

**Maulana Abul Kalam Azad University of Technology, West Bengal**  
*(Formerly West Bengal University of Technology)*  
**Syllabus for B. Tech in Leather Technology**  
 (Applicable from the academic session 2018-2019)  
**Semester-VI**

<b>HU 601 Principles of Management</b>
1. Basic concepts of management: Definition – Essence, Functions, Roles, Level.
2. Functions of Management : Planning – Concept, Nature, Types, Analysis, Management by objectives; Organisation Structure – Concept, Structure, Principles, Centralization, Decentralization, Span of Management; Organisational Effectiveness.
3. Management and Society – Concept, External Environment, CSR, Corporate Governance, Ethical Standards.
4. People Management – Overview, Job design, Recruitment & Selection, Training & Development, Stress Management.
5. Managerial Competencies – Communication, Motivation, Team Effectiveness, Conflict Management, Creativity, Entrepreneurship
6. Leadership: Concept, Nature, Styles.
7. Decision making: Concept, Nature, Process, Tools & techniques.
8. Economic, Financial & Quantitative Analysis – Production, Markets, National Income Accounting, Financial Function & Goals, Financial Statement & Ratio Analysis, Quantitative Methods – Statistical Interference, Forecasting, Regression Analysis, Statistical Quality Control.
9. Customer Management – Market Planning & Research, Marketing Mix, Advertising & Brand Management.
10. Operations & Technology Management – Production & Operations Management, Logistics & Supply Chain Management, TQM, Kaizen & Six Sigma, MIS.
<b>Readings:</b>
1. Principles of Management – Premvir Kapoor – Khanna Publishing House, New Delhi (2018)
2. Management : Principles, Processes & Practices – Bhat, A & Kumar, A (OUP).

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<b>LT 601 Chemistry &amp; Technology of Post Tanning Operations</b>
<b>1. Neutralisation:</b> Its objectives, necessities and controls to achieve desired up-take of dyes and fatliquors.
<b>2. Bleaching:-</b> Definition; theory; mechanism of chemical bleaching; classification and application of different methods of bleaching to leathers . Theory of optical bleaching and possibilities of its' application to leather bleaching .
<b>3. Dyeing :</b> Theory and mechanism of dyeing ; concept of colour ; manual colour matching. Colour and Chemical Constitution of Dyes – Classification of Dyes – Different Dyes – Azo – Azoic – Sulfur Dyes – Anthraquinone Dyes – Acridine – Azine – Methine – Nitro – Nitroso – Oxazine – Quinoline Dyes – Phthalocyanine Dyes & Pigments – Organic Pigments – Basic Dyes – Cationic Dyes – Photochemistry of Dyes.
<b>4. Retanning:</b> Objectives of retanning- Effect of different retanning agents on properties of leather- Principles of bondage of retanning materials as special reinforcing agent.
<b>5. Retanning Syntans:</b> Chemistry and classification- tanning power- role of hydroxyl group role of and molecular size of syntans- electron affinity and chemical structure- mechanism of synthetic tannage- general method of manufacture of aromatic syntans-their general properties- different types of syntan- chromium and aluminium containing syntans-syntan for retanning purpose- bleaching action and neutralisation.
<b>6. Fatliquoring:</b> Physical chemistry Of Colloids – Interfaces & Interfacial tension – Surface / Interfacial tension of solutions – Particle size Distribution – Viscosity – Concentration –Dielectric Constant – Theories of Stability of Emulsion ( Surface theories and Electrical theories ) – Inversion & De-emulsification – Chemistry of emulsifying agents – Emulsifier efficiency – HLB Method –Emulsification Techniques - Principles and objectives of fatliquoring ; difference between natural and synthetic fats & oils ; controls to achieve desired properties of leather .Concept of currying .
<b>7. Synthetic fatliquor:</b> Fischer – Tropsch synthesis – Mechanism of optical Dissociation –Mechanism of Photochemical Chlorination of Methane – Control of extent of Chlorination– Collision Theory _ Transitional State Theory – Comparison between Photochemical Chlorination, Fluorination, Bromination & Iodination of Methane – Photochemical Chlorination of Higher Alkanes – Prediction of yield of Positional Isomers – Mechanism of Sensitization – Mechanism of Photochemical Sulfochlorination of Mepasin – Raw Material Control – process Control – Mechanisms of Substitution Reaction – Manufacture of Anionic, Non-ionic, Cationic & Amphoteric Synthetic Fatliquor from Marsol, Advantages & Disadvantages of Synthetic Fatliquors.
<b>8. Water proofing:</b> Definition, theory and need of water barrier characteristics in leather . Difference among water repellent, water resistant and water proof leather, Principles involved in different methods of water proofing followed in leather industry.
<b>9. Theory Of Leather Drying:</b> Principles of energy and mass transfers ; physico- chemical aspects of leather drying ; different methods of drying followed in leather industry.
<b>Suggested Books:</b>
<b>1.</b> Introduction to the Principles of Leather Manufacture- S. S. Dutta, 4 <sup>th</sup> Edn. I. L. T. A., Calcutta.
<b>2.</b> Chemistry & Technology of Leather-Roddy, O` Flaherty & Lollar, Vol. 3. Robert E. Kreiger Publishing Co., N. Y.
<b>3.</b> Chemistry of Tanning Processes – K. H. Gustavson, Academic Press N. Y.
<b>4.</b> Fundamentals of Leather Manufacture – Eckhart Hidemann
<b>5.</b> Leather Technician`s Handbook –J. H. Sharphouse, Vernon Lock Ltd., 125 High Holborn, London W-C1.
<b>6.</b> Theory and Practice of Leather Manufacture – K. T . Sarkar , Macmillan India Press , Madras.
<b>7.</b> Practical Leather Technology – Thomas C. Thorstenson , Robert E. Krieger Publishing Co. INC. N.Y.

