

3.1 LEATHER MANUFACTURE - II

L T P Cr
4 - 6 7

RATIONALE

Diploma holders in Leather Technology are suppose to acquire knowledge of various methods of tanning of leather like vegetable tanning, oil tanning, aldehyde tanning, Alum tanning, zirconium tanning etc. Thorough study of various tanning techniques and tannages help in deciding the suitability of particular process. For this purpose, it is essential that students should be given adequate knowledge and skill development exercises for enabling them to perform effectively on the shop floor.

DETAILED CONTENTS

THEORY

1. Vegetable Tanning (10 hrs)
Classification, identification, physical and chemical properties. Study of vegetable tanning materials, preparation of tanning liquors by leaching and preparation of extracts, types of extracts, sulponation of tan liquors, factors involved in vegetable tanning machanism of vegetable tanning.
2. Oil Tanning (10 hrs)
Types of oils and fats, their properties, mechanism of oil tanning
3. Aldehyde Tanning (10 hrs)
Reactions of form aldehyde with proteins, mechanism of aldehyde tanning, use of glutar aldehyde and dialdehyde in leather manufacture
4. Alum Tanning (10 hrs)
Chemistry of aluminium salts (chlorides, sulphates) hydrolysis, olation, oxolation, basification effect of masking salts, mechanism of Alum tanning
5. Zirconium Tanning (10 hrs)
Zirconium sulphates, chlorides, hydrolysis basification, mechanism of zirconium tanning, use of zirconium salts in tanning
6. Combination Tannages (14 hrs)
Application of vegetable oils and syntans in combination in the production of semi chrome, Alum, chrome, Alum retan, sulphur-oil-vegetable tannage, chrome zirconium tannage, oil aldehyde tannage - their mechanism, application of iron salts and sodium silicate salts in tanning processes

LIST OF PRACTICALS

1. Group discussion with students alongwith industry representatives
2. Exercises involving tanning, aldehyde Alum tanning, combination tannage. Wet blue making.
3. Fur tanning, chamois leather manufacturing.
4. Visit to tanning units.

INSTRUCTIONAL STRATEGY

This subject is one of the basic subjects for the diploma in leather technology. The teacher should lay lot of emphasis on developing thorough understanding of various facts, concepts, principles and practices involved in leather manufacturing. Teacher should design tutorial exercises and students should be given practice on solving the same using books, manuals, with the assistance of teachers. Visits to some of the small, medium and large-scale tanneries may also be arranged to expose the students about various processes. Students should be sent to market for collecting samples and catalogue of various raw materials used in tanneries.

RECOMMENDED BOOKS

1. An Introduction to Principles of Leather Manufacture by SS Dutta, Indian Leather Technologists Association, Kolkota
2. Theory and Practice of Leather Manufacture by KT Sarkar
3. Leather Technicians Handbook by JH Sharpouse, Lather Producers Association, Northampton, UK
4. Chemistry and Technology of Leather by O' Flaherty, Roddy and Lollar, Vol. I and II, Robert E. Krieger Publishing Company, USA
5. Vegetable Tanning Materials of India by VS Sundara Rao
6. Practical Leather Technology by TC Thorstensen, Robert E. Krieger Publishing Co., Florida
7. Retanning Dyeing and Finshing of Leathers by KT Sarkar
8. Lecture Notes on Leather by PS Venkatachalam, APO Notes
9. Technical Literatures from Various Leather Chemicals Companies

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	16
2	10	16
3	10	16
4	10	16
5	10	16
6	14	20
Total	64	100

3.2 ORGANIC CHEMISTRY - I

L T P Cr
4 - 4 6

RATIONALE

Diploma holders in leather technology are required to supervise laboratories and should have practical and theoretical understanding which is to be applied in the leather technology (Leather Manufacturing). It is very essential that the students should have adequate knowledge of theory and practical skills for enabling them to perform effectively and efficiently on the shop-floor. Hence through this subject, it is expected from the teacher to provide/lay greater emphasis on theory and practicals in organic chemistry which are necessary element and are part and parcel of the leather manufacturing principles and processes

