

## Syllabus for Govt. Polytechnic (Diploma Sector)

Post : Lecturer Leather Technology

### PAPER-I

#### UNIT-I

##### Microscopy and Bacteriology

**History:** Histology of hides and skins-cells, tissues, fibers, muscles, glands, epidermis, dermis etc. histological characteristics of buffalo and cow hides, goat and sheep skins, reptiles skins.

**Compound Microscope:** Mechanical and optical part of compound microscope, image formed, defects in eye pieces and their rectification etc. different types of microscopes.

**Microscopical slides:** Preparation of microscopical slides, finishing and hardening, embedding, sectioning, staining and counting the photomicrography.

**Fiber Structure and Assessment:** Orientation of fiber, structure in curing, soaking, liming, picking tanning and optimal conditioning of fiber structure in various types of leather assessment of leather.

**The Bacterial Cell and its Internal Structure:** Nutrition of bacteria and the preparation of culture media. Metabolism and respiration of bacteria-sterilization-effect of environment upon bacteria-isolation and identification of bacteria classification of bacteria usually found on hides and skins-bacterial proteolysis disinfections and disinfectants-bacteriology of curing soaking, liming and bating.

**Mycology:** Isolation, identification and classification of fungi associate with leather processing. Morphology and physiology of fungi, Mycological problems of leather industry and their prevention.

**Entomology:** Influence of the following parasite diseases, skin leather quality and their prevention, warbles ticks, mosquito lice, insect damage to dry hides and skin caused by hide beetles and moths and their prevention.

**Leather Biotechnology:** Chemistry of DNA & RNA, structure conformation, classification of enzyme, essentials of biotechnology, restriction of enzyme.

#### UNIT-II

##### SKIN COMPOSITION, PROTEIN AND PRE-TANNING PROCESS

**Chemical Constituents of hides and skins:** Variation fibrous and non-fibrous proteins, non-proteinous skin components.

**General and physical chemistry of proteins:** with special reference to hide proteins, chemical constituents of hides and skins, reaction of proteins with acids, base and salts.

**Structure of collagen:** primary structure of collagen, amino acid composition, molecular conformation amino acid sequence in collagen in relation to molecular conformation- X-ray diffraction pattern, the triple helix structure, electron microscopy of the collagen fiber.

**Aggregation phenomenon of collagen:** precipitated form of collagen, Kinetics of fibril formation.

**Thermal transition:** Thermal transition in collagen and their relation with amino acid composition and environmental-temperature, Denaturation temperature, Mechanism of Denaturation process, Renaturation of gelatin solution.

**Effect of enzymes on collagen:** Collagenolysis, proteolytic enzymes, selective proteolysis and telopeptides.

**Reactive groups in collagen:** Modification of reactive groups of collagen modified proteins.

**Other skin properties:** Keratin, Reticulin, elastin- their chemical composition, structure and functions, nonfibrous skin proteins.

**Non proteinous skin components:** Lipids, carbohydrates vitamins, mineral constituents.

**Pre-tanning process:** Flaying, curing, defect of hides and skins, chemistry and principle of different pretanning process- soaking, liming, deliming, bating, degreasing, pickling and depickling process control.

### UNIT-III

#### INORGANIC AND ORGANIC TANNING

**Theory & behavior of group elements:** Werners co-ordination theory, behaviour of group elements, chromium, Aluminium, Zirconium, Iron, Titanium, Difference between salts of these elements.

**Chrome Tanning:** Chromium complexes and their structures, study on the phenomena of hydrolysis, olation, oxolation, polymerization of chrome complexes, masking principle of masking, affect of masking on chrome tanning, Method of chrome tanning, preparation of chrome liquors and powders, influence of reducing agent on nature of chrome complexes mechanism of chrome tanning, variable parameters of chrome tanning.

**Vegetable tanning:** Mechanism of vegetable tanning, factors affecting vegetable tanning, process of vegetable tanning.

