Date of
 - i. Joining.
 - ii. Leaving.
3. Nature of Industry
 - i. Product.
 - ii. Services.
 - iii. Working Hrs.
4. Sections of the unit visited and activities there in.
5. Details of machines/Tools & instruments used in working in the section of the unit visited.
6. Work procedure in the section visited.
7. Specifications of the product of the section and materials used.
8. Work of repair and maintenance cell.
9. Details of the shops
10. Name of checking and Inspecting Instruments and their details. Quality controls measures taken.
11. Details of hadraulics/pneumatic/thermal units or appliances used if any.
12. Discription of any breakdown and its restoring.
13. Use of computer - if any.
14. Visit of units store, Manner of keeping store items, Their receiving & distribution.
15. Safety measures on work place & working conditions in general - comfortable, convenient & hygeinic.

RECOMMENDED BOOKS

List of standard Text Books recommended for diploma level institutions of Uttar Pradesh

1. DISCIPLINE : APPLIED PHYSICS

| Sl.No. | TEXT BOOK | AUTHOR | MEDIUM | EDITION YR | COST | FULL ADDRESS OF PUBLICATION |
|--------|-------------------------------|------------------------|---------|------------|--------|---|
| 1. | ANUPRAYUKT BHAUTKI | GUPTA & GUPTA | HINDI | 1995 | 75.00 | ASIAN PUBLISHERS, 85-C NAI MANDI, MUZAFFAR NAGAR |
| 2. | ENGINEERING BHAUTKI | Dr. BHARGAVA | HINDI | 1995 | 60.00 | DHANPAT RAI & SONS |
| 3. | ANUPRAYUKT BHAUTKI | KUMAR & TYAGI | HINDI | 1995 | 75.00 | NAV BHARAT PRAKASHAN, BEGUM BRIDGE ROAD, MEERUT |
| 4. | ANUPRAYUKT BHAUTKI | Dr. R.C.PANDEY | HINDI | 1994 | 75.00 | NAV BHARAT PRAKASHAN, BEGUM BRIDGE ROAD, MEERUT |
| 5. | APPLIED PHYSICS-I (Vol - I) | Dr. H.H.LAL | ENGLISH | 1993 | 45.00 | TATA MCGRAW HILL |
| 6. | APPLIED PHYSICS-II (Vol - II) | Dr. H.H.LAL | ENGLISH | 1993 | 54.00 | TATA MCGRAW HILL |
| 7. | MODERN COLLEGE PHYSICS | WHITE | ENGLISH | 1995 | 110.00 | C. B. S. |
| 8. | PHYSICS Vol - I & II | HOLLIDAY AND RESNIC | ENGLISH | 1993 | 100.00 | WILEY EASTERN |

1. DISCIPLINE : APPLIED MATHEMATICS

| Sl.No. | TEXT BOOK | AUTHOR | MEDIUM | EDITION YR | COST | FULL ADDRESS OF PUBLICATION |
|--------|---|------------------|---------|------------|--------|--|
| 1. | APPLIED MATHEMATICS (Math-I & Math-II) | KAPOOR & TARAMAN | HINDI | 1994 | 75.00 | NAV BHARAT PRAKASHAN, MEERUT |
| 2. | APPLIED MATHEMATICS (Math-I & Math-II) | Dr KAILASH SINHA | HINDI | 1994 | 60.00 | BHARAT BHARATI PRAKASHAN, MEERUT |
| 3. | APPLIED MATHEMATICS (I & II) | LUTHERA | HINDI | 1994 | 65.00 | B. Tec. PRAKASHAN, LUCKNOW |
| 4. | APPLIED MATHEMATICS (I & II) | P. GUPTA | HINDI | 1994 | 65.00 | ASIAN PUBLISHERS, MUZAFFAR NAGAR |
| 5. | ADVANCE Engg. MATHS | H. K. DAS | ENGLISH | 1994 | 125.00 | S. CHAND & CO., RAM NAGAR NEW DELHI |

1. DISCIPLINE : COMMUNICATION TECHNIQUES

| Sl.No. | TEXT BOOK | AUTHOR | MEDIUM | EDITION YR | COST | FULL ADDRESS OF PUBLICATION |
|--------|---------------------------|--|---------|------------|-------|-----------------------------|
| 1. | ENGLISH FOR COMMUNICATION | V. SHASHIKUMAR M. N. K. BOSE | ENGLISH | 1987 | 21.00 | I. R. D. T. U. P., KANPUR |
| 2. | SAMPRESHAN TAKNIK | Prof. R. PAL Dr. Smt NEERAJ SHUKLA Dr. SUBHASH GARG | HINDI | 1989 | 15.00 | I. R. D. T. U. P., KANPUR |