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<b>LT 602 Physical Testing of Leather</b>
<b>STATISTICAL TESTING:</b>
Basic statistical principles, Selection of sampling location for physical as well as chemical testing of leather, Different methods and principles employed for physical testing of various leathers measurement of tensile strength, stitch tearing strength, tongue tearing strength, modulus of elasticity at specified load and elongation at break.
<b>MEASUREMENT OF PHYSICAL PROPERTIES OF LEATHER:</b>
_ Tear Strength.
_ Ball Bursting Strength (Lastometer).
_ Two Dimensional Extension.
_ Shrinkage Temperature.
_ Water vapour permeability.
_ Resistance to abrasion of sole leather.
_ Grain cracking (Conical Mandrel Test) in sole leather.
_ Resistance to cracking of grain in other leathers.
Resistance to repeated flexing.
_ Water penetration ( Kubelka Method).
_ Dynamic waterproofness testing in both sole and upper leather.
_ Non-destructive testing of leather.
<b>Suggested Books :</b>
1. An Introduction to the Principles of Physical Testing of Leather- Prof. S.S. Dutta, ILTA, Kolkata.
2. Technological Controls in Leather Manufacture – S.Bangaruswami, C.L.R.I.
3. The Chemistry and Technology of Leather – O’ Flaherty, Roddy, Lollar, Robert E.Krieger

