# B. TECH. (PART TIME) LEATHER TECHNOLOGY

## I – VII SEMESTERS CURRICULA AND SYLLABI

### SEMESTER I

<table>
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**TOTAL NO. OF CREDITS : 104**

### LIST OF ELECTIVES FOR LEATHER TECHNOLOGY

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OBJECTIVES

- To facilitate the understanding of the principles and to cultivate the art of formulating physical problems in the language of mathematics.

UNIT I MATRICES 9

UNIT II FUNCTIONS OF SEVERAL VARIABLES 9

UNIT III ANALYTIC FUNCTION 9
Analytic functions – Necessary and sufficient conditions for analyticity – Properties – Harmonic conjugates – Construction of analytic function – Conformal Mapping – Mapping by functions \( w = a + z , az, 1/z \) - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION 9
Line Integral – Cauchy’s theorem and integral formula – Taylor’s and Laurent’s Series – Singularities – Residues – Residue theorem – Application of Residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT V LAPLACE TRANSFORMS 9

TOTAL : 45 PERIODS

OUTCOMES

- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated

TEXT BOOKS

REFERENCES

PTPH8151 ENGINEERING PHYSICS

OBJECTIVE
To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

UNIT I PROPERTIES OF MATTER
- Elasticity - Poisson's ratio and relationship between moduli (qualitative)
- Stress-strain diagram
- factors affecting elasticity
- bending of beams
- cantilever bending moment
- theory and experiment of Young's modulus determination
- Uniform and non-uniform bending
- I shaped girders
- twisting couple
- hollow cylinder
- shaft
- torsion pendulum
- determination of rigidity modulus
- moment of inertia of a body (regular and irregular).

UNIT II ACOUSTICS AND ULTRASONICS
- Classification of sound - loudness and intensity
- Weber-Fechner Law
- standard intensity and intensity level
- decibel
- reverberation
- reverberation time
- rate of growth and decay of sound intensity
- derivation of Sabine’s formula
- absorption coefficient and its determination
- factors affecting acoustics of buildings: focussing, interference, echo, Echelon effect, resonance
- noise and their remedies.
- Ultrasonics
- production
- - magnetostriction and piezoelectric methods
- detection of ultrasound
- acoustic grating
- industrial applications
- NDT
- Ultrasonic method: scan modes and practice.

UNIT III THERMAL PHYSICS
- Thermal expansion
- thermal stress
- expansion joints
- bimetallic strips
- thermal conductivity
- conductions in solids
- Forbe’s and Lees’ disc methods
- Rectilinear flow of heat through a rod
- flow of heat through a compound materials
- radical flow of heat through a spherical shell
- thermal insulation of buildings
- Laws of thermodynamics
- Otto and diesel engines and their efficiency
- entropy
- entropy of Carnot’s cycle
- reverse Carnot’s cycle
- refrigerator.

UNIT IV APPLIED OPTICS
- Interference
- Michelson interferometer: construction, working, determination of wave length and thickness
- anti-reflection coating
- air wedge and its application
- Lasers
- Einstein’s coefficients
- CO2, Nd:YAG and semiconductor lasers
- homo junction and hetro junction
- construction and working
- applications
- Optical fibres
- classification (index & mode based)
- principle and propagation of light in optical fibres
- acceptance angle and numerical aperture
- fibre optic communication system
- active and passive sensors.

UNIT V SOLID STATE PHYSICS
- Nature of bonding
- growth of single crystals (qualitative)
- crystal systems
- crystal planes and directions
- expressions for interplanar distance
- coordination number and packing factor for simple structures: SC, BCC, FCC and HCP
- structure and significance of NaCl, ZnS, diamond and graphite
- crystal imperfections: point defects, dislocations and stacking faults
- unit cell, Bravais space lattices
- miller indices.

TOTAL : 45 PERIODS
OUTCOME
On completion of the course the students are expected to have a thorough knowledge on the basic physical concepts relevant to different branches of Engineering and Technology.

