

Leather Technology

4.1 LEATHER MANUFACTURE - III

L T P
4 - 3

RATIONALE

Several processing steps are involved in obtaining finished leather for manufacturing of leather goods from wet blue leather. These steps involve selection of wet blue leather, neutralization, dyeing, fat liquoring, stuffing, stripping, bleaching and water proofing. The students of diploma holders in leather technology must acquire knowledge and relevant skills related to these processing steps besides knowledge of finishing operations like sammying, setting, drying, sawdusting, buffing, snuffing etc. Awareness about finishing chemicals & auxiliaries will provide added advantage to the students. For this purpose it is essential that students should be given adequate knowledge and skills for enabling them to perform effectively on the shop-floor of leather manufacturing. Hence this subject.

DETAILED CONTENTS THEORY

1. Selection (4 hrs)
Selection of wet blue leather, sammying, splitting, shaving operations
2. Neutralization (6 hrs)
Principle of neutralization, and reactions involved in formulation. Different chemicals used in neutralization and their application in the order of preference.
3. Dyeing (8 hrs)
Principle and methods of dyeing for use of different end products with different recipes. Various types of dyes, their elementary chemistry and behaviour towards leather. Different types of dyeing auxiliary (levelling, fixing agents etc.).
4. Fat Liquoring (8 hrs)
Oil, fats, waxes, emulsions and their types. Different types of fat liquors and their uses. Preparation of fat liquors and their properties and formulation in the manufacture of different types of leathers. Factors affecting choice of fat liquor, mechanism of fat liquoring.
5. Stuffing (6 hrs)
Various types of fats, oils and waxes and their properties, recipes and uses.
Application of stuffing
6. Stripping and Bleaching (8 hrs)
Principles involved in stripping and bleaching of leathers, effect of bleaching and stripping chemicals in their order of preference
7. Water Proofing and Water Repellent Agents (6 hrs)
Different water repellent agents used, their applications and elementary reactions
8. Finishing (Machine Operations) (8 hrs)
 - a) Sammying, Setting and Drying

- Object of sammying and setting, drying process and method of drying with reference to vegetable tanned leather, chrome tanned leather and softy leathers. Vacuum drawing - elementary mechanism and application
- b) Saw dusting or Conditioning
Method and object of conditioning - nailing and toggling, object of nailing, toggling and staking
- c) Buffing and Snuffing
Object of buffing and snuffing. Use of emery paper for different purposes

9. Finishes (10 hrs)

- a) Composition and Classification:
General structure and composition of finishes, classification of finishes
- b) Materials
 - i) Pigments
Classification of pigment, their properties and uses in leather finishing, preparation of pigments and applications
 - ii) Binders
Type of binders – casein/shellac, mucilage and gums, properties and uses
Plasticizers and lusters -names of various materials used and method of their applications, resin binder or polymer binders - types and classification of different binders available in the market
Filling and impregnation agents and methods

Nitrocellulose lacquers, properties and uses. 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 acetate, Co-polymer lacquer and polyurethane - their applications.

Cationic Finishes- their properties & applications.
- c) Techniques
Seasons, their formulations and methods of application Spraying, Glazing, Hot plating, Measuring

LIST OF PRACTICALS

1. Exercises involved in dyeing and finishing like spraying, glazing, hot plating, measuring operations
2. Seasons, their formulations and method of applications
3. Visits to tanneries, auxiliaries and chemical units
4. Quiz competition
5. Identification, selection and grading of finished leather for export.
6. Practical exercises (in detail) involving dyeing, finishing and making of all varieties of leathers manufacturing. Students should undertake rigorous practical

exercises on leather making involving some of the processes from wet blue/E.I/Crust leathers and remaining should be studied during factory visit.

INSTRUCTIONAL STRATEGY

This is a theory and application oriented subject. Teacher should lay emphasis on theoretical and practical concepts for developing skills in the students in post tanning (wet finishing), finishing and mechanical operations involved in leather manufacture. Experts from the industry may be invited to deliver extension lectures on latest trends, specifications and BIS codes. Students should be encouraged to visit some of the leather manufacturing units so that they are able to appreciate the practices being followed in the industries. Students may also be asked to study the properties, application and comparison of various proprietary chemicals and auxiliaries manufactured by different leading companies.