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<b>LT 603 Mechanics of Leather Machines and Design of Parts</b>
<b>Group A</b>
<b>Mechanics of Leather Machinery:</b>
<b>Leather Machinery:</b>
Design and Construction of pits, drums and paddles, Hide processors; three compartment light speed drum, Mechanism, operation and control and adjustment of Fleshing, unhairing, shaving, sammying, staking, glazing, setting buffing, splitting and measuring machines and Ironing and embossing presses, Rotary Ironing machines, finiflex (Rotopress, Contilux) Foundation and erection of tannery machines. Vacuum Drying and other drying equipment, roller coater, handling tools- Horse, pallets, fork lifters etc., conditioning machine.
<b>Hydraulic &amp; Pneumatic Systems:</b>
Hydraulic & pneumatic steering mechanism for leather machinery. Air compressors, blowers and dust control equipment used in tannery, Drying mechanism and dryers used in tannery.
<b>Rubber-</b> Quality requirement at different stages of leather machines; specification and testing; maintenance. Knives used, their characteristics, their constituents, their preparation and optimum usages, their varied functioning, Variation of speeds of different rollers and their justification matching requirement of leather making. Electronics as applied and devices in different leather machinery, timer device. Surface coating devices, Insulation, Different heating systems and economic usage depending upon the final results; thermostatic controls. Varieties of pumps used in tannery, effluent treatment system.
<b>Group B:</b>
<b>Design of parts:</b>
Analysis of Biaxial Stresses-Mohr's circle for biaxial stress principle Stress and Pure shear & Strain energy. Stresses in beams; shear force (SF), axial force and bending moment (BM); differential Relations for BM,SF and load; bending stresses in straight beams, Torsion of a circular shaft. Modes of failure; Design/allowable stress; Factor of safety(FoS);
Theories of failure–maximum normal Stress theory, maximum shear stress theory, Distortion energy theory. Design for stability: buckling analysis–Johnson and Euler columns, Design of Shafts & Axels, Design of Cotter joint , Knuckle joint and Fillet Welded joint of bracket. Bolted joints: Metric thread, standardsizes, use of locknuts and washers; Applications in structures including brackets, turn buckle; Pre-stressed bolts; Riveted joints: Unwin's formula; Brief discussion on single, double and triple row lap joints, butt joints with single or double strap /cover plate; simple strength design; joint efficiencies
<b>Driving systems-</b> varied load factors, economic system, Conveyors, Lubrications and lubricants, Clutch mechanism, Crank slider, lever mechanism, Balancing and vibration – their application in high speed bladed cylinder and machines, Mechanism of cutting and slicking action of helical bladed cylinder, Bush, ball and roller bearings, cam, springs and their application and function in tannery machines.
<b>Suggested Books :</b>
01. Leather Technician's HandBook – J. H. Sharphouse, Leather Producers' Association, Northampton, 1971.
02. Lecture Notes on Leather – P. S. Venkatchalam, CLRI, Chennai, 1964.
03. Different Catalogues issued by different Leather Machinery producers.

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<b>LT 604A Material Science</b>
<b>1. Processing of Materials:</b>
Powder synthesis, sintering, chemical methods, crystal growth techniques, zone refining, preparation of nano particles and thin films
<b>2. Characterisation Techniques:</b>
X-ray diffraction, spectroscopic techniques like UV-vis, IR, Raman. Optical and Electron microscopy
<b>3. Structure and Imperfections:</b>
Crystal symmetry, point groups, space groups, indices of planes, close packing in solids, bonding in materials, coordination and radius ratio concepts, point defects, dislocations, grain boundaries, surface energy and equilibrium shapes of crystals
<b>4. Thermodynamics and Kinetics:</b>
Phase rule, phase diagrams, solid solutions, invariant reactions, lever rule, basic heat treatment of metals, solidification and phase transformations, Fick's laws of diffusion, mechanisms of diffusion, and temperature dependence of diffusivity
<b>5. Properties of Materials:</b>
<b>Mechanical Properties:</b> Stress-strain response of metallic, ceramic and polymer materials, yield strength, tensile strength and modulus of elasticity, toughness, plastic deformation, fatigue, creep and fracture
<b>6. Electronic Properties:</b> Free electron theory, Fermi energy, density of states, elements of band theory, semiconductors, Hall effect, dielectric behaviour, piezo, ferro, pyroelectric materials
<b>7. Magnetic Properties:</b> Origin of magnetism in metallic and ceramic materials, paramagnetism, diamagnetism, ferro and ferrimagnetism
<b>8. Thermal Properties:</b> Specific heat, thermal conductivity and thermal expansion, thermoelectricity
<b>9. Optical Properties:</b> Refractive index, absorption and transmission of electromagnetic radiation in solids, electrooptic and magneto optic materials, spontaneous and stimulated emission, gas and solid state lasers
<b>10. Material types</b>
Concept of amorphous, single crystals and polycrystalline materials, crystallinity and its effect on physical properties, metal, ceramic, polymers, classification of polymers, polymerization, structure and properties, additives for polymer products, processing and applications, effect of environment on materials, composites
<b>11. Environmental Degradation</b>
Corrosion, oxidation and prevention
<b>12. Elements of Quantum Mechanics and Mathematics</b>
Basics of quantum mechanics, quantum mechanical treatment of electrical, optical and thermal properties of materials, analytical solid geometry, differentiation and integration, differential equations, vectors and tensors, matrices, Fourier series, complex analysis, probability and statistics