TEXT BOOKS

REFERENCES

PTCY8152 ENGINEERING CHEMISTRY

OBJECTIVES
- To understand about the chemical thermodynamics.
- To impart knowledge in the basics of polymer chemistry.
- To develop sound knowledge on kinetics and catalysis.
- To impart basic knowledge on photochemistry and spectroscopy.

UNIT I CHEMICAL THERMODYNAMICS
Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Criteria of spontaneity; Helmholtz and Gibbs free energy functions; Gibbs-Helmholtz equation; Clausius-Clapeyron equation; Maxwell relations – Van’t Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation – variation of chemical potential with temperature and pressure.

UNIT II POLYMER CHEMISTRY
Introduction: Classification of polymers – Natural and Synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerisation. Types and mechanism of polymerisation: Addition (Free Radical, cationic, anionic and living); condensation and copolymerisation. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerisation: Bulk, emulsion, solution and suspension.

UNIT III KINETICS AND CATALYSIS

UNIT IV PHOTOCHEMISTRY AND SPECTROSCOPY
UNIT V NANOCHEMISTRY

TOTAL : 45 PERIODS

OUTCOMES:
On completion of the course the students are expected to have a thorough knowledge on thermodynamics, polymers, catalysis, spectroscopy and nanochemistry.

TEXT BOOKS

REFERENCES

PTGE8151 COMPUTING TECHNIQUES

OBJECTIVE
To introduce the basic knowledge about computers and fundamentals of C programming.

UNIT I INTRODUCTION

UNIT II C PROGRAMMING BASICS

UNIT III ARRAYS AND STRINGS
UNIT IV FUNCTIONS AND POINTERS

UNIT V STRUCTURES AND UNIONS
Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

TOTAL : 45 PERIODS

OUTCOME
On completion of the course the students are expected to have a thorough knowledge on computers and C programming.

TEXT BOOKS

REFERENCES

PTGE8152 ENGINEERING GRAPHICS

OBJECTIVE
To develop in students, graphic skills for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination)
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HAND SKETCHING
Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects
UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES
Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS
Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (Demonstration Only)
Introduction to drafting packages and demonstration of their use.

TOTAL : 45 PERIODS

OUTCOME:
On completion of the course the students are expected to have a thorough knowledge on design of various engineering products and technical drawings.

TEXT BOOK:

REFERENCES:

Publication of Bureau of Indian Standards:
Special points applicable to University Examinations on Engineering Graphics:
1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only.
4. The students will be permitted to use appropriate scale to fit solution within A3 size.
5. The examination will be conducted in appropriate sessions on the same day.

PTEE8253 PRINCIPLES OF ELECTRICAL AND ELECTRONICS ENGINEERING L T P C
3 0 0 3

OBJECTIVES:
- To explain the basic theorems used in Electrical circuits and the different components and function of electrical machines.
- To explain the fundamentals of semiconductor and applications.
- To explain the principles of digital electronics
- To impart knowledge of communication

UNIT I ELECTRICAL CIRCUITS
9
Basic principles involved in power generation, transmission and use – Ohms Law Kirchoff’s Law – steady state solution of DC circuits – Theorem: Thevinin’s, Norton’s and Superposition Theorems.

UNIT II AC CIRCUITS
9
Introduction to AC circuits – waveforms and RMS value – power and power factor, single phase and three-phase balanced circuits, housing wiring, industrial wiring, materials of wiring.

UNIT III ELECTRICAL MACHINES
9

UNIT IV ELECTRONIC DEVICES & CIRCUITS
9

UNIT V MEASUREMENTS & INSTRUMENTATION
9
Introduction to transducers: pressure, temperature, position, electrical measurements - Classification of instruments – moving coil and moving iron ,Ammeter and Voltmeter – multimeters – dynamometer type Wattmeter – three-phase power measurements – energy meter – megger – instrument transformer (CT and PT )

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to identify the electrical components explain the characteristics of electrical machines.
- Ability to identify electronics components and use of them to design circuits.
REFERENCES

PTLT8201 BASIC BIOCHEMISTRY AND MICROBIOLOGY L T P C
3 0 0 3

OBJECTIVE
To impart fundamental knowledge on biochemistry and microbiology that is essential for leather technologists

UNIT I
INTRODUCTION
Introduction to Biochemistry, water as a biological solvent, weak acid and bases, pH, buffers, Henderson-Hasselbalch equation, physiological buffers, fitness of the aqueous environment for living organisms.