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 T.C. Thorstensen, Robert E. Krieger Publishing Co., Florida
7. Lecture Notes on Dyeing and Finshing of Leathers by C.K. Rao & M.S. Olivannan
8. Lecture Notes on Leather by P.S. Venkatachalam, APO Publ.
9. Technical Literatures from Various Leather Chemicals Companies

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	4	8
2	6	8
3	8	12
4	8	12
5	6	8
6	8	12
7	6	10
8	8	12
9	10	18
Total	64	100

4.2 ELEMENTS OF LEATHER GOODS MANUFACTURE

L T P

**3 - 2
RATIONALE**

Some of the Diploma holders in Leather Technology may assume the responsibility of supervising leather footwear and leather goods manufacturing like selection of materials/inputs; upper, lining and grinders, process, quality checks, production, planning, pricing factors, scheduling, delivery commitment, packaging and forwarding - quality assurance operations. For this purpose it is essential that they should be given adequate knowledge and skills like anatomy of foot, types of lasts, material inputs, various processes, techniques of manufacturing and related topics, machining operations, tools and equipment, type and construction of leather goods, so as to enable them to perform effectively on shop-floor. These knowledge and skills shall be developed through this subject.

DETAILED CONTENTS

1. Brief history of leather goods industry, its impact and importance in modern life (6 hrs)
2. Classification of leather goods such as shopping bags, hand bags, patch bags, pouches and wallets, mobile cases, men's business satchels, executive accessories and petty articles etc. and their fabrication. (10 hrs)
3. Leather and other materials and their selection, characteristics, standardization of fittings and accessories (8 hrs)
4. Tools, equipments and machinery used in leather goods manufacturing (6 hrs)
5. Sketching and pattern cutting of components, their assembly and finishing (6 hrs)
6. Modern methods of fabrication (6 hrs)
7. Elementary knowledge of layout, costing and marketing strategies for leather goods unit (6 hrs)

LIST OF PRACTICALS

1. Sketching, designing and Pattern cutting of various leather goods articles
2. Manufacturing of various articles of leather goods such as leather garments, shopping bags, hand bags, patch bags, pouches and wallets, suitcases, brief case, men's business satchels
3. Executive accessories, fur articles and other petty articles
4. Visits to different sections of leather goods manufacturing units

INSTRUCTIONAL STRATEGY

This is a practical oriented subject. Teacher should lay emphasis on practical exercises for developing skills in the students, in making leather goods. Experts from the industry may be invited to deliver extension lectures on latest trends, specifications and BIS codes

related to leather goods. Students should be encouraged to visit some of the leather goods manufacturing houses so that they are able to appreciate the practices being followed in the industries. Students may also be asked to prepare catalogues of specifications for different types, sizes and styles of leather goods manufactured by different leading companies.

RECOMMENDED BOOKS

1. Manual on Shoe Making by Clark's
2. FDDI Publications
3. CLRI Publications
4. SATRA Publications UK
5. LASRA Publication, New Zealand
6. Textbook of Footwear Manufacture by JH Thornton, Heywood London
7. Textbook of Footwear Material by JH Thornton, Heywood London
8. How to Sew Leather Suede by G Philips W Schewebke, Machmillan, New York

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	14
2	10	20
3	08	16
4	06	12
5	06	12
6	06	14
7	06	12
Total	48	100

4.3 ELEMENTS OF FOOTWEAR TECHNOLOGY

L T P
3 - 4

RATIONALE

Some of the Diploma holders in Leather Technology may assume the responsibility of supervising leather footwear and leather goods manufacturing like selection of materials/inputs; upper, lining and grinders, process, quality checks, production, planning, pricing factors, scheduling, delivery commitment, packaging and forwarding - quality assurance operations. For this purpose it is essential that they should be given adequate knowledge and skills like anatomy of foot, types of lasts, material inputs, various processes, techniques of manufacturing and related topics, machining operations, tools and equipment, type and construction of footwear and leather goods, so as to enable them to perform effectively on shop-floor. These knowledge and skills shall be developed through this subject.