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<b>LT 604B Safety &amp; Occupational Health of Leather industry</b>
<b>Introduction to Occupational Health &amp; Safety.</b>
Basic principals in Epidemiological Practice:
How to perform an investigation, Basic measures & terms, Epidemiological researches, retrospective cohort studies , concept of 'relative risk', preventive role of epidemiology.
Ergonomics & Occupational Injuries:
Approach to prevention of occupation. Injuries, improvement of work & work place design, Use of anthropometric data . Biomechanics of lifting, pushing, pulling. role of environmental factors in occupational injuries. Setting up an 'ideal' computer work station. Musculoskeletal injuries (mention only with causes), cumulative trauma disorders in occupations associated with.
Noise & Occupational hearing loss-prevention of hearing loss.
(1)Noise & its measurements, Impact & impulse noise, sound level meters, noise exposure evaluation, machines of hearing – brief overview, hearing tests ,TTS, Assessment of hearing loss- brief overview, hearing conservation – reduction of noise exposure.
Working in heat – effects on human system. thermal environment, heat exchange man-environment, response and adaptation to work in heat , occupations with ' heat' risk , Heat cramps , heat exhaustion, Heat stroke stress criteria-WBGT index, Effective temperature, effect of heat on productivity, control of heat stress.
Working with non-ionising radiation.
solar radiation, Infrared , visible radiation , ultraviolet, extreme low frequency radiations, lasers, electric fields, magnetic fields , -known effects, unconfirmed effects.
Ionizing Radiation
radiation physics-basics, radiation measurements, biological effects of radiation in man. Sources of radiation in the workplace. External radiation exposure prevention, shielding, radiation exposure guidelines for works.
Occupational Toxicology
Basic principles, toxicokinetics, inhalation toxicology, toxicity testing, carcinogenesis, application of toxicology.
Biological monitoring
Environmental & biological monitoring, exposure monitoring, effect monitoring sources of error & quality assurance, monitoring exposure to carcinogens, In vivo measurement of body burden of chemicals, interpretation of chemicals, Interpretation of result, Analysis of specific chemicals-Al, As, Cd, Cr, Pd, Mn, Hg, CS <sub>2</sub> , CO & Benzene, Toluene, Xylem, Dichloro methane, etc.
Occupational exposure and effects of some specific agents--
(incidence, industrial occurrence, jobs involved and at high risk, systemic effects, acute effects, chronic effects, preventive measure, bio-monitoring, symptoms & signs of ailments, treatments as available)
Occupational health laws in India-Factories act, workmen's compensation act, ESI act-schedule of compensable occupational diseases, legal requirements as per factories act-physical amenities to be provided by employer, obligation of employer, obligation of practitioner in the field.
<b>Suggested Books:</b>
1. Occupational Medicine, 3rd Ed, Mosby, ---Carl Zenz,
Ed: O. Bruce Dickerson, Edward P. Horvath Jr.
2. Occupational & Environmental Medicine, 2nd Ed, Prentice-Hall Int. Inc.
Ed Joseph Ladon.
3. M.P. Poonia & S.C. Sharma, Industrial Safety, Khanna Publishing House, New Delhi (2018)

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<b>LT 604 C Industrial Sociology</b>
1. Natures definition and scope of industrial sociology.
2. Industrialisation process: early industrialisation, and its impact on temporary society.
3. Characteristics of industrial organisation.
4. Scientific management.
5. Hawthorne experiments and their impact on organisational structure.
6. Role of formal and informal groups.
7. Industrial management: Concept and techniques of management, top, middle and first levels of management.
8. Industrial relations and work; concept of work in traditional (Hindu) and modern societies.
9. Workers and management relations: Consensus versus conflict process; arbitration, adjudication and conciliation.
10. Social structure and trade unionism: trade unionism as an instrument of power, collective bargaining, trade unions, strikes and lockouts.
11. Industry and society: Industry and community; industry and family; industry and government; industrialism and social change; automation
12. and its effect on society.