UNIT II
NUCLEIC ACIDS
DNA - a genetic material, composition of DNA and RNA, generalized structure plan and nomenclature of nucleic acids, features of DNA double helix. Denaturation and annealing of DNA, structure and roles of different types of RNA.

PROTEINS
Amino acids: classification and structures of standard amino acids. Classification of proteins based on solubility, shape, composition and functions. Protein structure : levels of structure and protein architecture, primary structure of proteins, secondary structure of proteins- helix and pleated sheets, tertiary structure of proteins, forces stabilizing the tertiary structure and quaternary structure of proteins, denaturation and renaturation of proteins, behavior of proteins in solutions, salting in and salting out of proteins. Structure and biological functions of fibrous proteins, (keratin, collagen and elastin), globular proteins (hemoglobin and myoglobin), lipoproteins, metalloproteins, glycoproteins and nucleoproteins; Enzymes and their industrial applications.

UNIT III
CARBOHYDRATES
Structure, occurrence and biological importance of monosaccharides, disaccharides and polysaccharides

LIPIDS
Introduction, classification, nomenclature, structure and properties of lipids. Biological significance of fat.
UNIT IV
MICROBES- STRUCTURE AND MULTIPLICATION
Basics of microbial existence; History of microbiology, classification and nomenclature of microorganisms, microscopic examination of microorganisms, light and electron microscopy; principles of different staining techniques like gram staining, acid fast, capsular staining, flagellar staining. Structural organization and multiplication of bacteria, viruses, algae and fungi, with special mention of life history of actinomycetes, yeast, mycoplasma and bacteriophages.

UNIT V
MICROBIAL NUTRITION AND GROWTH
Nutritional requirements for microbial growth. Culture media - Chemical elements as nutrients. Carbon, Nitrogen Hydrogen, Oxygen, Sulfur, Phosphorus and other trace elements definitions of Chemo autotrophs, Chemoheterotrophs, Photo autotrophs, Photo heterotrophs. Media for cultivation of bacteria, fungi, protozoa and algae - Tissue culture media, brief account of animal cell culture, Plant cell culture, Chemically defined media, complex media, Selective media, Differential media, enrichment media and microbiological Assay media.

OUTCOMES
Students would gain knowledge on some of the basic aspects of biochemistry and microbiology.

REFERENCE BOOKS

PTLT8202 INORGANIC & ORGANIC CHEMISTRY L T P C
3 0 0 3

OBJECTIVE
To impart fundamental knowledge on inorganic and organic chemistry that is essential for leather technologists.
UNIT I INTRODUCTION TO INORGANIC COMPOUNDS
A brief survey of the ‘s’ block - binary compounds, complexes, alkalides and electrides. Features of the ‘p’ block and its elements - expansion of the octet, Lewis structures; ‘d’ orbitals and transition metals; Coordination compounds –nomenclature, Theories - Coordination theory, Werner’s theory; Stereo chemistry

UNIT II MOLECULAR BONDING
Shapes of molecules - Valence Shell Electron Pair Repulsion method; Valence bond approach and atomic orbital hybridizations. LCAO-MO theory, pictorial derivation of bonding and antibonding molecular orbitals. MO energy level diagrams for homonuclear diatomics; Redox reactions.

UNIT III OILS, FATS AND WAXES
Types of oils-Development of Rancidity in an oil –Factors contributing to rancidity –Free acid value-Saponification value and iodine value of an oil- Methodology of determining these values-Problems on computing free acid, Saponification and iodine value-Types of Cholesterol-Risk factor in precipitating heart disease- Waxes-Classifications

UNIT IV HETEROCYCLIC AND ANTIMICROBIAL COMPOUNDS
Definition and reactions of Pyrrole, Furan, Thiophene, Pyridine - Reactions of furfural-Synthesis of Isoriazid; Antibacterial drugs- Synthesis of Sulphanilamide and sulphapyridine.