DETAILED CONTENTS

THEORY

1. Introduction (6 hrs)
Purification of organic compounds (crystallisation) distillation and sublimation - detection of elements(N.S and Halogens). Estimation of Hydrogen and sulphur
2. Problems on (8 hrs)
Empirical and Molecular formulae. Isomerism (structural and stereo) Hydrocarbon saturated and unsaturated. Substitution and addition reactions. Chlorination of methane
3. Unsaturated Hydrocarbons and Alkylhalides (8 hrs)
Preparation, properties and uses of Ethylene and acetylene. Polymerisation of ethylene and acetylene. Alkylhalides CH_3Cl and CH_3I
4. Petroleum Products (8 hrs)
Preparation and properties of Chloroform and Iodoform. Theories of origin of petroleum. Fractional distillation of petroleum. Petroleum products and their uses
5. Alcohols (8 hrs)
Primary, Secondary, Tertiary alcohols. Difference between preparation of ethyl alcohol by fermentation of molasses. Preparation, properties and uses of ethylene glycol and glycerol

6. Ether (6 hrs)
Diethyl Ether - Preparation, properties and uses
7. Aldehydes (8 hrs)
Formaldehyde and acetaldehyde. Laboratory methods of preparation, properties and uses
8. Ketones (6 hrs)
Acetone-Laboratory method of preparation, properties and uses
9. Acids (6 hrs)
Laboratory Methods of preparation, properties and uses of acetic, lactic, formic, citric and oxalic acids

LIST OF PRACTICALS

1. Detection of Cl, Br, I, S and N in organic compounds
2. Detection of functional groups like aldehyde
3. Detection of functional group of ketones
4. Detection of carboxylic group
5. Detection of amino group (nitrogen content)
6. Detection of functional groups of carbohydrates

INSTRUCTIONAL STRATEGY

The understanding of chemistry is a must for the students for better appreciation of leather technology subjects. Teachers should give brief introduction to various topics and they should try to develop a co-relation of chemistry and its applied aspects to leather technology. Teachers may give appropriate tutorial exercises to the students. Use of charts may be made during the theory classes. Experiments given in the list of practical should be performed by individual students under the supervision of teachers. The safety precautions, while working on experiments, should be taken to avoid any accidents.

RECOMMENDED BOOKS

1. Principles of Physical Chemistry by Puri, Sharma and Pathania
2. Chemistry in Engineering and Technology Vol. I and II by JC Kuriaese and J Rajaram
3. Organic Chemistry V edition by RT Morison and RN Boyd; Prentice Hall of India Pvt. Ltd., New Delhi 1990

4. A Text Book of Organic Chemistry by KS Tewari SN Mehrotra and NK Vishnoi; Vikas Publishing House, New Delhi
5. Chemical Engineering Handbook by JH Perry
6. Riegel's Handbook of Industrial Chemistry by JA Kent, Ed., Van Nostrand Reinhold, 1974
7. Shreve's Chemical Process Industries 5th Edition by GT Austin; McGraw Hill International Book Co., Singapore 1984
8. Inorganic Chemistry by Cotton and Wilkinson
9. Chemical Technology by Kirk and Arthor
10. Physical Chemistry of Leather Manufacture by Bienkiewicz, 1952
11. Chemistry of Tanning Process by KH Gustavson; New York

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	6	10
2	8	12
3	8	12
4	8	12
5	8	12
6	6	10
7	8	12
8	6	10
	6	10
Total	64	100

3.3 MICROSCOPY AND MICROBIOLOGY

L T P Cr
4 - 6 7

RATIONALE

Diploma holders in Leather Technology are suppose to scientifically examine/study hides and skins and this requires microscopic observations. Diploma holders can effectively analyse raw materials only if they are equipped with practical and working knowledge of microscopes, bacteriology and moulds etc. Life cycles of small micro organisms bacterias provides scientific handling and treatment of leather and leather goods.

For this purpose students should be given adequate knowledge and skills of microscopy and microbiology so as to enable them to perform effectively on the shop-floor. Hence this subject.