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<b>LT 605 A DATABASE Management System</b>
1. Database System Architecture - Data Abstraction, Data Independence, Data Definitions and Data Manipulation Languages.
Data models - Entity Relationship(ER), Mapping ER Model to Relational Model, Network .Relational and Object Oriented Data Models, Integrity Constraints and Data Manipulation Operations.
2. Relation Query Languages, Relational Algebra, Tuple and Domain Relational Calculus, SQL and QBE.
Relational Database Design: Domain and Data dependency, Armstrong's Axioms, Normal Forms, Dependency Preservation, Lossless design, Comparison of Oracle & DB2
3. Query Processing and Optimization: Evaluation of Relational Algebra Expressions, Query Equivalence, Join strategies, Query Optimization Algorithms.
4. Storage Strategies: Indices, B-Trees, Hashing, Transaction processing: Recovery and Concurrency Control, Locking and Timestamp based Schedulers, Multiversion and Optimistic Concurrency Control Schemes.
Advanced topics: Object-Oriented and Object Relational databases. Logical Databases, Web Databases, Distributed Databases, Data Warehouse and Data Mining.
5. Overview of Data Communications and Networking.
Physical Layer : Analog and Digital, Analog Signals, Digital Signals, Analog versus Digital, Data Rate Limits, Transmission Impairment, More about signals.
Digital Transmission: Line coding, Block coding, Sampling, Transmission mode.
Analog Transmission: Modulation of Digital Data; Telephone modems, modulation of Analog signals.
Multiplexing: FDM 150, WDM 155, TDM 157,
Transmission Media: Guided Media, Unguided media (wireless)
Circuit switching and Telephone Network: Circuit switching, Telephone network.
6. Data Link Layer: Error Detection and correction : Types of Errors, Detection, Error Correction,
Data Link Control and Protocols: Flow and error Control, Stop-and-wait ARQ. Go-Back-N ARQ, Selective Repeat ARQ, HDLC.
Point-to –Point Access : PPP
Point –to- Point Protocol, PPP Stack,
Multiple Access, Random Access, Controlled Access, Channelization, Local area Network: Ethernet, Traditional Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LANs: IEEE 802.11, Bluetooth virtual circuits: Frame Relay and ATM.
7. Network Layer: Host to Host Delivery: Internetworking, addressing and Routing Network Layer Protocols: ARP, IPV4, ICMP, IPV6 ad ICMPV6 Transport Layer : Process to Process Delivery : UDP; TCP congestion control and Quality of service.
8. <b>Application Layer:</b> Client Server Model, Socket Interface, Domain Name System (DNS):
Electronic Mail (SMTP) and file transfer (FTP) HTTP and WWW.
Security Cryptography, Message security, User Authentication.
<b>Text Books:-</b>
1. Elmaski & Navathe -Fundamentals of Database Systems, 4th Edition, Pearson Education
2. C.J.Date - An introduction to Database Systems, Pearson Education
3. Bipin Desai -An introduction to Database System, Galgotia Publication
4.Data Communications and Networking : Third Edition. Behrouz A. Forouzan Tata McGraw-Hill Publishing company Limited.
5 Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mc.Graw Hill.
6. Elmasri Ramez and Novathe Shamkant, "Fundamentals of Database Systems", Benjamin Cummings Publishing. Company.
7. Ramakrishnan: Database Management System , McGraw-Hill
<b>References:</b>
1. R.P. Mahapatra, "Database Management Systems", Khanna Publishing House, New Delhi (AICTE Recommended)
2. James Martin, "Principles of Database Management Systems", 1985, Prentice Hall of India, New



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Delhi
3. "Fundamentals of Database Systems", Ramez Elmasri, Shamkant B.Navathe, Addison Wesley Publishing Edition
4. "Database Management Systems", Arun K.Majumdar, Pritimay Bhattacharya, Tata McGraw Hill
5. Gray Jim and Reuter Address, "Transaction Processing : Concepts and Techniques", MoraganKauffman Publishers.