UNIT V DYES AND DYEING
Classification of dyes based on the mode of application of the dye to the fabric- Structural classification of dyes-Coupling reaction to produce azo dyes-Synthesis of the following azo dyes- Methyl orange, Methyl red and Congo red- Synthesis of Triphenyl methane dyes-Malachite green and para-rosaniline -Phthalein dye-Preparation of Eosin- Introduction to natural dyes and Reactive dyes

OUTCOME
Students would gain knowledge on some of the basic aspects of inorganic and organic chemistry

TEXT BOOKS

REFERENCES
AIM
To introduce various methods of chemical analysis through sophisticated instruments for accuracy

OBJECTIVES
- To enable students gain fundamental knowledge on various physico-chemical analytical methods
- To make students understand the underpinning science behind various instrumental techniques

UNIT I
INTRODUCTION TO SPECTROSCOPICAL METHODS OF ANALYSIS
ELECTROMAGNETIC RADIATION; Various ranges, Dual properties, Various energy levels, Interaction of photons with matter, absorbance, and transmittance and their relationship, Permitted energy levels for the electrons of an atom and simple molecules, classification of instrumental methods based on physical properties.

QUANTITATIVE SPECTROSCOPY; Lambert’s Law, Limitations, Deviations (Real, Chemical, Instrumental) Nesslerimetry. Estimation of inorganic ions such as Fe, Ni and estimation of Nitrite using Beer-Lambert’s Law

UNIT II
MOLECULAR SPECTROSCOPY
Various transitions in organic and inorganic compounds effected by UV, visible and infra red radiations, various energy level diagrams of saturated, unsaturated and carbonyl compounds, excitation by UV and Visible radiations, Woodward-Fieser rules for the calculation of absorption maxima (dienes and carbonyl compounds) Effects of auxochromes and effects of conjugation on the absorption maxima, Instrumentation for UV, VISIBLE and IR spectrocopies (source, Optical parts and Detectors), Multicomponent analysis, Photometric titration (Experimental set-up and various types of titrations); Applications of UV, VISIBLE AND IR spectrscopies.

UNIT III
ATOMIC SPECTROSCOPY
Atomic Absorption Spectrophotometry; Principle, Instrumentation and Application, Various interferences observed in AAS (Chemical, radiation and excitation); Flame photometry; Principle, Instrumentation and applications

POLARIMETRY AND REFRACTOMETRY
Polarimetry and refractometry Principle, instrumentation and Applications

UNIT IV
THERMAL ANALYSIS
Thermogravimetry: Instrumentation, factors affecting the shapes of thermograms, applications, thermograms of some important compounds (CuSO₄, 5H₂O, CaC₂O₄.2H₂O etc; Differential thermal analysis: principle, Instrumentation and applications, differences between DSC and DTA, Applications of DSC (Inorganic and Polymer samples)

UNIT V
CHROMATOGRAPHIC METHODS
Classification of chromatographic methods, column, Thin layer, paper, Gas, High performance liquid chromatographical methods (principles, mode of separation, instrumentation and technique)

TOTAL : 45 PERIODS
OUTCOMES:
Students can understand the principle and importance of various analytical instruments used for the characterization of various materials.

TEXT BOOK

REFERENCES

PTLT8204 THEORY OF SKIN PROTEINS AND PRE-TANNING PROCESSES L T P C 3 0 0 3

AIM
To understand the basic structure and function of skin and its components and to understand the various pretanning processes/operations.

OBJECTIVES
- To impart knowledge on the structure and function of various constituents of skin.
- To impart knowledge on principles and practice of preservation and various pretanning processes / operations.

UNIT I COMPONENTS , FUNCTIONS AND COMPOSITION OF SKIN 9
Organization of skin components in different animals; Structure and function of epidermis, dermis, cutaneous and subcutaneous tissues; hair; fat tissue; nerve; erectorpilli muscle; sweat glands; Functions and properties of hides and skins; Chemical constituents of hides and skins; Fibrous and non-fibrous proteins in skin; Structure and properties of mono, di, oligo and polysaccharides; complex carbohydrates; Structure and properties of Fatty acids, Glycerolipids, phospholipids, sphingolipids, glycolipids, steroids; Structure, function and properties of amino acids.

