

3.1 LEATHER MANUFACTURE - II

L T P
4 - 6

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, Chamois Leather
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 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 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 - II

L T P
4 - 4

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. Dicarboxylic Acid (8 hrs)
 Malonic acid, succinic acid - Acid derivatives Acetylchloride, Acetic dihydroxide - higher fatty acids -members from C₁₂-C₁₈ saturated and unsaturated sources, properties and uses of sulphation and sulphonation, saponification and acid value only
2. Ester (6 hrs)
 Ethyl acetate - Laboratory method of preparation, properties and uses
3. Amines (6 hrs)
 Primary, Secondary, Tertiary - Preparation, properties and uses of methyl and ethyl amine
4. Amino Acids (4 hrs)
 Laboratory Method of preparation, properties and uses of glycine
5. Carbohydrates (10 hrs)
 Preparation, properties and uses of glucose, fructose and sucrose. Proteins - Composition - nature - classification, physical and chemical properties, test and uses (brief study)

6. Coal (4 hrs)
Destructive distillation of coal - fractional distillation of coal tar
7. Aromatic Compound (10 hrs)
Difference between aliphatic and aromatic compounds, preparation of benzene from coal tar -its properties and uses. Substitution in benzene ring and side chain. Preparation, properties and uses of chlorobenzene, phenol, benzaldehyde, acetophenone benzoic acid, aniline dyes
8. Lubrication (10 hrs)
Principles of lubrication; characteristics of lubricants such as viscosity, oiliness, acidity, flash point, fire point emulsification; selection of lubricant, types of lubricants - solid (graphite) liquid, mobile oil and semi-solid (grease)
9. Plastics (6 hrs)
Introduction to organic chemistry of plastics, saturated and unsaturated hydrocarbons, condensation, polymerisation, thermosetting and thermo-plastic. Cold setting and hot setting plasticisers. Names of common plastics and their uses

LIST OF PRACTICALS

1. Identification of organic compounds.
2. Detection of functional group of carbohydrates.
3. Detection of primary/secondary tertiary amine.
4. Preparation of soaps.
5. Detection of Glucose or Sucrose in the given sample.
6. Preparation of Chlorobenzene.

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 Kuriaseese 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	08	12
2	06	10
3	06	10
4	04	06
5	10	16
6	04	06
7	10	16
8	10	14
9	06	10
Total	64	100

3.3 MICROSCOPY AND MICROBIOLOGY

L T P

4 - 4

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 (12 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- sterlization, 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 (18 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.

RECOMMENDED BOOKS

1. An Introduction to Principles of Leather Manufacture by SS Dutta, Indian Leather Technologists Association, Kolkata
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 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	12	18
2	22	34
3	18	30
4	12	18
Total	64	100

3.4 STANDARDIZATION AND ANALYTICAL CHEMISTRY OF LEATHER MANUFACTURE (SACLM)

L T P
6 - 4

RATIONALE

Diploma holder in Leather Technology should have competency to analyze 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 for quality assurance. Physical testing help in analyzing quality of leather as per norms. The knowledge about some common instruments which are necessary in routine working of tanneries is necessary to create self confidence in the students.

DETAILED CONTENTS

THEORY

1. Analysis of Water (20 hrs)
Types of water- Principles of analytic methods employed in analysis of water. Effect of hardness of water on various processes in leather manufacture- Softening of water.
2. Analysis of Various Chemicals and Auxiliaries used in Leather Processing (20 hrs)
 - 2.1 Salt, lime, sodium, sulphide, ammonium salts, deliming acids, bates, neutralising agents.
 - 2.2 Oils and fats, sulphatd oils, soap, fatliquors and other auxiliaries like sodium and potassium bichromate resin binders, wax emulsions etc.
3. Analysis of Fresh and Used Liquors of Beam House Processes (20 hrs)
Soak liquor, lime liquor and pickle liquor.
4. Analysis of Tanning Agents (20 hrs)
 - 4.1 Vegetable tanning materials and extracts.
 - 4.2 Basic Chromium Sulphate extracts and liquors, Zirconium and aluminium tanning agents.
 - 4.3 pH measurement, indicators and their uses in testing.
5. Instrumental Methods of Analysis used in Leather Chemistry (16 hrs)
Spectrophotometry and colorimetry, ion-exchange resins etc. In testing of tanning chemicals.

LIST OF PRACTICALS

1. Water analysis-hardness of water (temporary & permanent), chloride content, sulphate content.
2. Analysis of common salt.
3. Analysis of lime-purity of lime, total bases.
4. Analysis of Sodium Sulphide.
5. Analysis of Deliming Agents-analysis of ammonium salts, analysis of organic acids.
6. Analysis of Pickle Liquor-acid and salt contents.
7. Analysis of Oils-moisture, acid value, iodine value, saponification value.
8. Analysis of Sulphated oils, moisture, pH, acid value.
9. Qualitative analysis of Vegetable Tannins, moisture, total solid, total soluble, insoluble, non-tannins, pH.
10. Analysis of Chrome Tanning Agents-chrome powder, moisture, chrome contents, basicity, pH.

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	20	22
2	20	22
3	20	20
4	20	20
5	16	16
Total	96	100

ECOLOGY AND ENVIRONMENTAL AWARENESS CAMP

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the eco system and controlling pollution by pollution control measures. He should also be aware of environmental laws related to the control of pollution.

This is to be organized at a stretch for 3 to 4 days. Lectures will be delivered on following broad topics. There will be no examination for this subject.

1. Basics of ecology, eco system and sustainable development
2. Conservation of land reforms, preservation of species, prevention of advancement of deserts and lowering of water table
3. Sources of pollution - natural and man made, their effects on living and non-living organisms
4. Pollution of water - causes, effects of domestic wastes and industrial effluent on living and non-living organisms
5. Pollution of air-causes and effects of man, animal, vegetation and non-living organisms
6. Sources of noise pollution and its effects
7. Solid waste management; classification of refuse material, types, sources and properties of solid wastes, abatement methods
8. Mining, blasting, deforestation and their effects
9. Legislation to control environment
10. Environmental Impact Assessment (EIA), Elements for preparing EIA statements
11. Current issues in environmental pollution and its control
12. Role of non-conventional sources of energy in environmental protection

ENVIRONMENTAL STUDIES

RATIONALE

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the eco system and controlling pollution by pollution control measures. He should also be aware of environmental laws related to the control of pollution.

Lectures will be delivered on following broad topics.

DETAILED CONTENTS		
1	Basics of ecology, eco system and sustainable development.	
2	Conservation of land reforms, preservation of species, prevention of advancement of deserts and lowering of water table	
3	Sources of pollution - natural and man made, their effects on living and non-living organisms	
4	Pollution of water - causes, effects of domestic wastes and industrial effluent on living and non-living organisms	
5	Pollution of air-causes and effects of man, animal, vegetation and non-living organisms	
6	Sources of noise pollution and its effects	
7	Solid waste management; classification of refuse material, types, sources and properties of solid wastes, abatement methods	
8	Mining, blasting, deforestation and their effects	
9	Legislation to control environment	
10	Environmental Impact Assessment (EIA), Elements for preparing EIA statements	
11	Current issues in environmental pollution and its control, Global warming, Green house gases, non-conventional sources of energy, introduction to clean technology.	
12	Introduction to Green buildings, site selection, material efficiency, energy efficiency, water efficiency, building form.	
13	Role of non-conventional sources of energy in environmental protection	

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Marks Allotted (%)
1	5
2	7
3	7
4	10
5	10
6	6
7	10
8	6
9	6
10	8
11	10
12	5
13	10
Total	100