DETAILED CONTENTS

1. Brief history of footwear (2 hrs)
2. Foot Anatomy: Structure of foot bones, arches of human foot, foot movements (7 hrs)
3. Foot abnormalities, foot ailments, cures (7 hrs)
4. Shoe lasts, materials, different types of shoe lasts (3 hrs)
5. Size systems, classifications/types of footwear (3 hrs)
6. Designing and pattern cutting, its importance, grading of patterns, upper, lining and bottoming parts/components (9 hrs)
7. Characteristics and Selection of Different materials for upper, lining as leather, synthetic, non-leather and textile etc. (3 hr)
8. Materials for insole, sole, adhesives – their characteristics etc. Standardization of footwear grinders (3 hrs)
9. Pattern-layout, Cost analysis, Clicking and Closing of uppers, in-process quality control, (5 hrs)
10. Tools, equipments and machinery for footwears (3 hr)
11. Elementary knowledge of layout, cost analysis and marketing strategy for footwear unit. (3 hr)

LIST OF PRACTICALS

1. Preliminary practice of various operation viz clicking, skiving, edge treatment, stitching
2. Designing and pattern cutting of various footwear - upper and bottoming
3. Manufacturing of men's and ladies, chappals, sandals and shoe from clicking to finishing
4. Preliminary practice of different operation such as clicking, skiving, edge treatment, stitching
5. Visit to various footwear manufacturing industries

INSTRUCTIONAL STRATEGY

This is a practical oriented subject. Teacher should lay emphasis on practical exercises for developing skills in the students, in making footwear.. Experts from the industry may be invited to deliver extension lectures on latest trends, specifications and BIS codes related to footwear. Students should be encouraged to visit some of the footwear manufacturing houses so that they are able to appreciate the practices being followed in the industries. Students may also be asked to prepare catalogues of specifications for different types, sizes and styles of footwear manufactured by different leading companies.

RECOMMENDED BOOKS

1. Manual on Shoe Making by Clark's
2. FDDI Publications
3. CLRI Publications
4. SATRA Publications UK
5. LASRA Publication, New Zealand
6. Textbook of Footwear Manufacture by JH Thornton, Heywood London
7. Textbook of Footwear Material by JH Thornton, Heywood London
8. Howe to Sew Leather Suede by G Philips W Schewebke, Machmillan, New York

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	2	4
2	7	10
3	7	10
4	3	8
5	3	8
6	9	14
7	3	10
8	3	8
9	5	12
10	3	8
11	3	8
Total	48	100

4.4 TANNERY WASTE MANAGEMENT

L T P
5 - 3

RATIONALE

The control of environmental pollution is very essential to establish healthy working atmosphere in and around tanneries. The students should have knowledge of tannery wastes treatment and their safe disposal to check atmospheric pollution. Tannery wastes can also be utilized for manufacturing of certain products and students should be provided sufficient knowledge about the same.

DETAILED CONTENTS

THEORY

1. Sources, composition, types and characteristics of tannery wastes. (8 hrs)
2. Hazards created by untreated tannery effluents. (8hrs)
3. Legislation for disposal of tannery effluents. (6 hrs)
4. Environmental problems caused by various pollutants. Methods of disposal, BIS/CPCB/SPCB standards for disposal. (12hrs)
5. Recovery and reuse of chrome from wastes chrome liquor, (6 hrs)
6. Elementary idea of different treatment methods ,primary secondary and tertiary (8 hrs)
- 7 Sludge treatment and disposal, model treatment plants (8 hrs)
8. Various solid wastes, their composition and characteristics (6 hrs)
9. Environmental problems in handling tannery solid wastes (4 hrs)
10. Utilization and disposal of tannery solid wastes (6 hrs)
11. Manufacture of Glue and Gelatin (4 hrs)
12. Manufacture of Leather boards (4 hrs)

LIST OF PRACTICALS

1. Determination of total and dissolved & suspended solids.
2. Determination of sulphate, chloride, acidity, alkalinity and organic nitrogen in tannery influence.
3. C.O.D. & D.O. Determination.
4. Special guest lectures of experts may be arranged at suitable times.
5. Students should be taken to common treatment plant in leather complexes.
6. Students should be taken to leather tannery having independent treatment plant attached with it.
7. Visits of units manufacturing leather based bi-products.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	10
2	08	10
3	06	08
4	12	15
5	06	08
6	08	10
7	08	10
8	06	08
9	04	05
10	06	08
11	04	04
12	04	04
Total	80	100

4.5 LEATHER TRADE ENGINEERING

L T P
3 - 3

RATIONALE

Different types of machinery and machine components are used in leather industry. Diploma holders in Leather Technology are suppose to supervise/perform duties such as selection of site, infrastructure (land/work shed, power, water etc.), installation, operation and maintenance of machinery planning and establishing of tannery, preparation of project feasibility report besides possessing, enterprising qualities (risk taking ability, ability to identify and evaluate available alternatives, arrange and develop resources). For this purpose, it is essential that students should be given adequate knowledge and skills in the areas of product manufacturing, planning, processes, and identify budgetory/materials/inputs to have gainful business and enabling them to perform effectively on the shop-floor. Hence this subject