DISCIPLINE : APPLIED CHEMISTRY

| S1.No. | TEXT BOOK | AUTHOR | MEDIUM | EDITION YR | COST | FULL ADDRESS OF PUBLICATION |
|--------|-------------------------|---------------------------|---------|------------|--------|--|
| 1. | ANUPRAYUKT RASAYAN | KHANNA & KHANNA & BOUNTRA | HINDI | 1994 | 60.00 | BHARAT BAARTI PRAKASHAN, MEERUT |
| 2. | PRAYUKT RASAYAN | MAHENDRA AND SRIVASTAVA | HINDI | 1994 | 58.00 | B.TECH. PUBLISHERS, AMMINABAD LUCKNOW |
| 3. | PRAYUKT RASAYAN SHASTRA | S. CHANDRA | HINDI | 1994 | 60.00 | NAV BHARAT PRAKASHAN, BEGUM BRIDGE ROAD, MEERUT |
| 4. | APPLIED CHEMISTRY | V. P. MEHITA | HINDI | 1993 | 60.00 | ASIAN PUBLISHERS, 85-C NAI MANDI, MUZAFFAR NAGAR |
| 5. | ENGINEERING RASAYAN | Dr. LALIT | HINDI | 1994 | 45.00 | DHANPAT RAI & SONS, 1682 NAI SARAK, DELHI |
| 6. | ENGINEERING CHEMISTRY | P. C. JAIN | ENGLISH | 1994 | 100.00 | DHANPAT RAI & SONS, 1682 NAI SARAK, DELHI |

1. DISCIPLINE : LEATHER TECHNOLOGY

| S1.No. | TEXT BOOK | AUTHOR | MEDIUM | EDITION YR | COST | FULL ADDRESS OF PUBLICATION |
|--------|---|------------------------------|---------|------------|---------|-------------------------------------|
| 1. | ENVIRONMENT CHEM. | SAWYER | ENGLISH | LATEST | | |
| 2. | WASTE WATER ENGG. TREATMENT DISPOSAL & REUSE | METCALFA & EDDY | ENGLISH | LATEST | | |
| 3. | BIOLOGICAL WASTE TREATMENT | RAO, DUTTA | ENGLISH | LATEST | | |
| 4. | PRACTICAL INTRODUCTION TO THE DYES & FINISHING OF WOOD FABRICS | I. E. BEAKPARK | ENGLISH | 1986 | \$ 7.50 | DYEIS CO. PUBLICATIONS TRUST |
| 5. | PHYSICAL CHEMISTRY OF LEATHER MAKING | Z.K.BIENKIEWIEZ | ENGLISH | 1983 | \$49.00 | KRIEGER PUBLISHING Co. |
| 6. | GLOVING, CLOTHING & SPEICAL LEATHER | P. S. BRIGGS | ENGLISH | 1981 | \$ 5.00 | TROPICAL PRODUCT INSTT., U.K. |
| 7. | AUTOMATIC SPRAYING M/c FOR LEATHER PRODUCTION | D. N. PRICE | ENGLISH | LATEST | \$45.00 | SHOE TRADES PUB., U.S.A. |
| 8. | FARMING & ABBITION PRACTICES LEADING TO IMPARIED LEATHERS QUALITY | COMPILED | ENGLISH | 1987 | \$20.00 | BRITHSH LEATHER CONFEDRATION |
| 9. | FUNGICIDES USED ON LEATHER | C. CALNAN | ENGLISH | 1985 | \$ 6.00 | LEATHER CONSERVATION CENTRE |
| 10. | LEATHER DEFECTS- A GUIDE TO THEIR MECROSCOPY | M. DEMPSEY | ENGLISH | 1974 | \$19.70 | LEATHER & SHOE RESEARCH ASSOCIATION |
| 11. | FUNDAMENTAL OF LEATHERS MANF. | HEIDEMANN | ENGLISH | 1993 | \$61.80 | EDNARD ROETHER |
| 12. | HIDE SKINS IMPROVEMENTS IN DEVELOPING COUNTRIES | H. M. S. O. | ENGLISH | 1985 | \$ 9.00 | H. M. S. O. |
| 13. | SAFE GARDING OF MULTI ROLLER M/c USED IN THE LEATHER PRODUCING INDUSTRIES | | ENGLISH | 1981 | \$ 8.00 | LEATHER PRODUCIRS ASS. |
| 14. | SAFE GARDING OF TANNERY DRUMS | | ENGLISH | 1980 | \$ 6.70 | LEATHER PRODUCIRS ASS. |
| 15. | SUPPLMENT TO SAFE GARDING OF TANNERY DRUMS | | ENGLISH | 1984 | \$ 5.35 | LEATHER PRODUCIRS ASS. |
| 16. | TAINNING OF HIDES & SKINS | LOCKHART SMITH C. J. ELLIOTT | ENGLISH | 1974 | \$ 0.70 | TROPICAL PRODUCT |
| 17. | MODERN RATIONAL DYEING AND FINISHING OF VEG-SOLE LEATHER | J. MOSIEWICA J. | ENGLISH | 1982 | \$19.99 | SHOE TRADES PUB. CO., U.S.A. |