DETAILED CONTENTS

THEORY

1. Microscopy (16 hrs)
 - 1.1 Microscopes:
Different types of microscopes - mechanical and optical parts in microscope
 - 1.2 Slide preparation for microscopic study:
Preparation of materials, fixing, embedding, section cutting, staining and mounting
 - 1.3 Application of microscopy:
Anatomical structure of hair and wool grain patterns of hides and skins, Fibre structure of leather, microscopic assessment of leathers, Application of microscopy to note the changes that may take place in processing i.e. soaking, liming, deliming, batting, pickling tanning and finishing

2. Bacteriology (22 hrs)
 - 2.1 Fundamentals of Bacteriology:
Microscopic form of life, recognition under microscope, their culture, preparation of various culture media- sterilization, morphological characteristics of bacteria, staining of bacteria and classification, Biochemical properties of bacteria count
 - 2.2 Action of Bacteria on Hides and Skins:
Damage caused by bacterial infestation, hair slip, liberation of ammonia - Halophilic bacteria, problem of red heat and its cure, Bacterial analysis of various tannery substrates in different stages of leather manufacture and their control and prevention of its growth by use of preservatives such as bacteriostatic and bacteriocidal agents, determination of protelytic activity of bacteria

3. Moulds (14 hrs)
Moulds and their difference from bacteria. Damages that can be produced by moulds to leathers, tan liquors, pickledskins and mould prevention
4. Applications of various enzymes in leather processing. (12 hrs)

LIST OF PRACTICALS

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

INSTRUCTIONAL STRATEGY

This subject is one of the basic subjects for the diploma in leather technology. The teacher should lay lot of emphasis on developing thorough understanding of various facts, concepts, principles and practices involved in leather manufacturing. Teacher should design tutorial exercises and students should be given practice on solving the same using books, manuals, with the assistance of teachers. Visits to some of the small, medium and large-scale tanneries may also be arranged to expose the students about various processes. Students should be sent to market for collecting samples and catalogue of various raw materials used in tanneries.

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2. Theory and Practice of Leather Manufacture by KT Sarkar
3. Leather Technicians Handbook by JH Sharphouse, Lather Producers Association, Northampton, UK
4. Chemistry and Technology of Leather by O' Flaherty, Roddy and Lollar, Vol. I and II, Robert E. Krieger Publishing Company, USA
5. Vegetable Tanning Materials of India by VS Sundara Rao

6. Practical Leather Technology by TC Thorstensen, Robert E. Krieger Publishing Co., Florida
7. Retanning Dyeing and Finishing of Leathers by KT Sarkar
8. Lecture Notes on Leather by PS Venkatachalam, APO Notes
9. Technical Literatures from Various Leather Chemicals Companies

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	16	25
2	22	35
3	14	20
4	12	20
Total	64	100

3.3 GENERAL ENGINEERING

L	T	P	Cr
4	-	2	5

RATIONALE

A diploma holder has to assist in activities of installation, operation and maintenance etc of different machines and equipment. These activities are not branch specific and instead require him to know basics of civil, electrical and mechanical engineering. The subject of General Engineering has been included to impart basic knowledge of civil, electrical and mechanical engineering to the students.

Note:

1. The students of Civil Engineering, will be studying Part A (Mechanical Engineering) and Part B (Electrical Engineering) only.
2. The students of Electrical engineering, Electronics and Communication Engineering, Instrumentation and Control Engineering, Computer Engineering and Information Technology will be studying Part A (Mechanical Engineering) and Part C (Civil Engineering) only.
3. The students of Mechanical Engineering will be studying Part B (Electrical Engineering) and Part C (Civil Engineering) only.
4. The students of remaining branches of engineering and technology will be studying all the three Parts A (Mechanical Engineering), Part B (Electrical Engineering) and Part C (Civil Engineering), unless specified otherwise
5. A time of 2 hours per week has been allotted to Mechanical Engineering, 2 hours per week to Electrical Engineering and 2 hour per week to Civil Engineering in the lecture hours, for teaching theory and a lump-sum time of 2 hours per week has been allotted for the Practicals.