UNIT II STRUCTURE, FUNCTION, THERMAL TRANSITION AND DEGRADATION OF COLLAGEN 12
Structure, function and chemical features of collagen; Types of collagen; Tropocollagen molecules; Sub-units of collagen; Kinetics of fibril formation; precipitated forms of collagen; Electron microscopy of the collagen fibre; Biosynthesis; Denaturation temperature; Mechanism of denaturation process; Thermal shrinkage; Factors influencing melting transition; Degradation of collagen – collagenase and its physico - chemical properties, and mechanism of action.

UNIT III PRETANNING PROCESSES 10
Chemistry and principles of different pretanning processes - Soaking, liming, deliming, bating, pickling, depickling and degreasing.
UNIT IV  CLEANER PROCESSING IN BEAMHOUSE PRACTICES  7
Salt-free curing options, sulphide free unhairing systems, ammonia-free deliming, salt free pickling systems, solvent and eco friendly degreasing systems. Strategies to bring down BOD, COD and TDS standards of tannery effluents.

UNIT V  PRACTICE AND QUALITY CONTROL  7
Different methods of pretanning processes as applied to light, heavy and industrial leathers. Process control in pretanning operations.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of this course students would have a good understanding on the skin, which is the substrate used for leather manufacture. Also the students will have fundamental understanding on preservation and various pretanning processes/operations.

TEXT BOOKS

REFERENCES

PTCY8302  PHYSICAL CHEMISTRY FOR LEATHER TECHNOLOGY  L T P C
3  0  0  3

OBJECTIVE:
To impart fundamental knowledge on physical chemistry for aspects related to leather technology

UNIT I  PHASE RULE  9
Definition – Application of phase rule to water system – Thermal Analysis – Cooling curves – Two component system – Eutectic and compound formation-Liquid –liquid equilibria-Distillation of binary liquid mixture- Azeotropic distillation-Fractional distillation-partially miscible liquid-CST-Immiscible liquid-Steam distillation

UNIT II  IONIC EQUILIBRIA  9

UNIT III  COLLOIDS  9
UNIT IV SURFACTANTS
Chemical and Physico-chemical types, properties; Rheology : Viscosity. Non-Newtonian flow and Viscoelasticity, Birefringence: electrical and streaming ; X-ray and Neutron scattering. Various Diffusional aspects and applications.

UNIT V APPLICATION TO LEATHER TECHNOLOGY
Wetting, Cohesion & Adhesion, Contact Angle, Foams, detergency, Emulsions, stability, Surface properties and Membrane technology.

TOTAL : 45 PERIODS

OUTCOMES:
The students will an understanding on the physical chemistry and at a later stage when they pursue leather courses they will be able to relate the concepts of this course

TEXT BOOKS

PTLT8301 TECHNOLOGY OF HEAVY LEATHER MANUFACTURE

OBJECTIVES:
This course aims at imparting knowledge in the technology of making different types of heavy leathers from hides.

UNIT I SOLE, HARNESS AND SADDLERY LEATHERS
Property requirement of sole leathers; Process design considerations; Choice of raw material; Manufacture of vegetable tanned sole leathers – Traditional and modern methods; Chrome tanned sole leathers; Water proofing of sole leathers; Manufacture of harness and saddlery leathers; International standards required for the above heavy leathers

UNIT II INDUSTRIAL LEATHERS
Different types of raw materials used, properties required: physical and chemical standards required and process details to achieve the specifications for the following industrial leathers: Belting leathers, honing/stropping leathers, picking band leathers, picker apron leathers. Hydraulic and pneumatic leathers.