<b>LT 605 B Industrial Psychology &amp; Organisational Behaviour</b>
1. <b>Introduction:</b> Meaning; objectives; scope; definition; methods of psychology applied to industry; history of industrial psychology.
2. <b>Occupational information:</b> Definition; occupational information and psychology; job description; job analysis; job evaluation; methods of evaluation.
3. <b>Individual differences and their evaluation:</b> introduction; personality, traits; motives; scheme; individual differences in various traits; expressive traits; physical traits; movement traits; perceptual traits; style traits; age and sex; physical performance
Traits; intellectual abilities; interest.
4. <b>Personnel selection:</b> The selection problem; the problem on criteria; some available criteria; company records; rating critical; incident technique; forced-choice technique; selection by interview and application blank.
5. <b>Personnel test:</b> Value, use; status of intelligence test; steps in a test program; purposes of personnel tests in industry; selection; placement; promotion; kinds of personnel test, clerical ability; mechanical ability; personality; trade.
6. <b>Training in industry:</b> Introduction; steps in training needs; human relations; production waste; upgrading; satisfaction; safety; versatility; free enterprise; culture; training methods; systematic versus unsystematic training; individual training; conference versus
lecture; case discussion; role playing.
7. <b>Accident and safety:</b> Concept of accident; cause of accident; personal factors, intelligence, vision, co-ordination; personality characteristics; fatigue experience; basic acceptance; environmental conditions related to accidents; lighting and temperature; severity of work; industrial theories of safety psychology; accident proneness theory ; goals; freedom_ alertness theory; adjustment-stress theory; industrial safety programme; overall accident prevention strategy.
8. <b>Work and Conditions of Work:</b> Common characteristics of work; rest, pauses and worker efficiency; repetitive work; eliminate boredom; time and motion study; working environmentnoise, music atmospheric effects; financial incentives as applied to people
at work.
9. <b>Motivation:</b> motivation and work; fundamentals of motivation; important incentives; Pay, wage-incentive systems; competition, praise and punishment; knowledge of result; participation; arousing enthusiasm.
10. <b>Attitudes, Job-Satisfaction and Morale:</b> methods of finding employee attitudes; factors related to jobsatisfaction; personnel factors; inherent in the job; increasing job satisfaction ; meaning of morale; measurement and factors of morale; improving morale.

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<b>LT 605 C Ecological Engineering &amp; Eco-Audit</b>
<b>1. Ecosystem Concept:</b>
Definition and Types, Biogeochemistry, Eco-cycling and Eco-energetics
<b>2. Ecology and Individual Organisms:</b>
Tolerance Range, Limiting Factors and Environmental Complex, Ecological Indicators
<b>3. Population Ecology:</b>
Population Growth, Population Density and Regulation
<b>4. Community Ecology:</b>
Organisation of Communities and Types of Interactions, Ecological Diversity, Natural Landscape and Community Change
<b>5. Resources and Pollution:</b>
Renewable and non-renewable resources, Bio-degradable and non-biodegradable pollutants, Treatment and Disposal Techniques, Eco-sphere and Pollution
<b>6. Ecotoxicology:</b>
Disciplines and Relevance of Toxicological Studies, Toxic response in Organisms, Exposure, Accumulation and Biotransformation of Toxins, Excretion of Toxic Agents, Toxic Action and Detection of Exposure, Toxicity Reduction and Antidotal Procedures
<b>7. Ecotechnology:</b>
Biomaniipulation of eutrophication, Biofilters for hazardous wastes, Construction of Reed-beds land treatment of wastewater, Vermi-composting – system, design, benefits and limitations, Biogas technology – requirements, operation, benefits and limitations, Aquatic weeds and their utilisation in phytoremediation, Wastewater fed aquaculture – energy from effluent, Garbage farming – energy from solid wastes.
<b>Suggested Books: -</b>
1. Fundamentals of Ecology -Odum, E.P.
2. Basic Ecology-Odum, E.P.
3. Ecology-Chapman,
4. Instant notes on Ecology -Mackenzie, A., Ball, A.S. and Virdee, S.R. (1999) Viva Books
5. M.P. Poonia – Environmental Studies, Khanna Publishing House, New Delhi (2018)
6. M.P. Poonia – Environmental Engineering, Khanna Publishing House, New Delhi (2019)