DETAILED CONTENTS

PART-A

MECHANICAL ENGINEERING

Theory

1. **Transmission of Power** (8 hrs)
 - 1.1 Belt Drives:
Types of belts, belt materials, cross and flat belt drives, advantages of V-belt drive over flat belt drive.
 - 1.2 Gears Drives:
Types of gears (briefly), types of gear trains

- 2. Internal combustion Engines** (10 hrs)
- 2.1 Classification of IC engines
 - 2.2 Working principles of two stroke and four stroke engines
 - 2.3 Working principles of petrol engine and diesel engines
 - 2.4 Gas turbines (working principle only)
- 3. Refrigeration and Air Conditioning System** (8 hrs)
- 3.1 Different types of refrigeration principles and refrigerants
 - 3.2 Working of domestic refrigerator
 - 3.3 Working of Window type AC system
- 4. Hydraulics:** (6 hrs)
- 4.1 Classification of pumps (reciprocating and centrifugal)
 - 4.2 Working principles of both reciprocating and centrifugal pumps
 - 4.3 Turbine: Working principles of impulse turbine and reaction turbine

PRACTICAL EXERCISES IN MECHANICAL ENGINEERING

1. Demonstration and study of main parts of 4 stroke petrol and diesel engines by actually dismantling them (The idea is to acquaint the students with the most common troubles occurring in the engines)
2. Demonstration and study of main parts of 2 stroke petrol engine by actually dismantling it. (The idea is to acquaint the students with the most common trouble occurring in the engines)
3. Demonstration and study of gas turbines through models
4. Demonstration and study of different hydraulic pumps
5. Demonstration and study of various drives for transmission of powers i.e. models of belts and gears.
6. Demonstration and study of air conditioning system in a building
7. Demonstration and study of domestic refrigerating system

PART B

ELECTRICAL ENGINEERING

Theory

Electrical:

1. Basic Quantities of Electricity: (4 hrs)
 - 1.1 Definition of voltage, current, power and energy with their units
 - 1.2 Name of the instruments used for measurement of quantities such as voltmeter, ammeter, wattmeter, energy meter.

- 1.3 Connection of the instruments in electric circuit
2. Application and Advantages of Electricity: (3 hrs)
 - 2.1 Difference between AC and DC
 - 2.2 Various applications of electricity
 - 2.4 Advantages of electrical energy over other types of energy
3. Various Types of Power Plants: (3 hrs)
 - 3.1 Elementary block diagram of thermal, hydro and nuclear power stations
 - 3.2 Brief explanation of the principle of power generation in above power stations
4. Transmission and Distribution System (6 hrs)
 - 4.1 Key diagram of 3 phase transmission and distribution system
 - 4.2 Brief functions of accessories of transmission line
 - 4.3 Distinction between high and low voltage distribution system
 - 4.4 Identification of three phase wires, neutral wires and the earth wire on a low voltage distribution system
 - 4.5 Identification of the voltage between phases and between one phase and neutral
 - 4.6 Distinction between three phase and single phase supply
5. Supply from the Poles to the Distribution Board: (4 hrs)
 - 5.1 Arrangement of supply system from pole to the distribution board
 - 5.2 Function of service line, energy meter, main switch, distribution board
6. Domestic Installation: (6 hrs)
 - 6.1 Distinction between light and fan circuits and single phase power circuit, sub circuits
 - 6.2 Various accessories and parts of installation, identification of wiring systems
 - 6.3 Common safety measures and earthing
 - 6.4 Introduction to BIS code of safety and wiring installation
7. Electric Motors and Pumps: (6 hrs)
 - 7.1 Definition and various application of single phase and three phase motors
 - 7.3 Conversion of horse power in watts or kilowatts
 - 7.4 Type of pumps and their applications
 - 7.5 Use of direct online starter and star delta starter

PRACTICAL EXERCISES IN ELECTRICAL ENGINEERING:

1. Use of Megger:

Objective: To make the students familiar with different uses of megger

2. Connection of a three phase motor and starter including fuses and reversing of direction of rotation.

Objective: Students may be made familiar with the equipment needed to control a three-phase motor
The students must experience that by changing any two phases, the direction of rotation is reversed.