UNIT III SPORTS GOODS LEATHERS
Different types of raw materials used, physical and chemical properties required and process details to achieve the specifications for the following sports goods leathers: Leathers for football, rugby ball, volley ball, hockey ball and cricket ball. Glove leathers for wicket keepers and boxing.
UNIT IV  FINISHED LEATHERS FROM HIDES  9
Different types of raw materials used, physical and chemical properties required and process details to achieve the specifications for the following leathers: Full chrome, Semi chrome and Chrome retan - uppers, suedes, nubuck, lining, nappa, shrunken grain, upholstery, Dressing of E.I. kips into upper, lining and leathers for leathergoods, burnishable, printed leathers, Case hides.-Kattai and banwar from buff calf; Bag tanned leather and their use in traditional products

UNIT V  UPGRADATION AND QUALITY CONTROL  9
Upgradation technologies; Rectification of defects in hides; Control of area, yield, color and finish of leathers; Quality control in heavy leather manufacture.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the students will be in a position to understand the property requirements of different kinds of heavy leathers and process aspects for the same

TEXT BOOKS

PTLT8302  THEORY AND PRACTICE OF CHROME AND INORGANIC TANNAGES  L T P C 3 0 0 3

AIM
To impart knowledge on the chemistry of various inorganic tanning materials and systems

OBJECTIVES
Chemistry of inorganic tanning materials giving more thrust to chrome tanning material and system and a glimpse of other inorganic tanning systems based on Al, Zr, Ti, Fe, Si and P.

UNIT I  INTRODUCTION TO COORDINATION CHEMISTRY; METAL IONS IN TANNING  10
Werner's theory of coordination, origins of coordinative interactions, role of d and f orbitals, definition of ligands, nucleophilicity of ligands and electronegativity of donor atoms, chelation and masking, ligand field stabilisation energy and introduction of factors controlling molecular stability of transition metal complexes. Historical overview of mineral tanning.

UNIT II  AQUEOUS CHEMISTRY OF CHROMIUM  8
Electronic configuration and its implications, common oxidation states of chromium, redox stabilities of chromium (VI) and chromium (III) salts, redox potentials and their interconversion, protolysis, kinetic inertness of chromium (III), basicity, olation, oxolation and polymerisation, Stiasny's series, McClandish precipitation point.
UNIT III  FACTORS CONTROLLING CHROME TANNING  8
Single and double bath chrome tannages and their relative merits and demerits, preparation of basic chromium sulphate (BCS) salt, reaction parameters influencing composition of BCS, kinetics of chrome tanning, diffusion and complexation, effects of float volume, pH, basicity, masking, temperature, drum speed, ageing chrome tanned substrates.

UNIT IV  MECHANISM OF CHROME TANNAGE  9
Theories of chrome tanning; absorption, coating, electrostatic and hydrogen bond interactions and coordinative forces involved in chrome tanning, indirect evidence for chrome binding sites in protein, hydrothermal stability of chrome-collagen compound.

UNIT V  OTHER INORGANIC TANNAGES  10
Aqueous chemistry of aluminium (III), zirconium (IV), titanium (IV) and iron(III) and its relevance to mineral tanning, chemistry of silicates and phosphates and their tanning mechanisms, mechanism of inorganic tannages and their relevance to combination tanning.

OUTCOMES
The students will gain a thorough understanding on the principles and practice of chrome tanning and a glimpse of other inorganic tannages.

REFERENCES

PTLT8303  THEORY AND PRACTICE OF VEGETABLE AND ORGANIC TANNAGES  L T P C
3 0 0 3

AIM
To make the students understand the chemistry of different vegetable and organic tanning agents and respective technology systems.

OBJECTIVES
- At the end of this course, the students will have knowledge on the chemistry of various vegetable and organic tanning agents and the mechanism of their interaction with the skin protein - Collagen.

UNIT I  VEGETABLE TANNINS  14
Vegetable tannins - definition and classification, Occurrence, Biosynthesis; Chemistry of hydrolysable tannins - gallotannins, ellagi tannins - their structural aspects including tannin dimers, trimers, etc., Chemistry of condensed (flavanoid) tannins proanthocyanidins, dimers, trimers and other oligomers - Isolation and characterization of vegetable tannins.