**Aluminium Tanning, Zirconium Tanning, Neutralization, Combination Tanning.**

**Collagen Tanning:** Concept of tanning, leather properties of dependent on tanning.

**Vegetable tannins, Hydrolysable tannins, Condensed tannins, Biosynthesis of plant polyphenols, Synthetic tannins, Resin and Polymeric Tannages, Aldehyde tanning.**

### UNIT-IV

#### POST TANNING AND FINISHING OPERATION FOR LEATHER MANUFACTURING

**Chemistry of Bleaching and Mordanting agent:** Dyeing: Principles of colour chemistry, Classification of leather dyes, Blending of dyes, Principles of color matching, Theory and mechanism of dyeing, Dyeing methods, Light fastness of dyeing, Dyeing auxiliaries such as leveling agents, wetting agents, Dispersing agents and Dye fixatives.

**Leather Auxiliaries :** Fat Liquoring agents, Pigments, Binders, Lacquers.

**Washing, Neutralization, Oil, Fat and Fat liquoring.**

**Water Proofing.**

**Finishing Materials:** Properties, Chemistry and methods of preparation of Nitrocellulose lacquers and lacquer Emulsions, Wax emulsions, Silicone emulsions.

### UNIT-V

#### LEATHER PROCESSING

**Processing of Leather From Goat skins:** Glazed kid, resin uppers, glazed uppers, shoe suede, garment suede, Lining leathers. Chamois leathers, printed leathers, morocco and book binding leathers, E.I. Goat skins and their dressing into different types of leathers.

**Processing of Leather From Sheep Skins:** Vegetable tanning and chrome tanning of sheep skins, conversion into different types of finished leathers-sheep nappa, garment, suede, uppers. Lining leathers, glove leathers, diaphragm leathers.

**Exotics and others:**

Reptile leathers, hair on tanning and dressing of fur skins.

**Upgrading of leathers:**

Retanning special finishing effects for up gradation of lower ends like Embossing, screen printing block printing, transfer film finishing, seal and Sink finish, popcorn effect, punching etc. Roller coating and other modern equipments, Burnishable and oil pull up leathers

**Heavy Leathers:** Vegetable tanned sole leathers, Bag tanning, different types of finished leathers, Belting leathers, Harness and saddlery leathers, Chrome and waxed soles, picking band leathers. Picker and apron leathers, Hydraulic and pneumatic leather such as hand pump leathers.

Leather for liquification plants for air, Oil seal, Gas, etc. Sports Goods leathers like Football. Rugby ball, Volley ball, Hockey ball, Cricket Ball etc. Gloves leathers for wicket keepers, Batting, Boxing etc).

**Light Leather:** Full chrome retan, hunting suedes, softies, nappa, and burnishable Upper leathers, Printed, Shrunk grain and upholstery leathers Water proof and water repellent upper leather, Nubuk and white leather. E.I. tanning, dressing of E.I. tanned leathers in to upper, lining, Bag leather, leather for leather goods kattas, bunwar etc.

Different types of leathers using chrome splits, Formulation and different dyestuffs, fat liquors, retaining agents.



**Syllabus for Govt. Polytechnic (Diploma Sector)**  
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**PAPER-II**

**UNIT-I**

**ANALYSIS OF WATER AND DEFFERENT CHEMICALS USED FOR MANUFACTRING OF LEATHER**

**Analysis of water:** Type of water – principle of analytical method employed in analysis of water effect of hardness of water on various processes in leather manufacture softening of water.

**Water Analysis:** Temporary hardness, Permanent hardness, Total hardness, Chloride content, Sulphate content, Iron content.

**Analysis of Various Chemicals and Auxiliaries used in Leather Processing:** Analysis of common salt, Analysis of lime-available lime, Total bases, Analysis of sodium sulphide, Aluminum salt, Deliming agents, Bates, Neutralizing agents. Oils and Fats, sulfated oils, soap, fat liquors and other auxiliaries like resin binders, wax emulsions etc.

**Analysis of Liquors of beam House Processes:** Soak liquor, Analysis of used lime liquors-lime, sodium sulphide, salt content and Analysis of pickle liquor.

**Analysis of Tanning Agent:** Vegetable tanning materials and extracts, chrome extracts and liquors, zirconium and Aluminum Tanning agent, formaldehyde, Analysis of bate, Analysis of oils, moisture, acid value, saponification value, iodine value, unsaponifiables, Analysis of sulphate oils-moisture, pH, acid value, total alkalinity organically combined  $SO_3$ , Na groups.