| S1.No. | TEXT BOOK | AUTHOR | MEDIUM | EDITION YR | COST | FULL ADDRESS OF PUBLICATION |
|--------|--|-----------------|---------|------------|----------|------------------------------------|
| 18. | MODERNISATION RATIONAL PIT DRUMS TANNAGE OF VEG. SOLE LEATHER | MOSIEWICZ J. | ENGLISH | 1976 | \$17.95 | SHOE TRADES PUB. CO., U.S.A. |
| 19. | CHEMISTRY AND TECH. OF LEATHER 4 VOLUME | F. O. FLAHERTY | ENGLISH | 1992 | \$199.99 | KALLEN BERGER W. E. |
| 20. | LEATHER TECHNICIAN HAND BOOK | J.H. SHERPHOUSE | ENGLISH | 1989 | \$18.50 | LEATHER PRODUCIRS ASS. |
| 21. | SKIN, HIDS & LEATHER AFICTS | J. J. TANCOUS | ENGLISH | 1959 | \$57.00 | TANNIRS COUNCIL, U. S. A. |
| 22. | SURVEY OF MODERN VEG. TANNAGE | | ENGLISH | 1974 | \$25.20 | TANNING EXPRACT PRO. FEDERATION |
| 23. | DYES HOUSE LABORATORY PRACTICE | T. M. THOUMPSON | ENGLISH | 1983 | \$ 7.20 | DYES Co. PUBLICATION TRUST |
| 24. | PRACTICAL LEATHER TECH. | T. C.THOSTENSEN | ENGLISH | 1992 | \$34.95 | KRIEGER PUBLISHING CO.,U.S.A |
| 25. | MANF. OF UPPER LEATHER | D. H. TUCK | ENGLISH | 1981 | \$ 5.00 | TROPICAL PRODUCTS |
| 26. | OILS AND LUBRICATION USED IN LEATHER | D. H. TUCK | ENGLISH | 1983 | \$ 6.50 | LEATHER CONSERVATION CENTRE |
| 27. | FUNDAMENTALS OF POLLUTION CONTROL FOR LEATHER INDUSTRY | T.C. THORTENSEN | ENGLISH | | | SHOE TRADER PUB. Co., U.S.A. |
| 28. | CHEMICALS FOR LEATHER INDUSTRY | COMPILED | ENGLISH | 1994 | 200.00 | N. L. D. P., MADRAS |
| 29. | RAW MATERIALS FOR INDIAN LATHER | COMPILED | ENGLISH | 1994 | 250.00 | N. L. D. P., MADRAS |
| 30. | MODERNISATION OF LEATHER INDUSTRY & DEV. OF LEATHER IN INDIA | COMPILED | ENGLISH | 1994 | 200.00 | N. L. D. P., MADRAS |
| 31. | THEORY OF PRACTICE OF LEATHER MANF. | K. T. SARKAR | ENGLISH | | | |
| 32. | LECTURE NOTES OF DYEING AND FINISHING | C. K. RAO | ENGLISH | | | C. L. R. I., MADRAS |
| 33. | AN INTRODUCTION TO THE PRINCIPLE OF PHYSICAL TESTING OF LEATHER | S. S. DUTTA | ENGLISH | | 50.00 | I. L. T. A., CALCUTTA |
| 34. | PRACTICAL ASPECT OF THE MANF. OF UPPER LEATHER | J. DEY | ENGLISH | | 50.00 | I. L. T. A., CALCUTTA |