UNIT II  CONSTITUENTS OF VEGETABLE TANNING MATERIALS  7
Tannins as well as non-tannins, polyphenolic constituents present in popular tanning materials like avaram, konnam, wattle, cutch, babul, myrobalan, etc., and their physico-chemical properties and their effect on the physical properties of leathers.
UNIT III  MECHANISM AND PRACTICE OF VEGETABLE TANNING  10

UNIT IV  OTHER ORGANIC TANNAGES  8
Mechanism of tanning with Aldehyde, Dialdehydes, oil, Sulphonyl chloride, Quinone, oxazolidine, phosphonium and other organic tanning agents; wet white leathers; Synthetic tannins - Classification - properties, uses in leather industry - Mechanism of reaction with collagen.

UNIT V  PREPARATION OF VEGETABLE TANNIN EXTRACTS AND SYNTHETIC TANNING AGENTS  6
Methods of preparation of vegetable tannin extracts, spray dried vegetable tannins, synthetic and other organic tannages.

TOTAL : 45 PERIODS

OUTCOMES
The students will gain a thorough understanding on the principles and practice of chrome tanning and a glimpse of other inorganic tannages

TEXT BOOKS
2. Rodd, "Chemistry of carbon compounds", Vol. III-D, Chapter on "Hydrolysable tannins".

PTLT8304  THEORY OF MATERIAL TESTING OF LEATHERS – I  L T P C
3 0 0 3

AIM
To impart knowledge on analytical methods for the analysis of leather, leather chemicals and process liquors generated during processing of leathers

OBJECTIVES
At the end of the course, the student would understand
- The analytical chemistry behind testing of leather chemicals and leathers
- The principle used in instrumental techniques
- Various methods of analyses of leather chemicals, spent process liquors and pelts/ leathers
- Quality Standards of various leather chemicals and leather end products
UNIT I    ANALYSIS OF PRETANNING & TANNING AGENTS/CHEMICALS   15
Principles of analytical methods employed in analysis of pretanning chemicals – Water, Common salt, lime, unhairing, deliming and bating agents; Vegetable tanning materials and extracts; Aldehydes; Chrome extracts and liquors; Zirconium, Titanium, Aluminium, Iron and THPS tanning agents; Specifications recommended by standards organizations.

UNIT II   ANALYSIS OF POST TANNING AND FINISHING CHEMICALS   8
Principles of analytical and instrumental methods employed in analysis of neutralising agents, syntans, dyes, oils and fats, fatliquors, post tanning auxiliaries, pigments, resin binders, wax emulsions, fillers, lacquers and lacquer emulsions and finishing auxiliaries; Specifications recommended by standards organizations.

UNIT III   ANALYSIS OF PROCESS LIQUORS AND EMISSIONS   8
Principles of analytical and instrumental methods employed in analysis of exhaustion liquors of pretanning, tanning and post tanning processes. Analysis of emissions - air pollutants from leather processing; Specifications recommended by standards organizations.

UNIT IV   ANALYSIS OF TANNED LEATHERS   8
Principles of analytical and instrumental methods employed in analysis of various chrome leathers, vegetable tanned leathers; Specifications recommended by standards organizations.

UNIT V   ANALYSIS OF ECO-SENSITIVE SUBSTANCES IN LEATHER   6
Principles of analytical and instrumental methods employed in analysis of eco-sensitive substances - Penta chlorophenol (PCP), Formaldehyde, Hexavalent chromium [Cr(VI)], azodyes etc., present in leather chemicals and finished leathers; Application of instrumental techniques such as UV-Vis spectrophotometer, GC,HPLC to analyse these eco-sensitive substances; Specifications recommended by standards organizations.