**UNIT-II**

**PHYSICAL, CHEMICAL AND INSTIRUMENT ANALYSIS OF LEATHER AND QUALITY CONTROL OF LEATHER**

**Chemical analysis of pelts and Leathers:** Principles and methods of analysis of limed and pickled pelt, chemical testing of vegetable tanned/chrome tanned/aluminum tanned/zirconium tanned/ formaldehyde tanned, combination tanned leathers.

**Physical Testing of Leather:** Sampling position for physical testing of leather. Different methods employ for physical testing of leather. Principle involved in Static and Dynamic methods of non destructive testing of leathers. Different methods in testing of colour fastness of leathers.

**Standards and quality Control:** Quality control in leather processing, Rectification of defects in hides, Skin and Leathers, control of yield, colour and finish of leather etc. Physical and chemical characteristics (standard specifications) of various types of leathers.

**Instrument Analysis:** Potentiometry, non-aqueous titrations, conductometry chromatography, spectrophotometry and colorimetry, ion-exchange resins, electrophoresis. Principles and their application analysis.

**UNIT-III**

**TANNERY POLUTION AND TREATMENT**

**Pollution:** Types of water pollution, physical, chemical, physiological and biological pollutants, Pollution effects of land ground after, surface water, aquatic life and sea.

**Tannery Effluents:** Types of tannery effluents, characteristics of effluents from Beam House Process, tan yard process and finishing yard process- Estimation of OD, BOD, COD, heavy metals(Ca, Cr, Pb and Hg) and total dissolved solids in waste water.

**Primary treatments:** Waste water drainage and collection system in tanneries, screens, equalization of waste water, primary treatment unit.

**Secondary Treatment Systems:** Lagoon treatment, aeration systems, trickling filter, design criteria, Biotechnology in effluent and disposals.

**Effluent Disposal:** Types of effluent disposal, standards and specification Indian Standards, specification for industrial effluent discharge.

**Water for Tanning:** Water for tanning process, recovery and reuse of water in tanning Industry, utilization of treated effluents.

**Solid Waste Management:** Solid wastes from tanneries origin and disposal, utilization sludge disposal from treatment system.

#### **UNIT-IV**

##### **LEATHER TRADE ENGINEERING**

Clutch mechanism, crank-slide and straight motion and lever mechanism and development of tannery machines.

Balancing and Vibration - their application in high speed slicking action for helically bladed cylinders, Bush, ball, roller and ring oil bearings, cam, springs and their application and function in tannery machines.

Development of hydraulic and pneumatic steering mechanisms accessories and control applied to tannery machines, air compressors, dust control equipment, blowers, etc. Automatic controls and their application in all Instruments, drying mechanisms and different types of dryers.

Detailed study of Beam-house, tanning and finishing machines, their description, construction with sketch, selection, Foundation and Erection of machinery. Latest development of leather processing vessels Internal transport, safety precautions, power, water and steam distribution, drainage and disposal in tanneries.

Maintenance of tannery buildings: Electrical, steam and water lines, tanning machinery, routing prevent maintenance, automatic and mechanization of tanneries.

#### **UNIT-V**

##### **LEATHER PRODUCT TECHNOLOGY AND COMPUTER AIDED DESIGN**

**OVERVIEW:** Classification of leather Goods & Garments. Selection of materials Grading and assorting of Leathers for Leather Goods & Garments. Property Requirement for Leather and Lining materials, Accessories for leather Goods and garments.

**CUTTING:** Hand and Machine Cutting, Pattern interlocking, various types of assembly Techniques, skiving, splitting, folding, Sewing Quality Control measures in Leather products manufacture.

**Machinery needs for leather goods manufacture.**

**Organization, Classification of leather based sports goods.**

Anatomy of human foot, Function of the foot, Foot comfort and Common foot abnormalities, Foot and Last measurement, Shoe sizing system and fittings. Designing and pattern making, Different types of footwear, Various components of footwear, Basics concepts of design and pattern cutting, Grading methods, Various allowances, Applications of computer aid designing, Materials of leather products- Selection of leather and non-leather materials for different components of footwear and garments.

Computer aided design, CAD, CPU, Data storage, Input/output devices, Function of CPU, Main memory and backup storage devices, Selection of Input/output devices, Operating system, Application of software for Footwear.