DETAILED CONTENTS

THEORY

1. Selection of Site (6 hrs)
Location - geographical background, soil and water, power and transport facilities. Facilities of disposal of effluents, facilities for import/export, planning/layout of different sections of tanneries like pots, drums and relevant machinery, building for tannery keeping factors like free air, natural and artificial lighting arrangement, ventilators, windows, doors, roof levels, exhausts etc.
2. Water and Pits (8 hrs)
Water supply, storing and distribution by pipes, valves etc. Arrangements, Sizes, Construction and costing of different pits, sewerage for tannery effluent treatment and proper discharge, estimate for cost of tannery yard with and without machinery
3. Power (6 hrs)
Power supply, steam boiler, types, components and functions of boilers, advantages and disadvantages of machine power and electrical power
4. Transmission of Motion and Power (6 hrs)
Belt drive, slipping of belts, power transmitted by belts, reversing motion by belting fast and lose pullies, rope and chain drive, gear drive, power transmitted by gearing
5. Drums and Paddles (6 hrs)
Types, characteristics, size, weight and cost of drums and paddles, erection and construction of different drums and paddles. Drives for drums and paddles, routine repair and maintenance
6. Tannery Machinery (6 hrs)
General description/characteristics, foundation, installation, erection and commissioning of various tanning machinery like fleshing, unhairing, scudding, setting, shaving, splitting buffing, stacking etc., availability, size, weight, cost,

- mode of working, fuel and speed, power required, types of drive for each machine, power KWH, safety measures and repair and maintenance for each machine
7. Finishing Machines (6 hrs)
Principles of working of various finishing machines, free hand drawing, weight, cost, capacities - power required, total power for finishing yard, repair and maintenance of of various machines, safty precautions to be observed in each machine
 8. Conservation of Energy and Water (4 hrs)

LIST OF PRACTICALS

1. Visit to workshop and tannery to study various working parts of the tanning machines, their make, functions etc
2. Visit to different sections of leather manufacturing industry to study practices followed for checking alignment and rectifying defects therein, Removal of parts for general repair, maintenance and routine service, renewal and reassembly of machines/machine parts
3. Replacement of worn out knives of splitting machine and their renewal
4. Adjustment of grinders and grinding wheels and other attachments of splitting, shaving, and fleshing machine
5. Removal and refixing of glazing glass rollers and seeks in the staking machines, emy shafts in buffing machine and old grinder in shaving machine
6. General check up of all the electrical equipment of motors, starters, switches, fuses etc
7. Replacement of belts, fastening checking slackness of belts their remedies, checking of pulleys, tightening/loosening of shafts, bearing and other alignments
8. Visit to tanning industry to study spray guns and drying chambers
9. Demonstration of correct methods of operating machines in industry/workshop and first aid practical training
10. Blue print reading of tannery layouts and installation drawings
11. Exposure to industry
12. Resource financing through institutions - exposure to various institutions
13. Market survey to identify the design and style packaging and forwarding

INSTRUCTIONAL STRATEGY

Since the diploma holders in leather technology have to perform at the shop floor level, a thorough understanding about tool, machinery and equipment used in tannery is essential. The teachers should teach the subject by showing photograph, slide and video films on the machinery and equipment in the modern tanneries. The students may be taken to various leather tanneries so that they are able to appreciate the size, scale and level of operation being undertaken in the tanneries. The specifications and BIS codes related to equipment and processes should also be included in the various units of instructions. Operation, maintenance, minor repair and safety precautions about each of the machine in different sections of leather processing units should be explained and demonstrated to the students.

RECOMMENDED BOOKS

1. Central Leather Research Institute (CLRI) Process Bulletins
2. Modern Practice in Tanning Dyeing and Finishing Leather by PS Briggs, Tropical Products Institute, London
3. Leather Technician's Hand Book by JH Sharpouse, Leather Producer Association, Northamptonh
4. PracticalLeather Technology by TC Thorstemon; Krieger Publishing Co., Malabar, Florida
5. Automatic Spraying Machine for Leather Production – their Operation and Maintenance by DN Price Shoe Trades Publishing Company Cambridge MA

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	6	12
8	8	16
3	6	12
4	6	12
5	6	12
6	6	12
7	6	12
8	4	
Total	48	100