3. Connection of a lamp, ceiling fan, socket outlet, geyser, floor grinder, voltage stabilizer etc.

Objective: Students may be made familiar with the different types of equipment and circuits used in the domestic installations

4. Trouble shooting in a three-phase motor

Note: The teacher may create anyone of the following faults

- (a) Loose connections
- (b) Blown fuse
- (c) Tripped overload protection
- (d) Incorrect direction of rotation
- (e) Single phasing
- (f) Burnt winding to be simulated by a loose connection behind a terminal box.

Objective: The students must be able to detect the most common faults, which may occur in a three-phase motor, using meggar wherever necessary

5. Treatment of electric shock

Note: The teacher may give a demonstration how an electric shock must be treated.

Objective: Students must be trained to treat the persons suffering from an electric shock

6. Demonstration and study of Domestic installation components used in single phase and three phase wiring

7. Demonstration and study of distribution line components

8 Demonstration and study of a distribution Board

Note: Students may be asked to study the distribution board in the institution and note down all accessories.

Objective: Students must be made familiar with the distribution board

9 Connections and taking reading of an energy meter (1 ϕ & 3 ϕ)

Objective: Students may be asked to connect an energy meter to a load and calibrate reading

10. Demonstration and study of submersible motor pump set and its working

Objective: To tell use of the set in water supply and irrigation works.

PART C

CIVIL ENGINEERING

Theory

1. Construction Materials (10 hrs)

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

2. Foundations (8 hrs)

- i) Bearing capacity of soil and its importance
- ii) Types of various foundations and their salient features, suitability of various foundations for heavy, light and vibrating machines

3. Basic concept of concrete (8 hrs)

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

4. RCC (6 hrs)

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

PRACTICAL EXERCISES IN CIVIL ENGINEERING

1. Testing of bricks
 - a) Shape and size
 - b) Soundness test
 - c) Water absorption
 - d) Crushing strength
2. Testing of concrete
 - a) Slump test
 - b) Compressive Strength of concrete cube
3. The students should be taken to different construction sites to show them various construction materials, concreting process and construction of RCC structural elements, foundations and other civil works

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

RECOMMENDED BOOKS

Mechanical Engineering

1. General Mechanical Engineering by M. Adithan; TTTI, Chandigarh
2. Basic Civil and Mechanical Engineering by Jayagopal; Vikas Publications, New Delhi
3. IC Engines and Automobile Engineering by Dr.MP Poonia, Standard Publishers, New Delhi
4. Refrigeration and Air Conditioning by RK Rajput; SK Kataria and sons; Ludhiana
5. Theory of Machines by RS Khurmi and JK Gupta; S. Chand and Company Ltd., New Delhi

Electrical Engineering

1. Electrical Technology Part 1: Basic Electrical Engineering by Theraja, BL; S Chand and Company, New Delhi
2. Principles of Electrical Engineering by Gupta BR, S Chand and Company, New Delhi
3. Basic Electrical Engineering by Mehta VK; S Chand and Company, New Delhi
4. Basic Electricity and Measurements by Suryanarayan NV and N Delhi; Tata McGraw Hill, 1987, New Delhi
5. Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and sons, New Delhi
6. Basic Electrical Engineering by PS Dhogal, Tata McGraw Hill, New Delhi

7. Basic Electricity by BR Sharma; Satya Parkashan, New Delhi

Civil Engineering

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

SUGGESTED DISTRIBUTION OF MARKS

Part-A

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	8	25
2	10	31
3	8	25
4	6	19
Total	32	100

Part-B

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	4	12
2	3	9
3	3	9
4	6	18
5	4	16
6	6	18
7	6	18
Total	32	100

Part-C

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	31
2	8	25
3	8	25
4	6	19
Total	32	100