<b>LT 691 Physical Testing Lab</b>
Conditioning of Leathers for physical testing purpose. Determination of strength of tensile strength, stitch tear strength, tongue tear strength, buckle strength, tearing strength and percent elongation at break.
<b>TESTING FOR UPPER LEATHER &amp; OTHERS:</b>
Bursting strength of upper leather, grain crackiness of upper leather, air and water vapour permeability, dry and wet rub fastness of dyed and finished leather. Measurement of shrinkage temperature, measurement of water penetration. Measurement of flexing endurance, Measurement of two- dimensional extension. Hand measurement of leather and sampling location both physical and chemical testing. Non- destructive testing of leather.
<b>TESTING FOR SOLE LEATHER:</b>
Measurement of apparent and real density and porosity of sole leather. Determination of abrasive resistance of sole leather. Dynamic waterproofness of sole leather. Hardness determination of sole leather. Determination of bond strength between the leather surface and the finish film of finished upper leather. Cold crack resistance of finished upper leather.
<b>Suggested Books :</b>
1. An Introuction to the Principles of Physical Testing of Leather- Prof. S.S. Dutta, ILTA, Kolkata.

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2. Technological Controls in Leather Manufacture – S.Bangaruswami, C.L.R.I.
3. The Chemistry and Technology of Leather – O’ Flaherty, Roddy, Lollar, Robert E.Krieger Publishing Co. N.Y. (1977).

<b>LT 692 Mechanics of Leather Machines Lab</b>
Free hand sketch and drawing of tannery drums and paddle. Calculation of the pitch, contact angle, lead angles of helical blades, Fixing of blades in bladed cylinder. Free hand sketch of different parts of Fleshing, shaving, staking, buffing, glazing, setting & measuring machines. Study and adjustment of different parts of Fleshing, shaving, staking, buffing, glazing, setting and measuring machines. Dismantling and assembling of mechanical type of shaving machine and staking machine.
<b>Suggested Books :-</b>
1. Leather Technician’s HandBook – J. H. Sharpouse, Leather Producers’ Association, Northampton, 1971.
2. Lecture Notes on Leather – P. S. Venkatchalam, CLRI, Chennai, 1964.
3. Different Catalogues issued by different Leather Machinery producers.

<b>LT 693 Instrumental Analysis of Leather &amp; Leather Chemicals</b>
1. Application of UV-VIS spectroscopy in evaluating the characteristics of organic dyes and phenolic substances in leather processing.
2. Application of atomic absorption spectrometry in determining the heavy metal components in leather and leather chemicals.
3. Application of Fourier Transform Infrared Spectroscopy for determining various chemical species such as amides, aromatic components, aldehydes, sulfonates/ sulfonic acids in processed leather and leather chemicals.
4. <sup>1</sup> H-/ <sup>13</sup> C-NMR analysis of collagenic materials
5. Application of thermal analyses (TGA, DSC), XRD, SEM, chromatography, pHpzc measurement, for analysis and determination of quality of raw materials, processing chemicals and finished products as required in the leather and allied industries.
<b>References:</b>
1. H.H.Willard, L.L.Merritt, Jr. J.A.Dean and F.A. Selte.
‘Instrumental Methods of Analysis’ - 6 th Edition CBS Publishers & Distributors, Delhi.
2. Snell F.D. and Snell F.D. - ‘Calorimetric methods of Analysis’ D. Van Nostrand, New York.

<b>LT 694 DATABASE Management Lab</b>
Structured Query Language
1. Creating Database
Creating a Database
_Creating a Table
_Specifying Relational Data Types
_Specifying Constraints
_Creating Indexes
2. Table and Record Handling
_INSERT statement
_Using SELECT and INSERT together
_DELETE, UPDATE, TRUNCATE statements
_DROP, ALTER statements

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3. Retrieving Data from a Database
_ The SELECT statement
_ Using the WHERE clause
_ Using Logical Operators in the WHERE clause
_ Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING Clause.
_ Using Aggregate Functions
_ Combining Tables Using JOINS
_ Subqueries
4 Database Management
_ Creating Views
_ Creating Column Aliases
_ Creating Database Users
_ Using GRANT and REVOKE
COMPUTER NETWORKS
__ NIC Installation & Configuration (Windows/Linux) ___ Familiarization with
Networking cables (CAT5, UTP)
Connectors (RJ45, T-connector)
Hubs, Switches
__ TCP/UDP Socket Programming
_ Multicast & Broadcast Sockets
_ Implementation of a Prototype Multithreaded Server
_ Implementation of
Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window)
Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check)
Data Link Layer Error Control Mechanism (Selective Repeat, Go Back N)