TOTAL : 45 PERIODS

OUTCOMES
This subject provides the students an understanding on the theoretical background on the chemical testing of leather, process liquor and chemicals used for leather manufacture

REFERENCES
AIM
To impart knowledge on basic concepts of chemical engineering unit operations and processes and application in leather and leather chemicals manufacture

OBJECTIVES
To impart knowledge on basic concepts of chemical engineering unit operations and processes connected to leather chemicals manufacture

UNIT I CONCEPTS & METERING OF FLUIDS

UNIT II HEAT TRANSFER AND MASS TRANSFER
Diffusion: Binary diffusion, concept of mass transfer coefficients and interface mass transfer and stagewise contact.
Distillation: Principle of distillation, Application of distillation in leather chemicals and auxiliaries processing.
Extraction: Extraction principles, Leaching and Extraction equipment and their application in manufacture of leather chemicals.
Drying: Drying characteristics, Theory and mechanism of drying, estimation of drying rate, design and performance of industrial dryers for leather.
Humidification: Humidity charts, methods of humidification and dehumidification; Equipments and their design aspects; Humidity control in leather processing.

UNIT III MECHANICAL SEPARATIONS
Size reduction: Theory and equipment; application in leather chemical processing
Clarification: Principles of clarification, Liquid-Liquid, Liquid-solid and Liquid-gas separations, Application in leather processing and effluent treatment
Mixing: Basic theory and application in leather and leather chemical processing.

UNIT IV PRINCIPLES OF UNIT PROCESSES
General principles of unit operations and unit processes in leather & leather chemicals processing: General concepts of unit operations and unit processes in leather & leather chemicals processing. Development of process flow sheets with reference to leather and leather chemical industries design, control safety pollution abatement. Principles of halogenation, esterification, hydrolysis, oxidation, hydrogenation. Polymerization, sulphation and sulphonation, diazotization and coupling.
Tanning agents: Vegetable tannins and Vegetable tannin extracts, Basic Chromium Sulphate, Aluminium, and Zirconium, salts for leather processing.
Oils, fats and detergents: Oils and fats; their nature and products derived from oils and fats, Fatty Acids and Alcohols, waxes and fatliquors.
Synthetic binders: Binders on acrylics, polyamides, polyesters, polyurethanes, polypropylene.
Dyes and intermediates & surface coating agents: Raw materials; important unit processes; Types of dye intermediates and dyes; pigments, lacquers.
Recent developments in chemicals for leather manufacture: Recent developments like REACH and its implications on leather chemicals; Alternate eco-benign leather chemicals and auxiliaries for leather manufacture.

UNIT V WATER AND INORGANIC CHEMICALS
Treatment of water for domestic and industrial purposes, manufacture of sodium chloride, sodium sulphide, sodium sulphite and bisulphite, soda ash, caustic soda, lime, sulphuric and hydrochloric acids.

TOTAL: 45 PERIODS

OUTCOMES
At the end of the course, the student would understand the basic concepts of unit operations, material and energy balances, fluid dynamics mass and heat transfer in various unit operations such as distillation, extraction, drying and humidification size reduction and separation and mixing techniques technology of organic and inorganic chemicals involved in the processing of leather chemicals.

REFERENCES
8. Dutta, S.S., An introduction to the principles of leather manufacture, ILTA.

PTLT8402 TECHNOLOGY OF LIGHT LEATHER MANUFACTURE L T P C 3 0 0 3

AIM
This course aims at imparting knowledge in the technology of making different types of light leathers from skins.

OBJECTIVES
• At the end of the course, the students will be in a position to understand the property variations of different leathers and suitable processing variations that are required in the manufacture of the same.
UNIT I  PROPERTIES OF LEATHER  9
Definition and understanding of various physical, chemical and organo-leptic properties of leather.

UNIT II  PROPERTY – PROCESS RELATIONSHIP  8
Understanding of the relationship between each leather property and the process parameter of each unit operation/process.

UNIT III  PRODUCT BRIEF OF LIGHT LEATHERS  8
Product brief i.e, property requirements w.r.t. product manufacture and use of different light leathers

UNIT IV  PROCESS DESIGN  8
Concept of designing the process of manufacture of light leathers of different product briefs.

UNIT V  LIGHT LEATHER MANUFACTURE  12
Process of manufacture of leathers such as glazed kid, nappa garment, fine glove, suede garment and lining; Quality control aspects with special reference to light leather manufacture

TOTAL : 45 PERIODS

OUTCOMES
At the end of the course, the students will be in a position to understand the property variations of different leathers and suitable processing variations that are required in the manufacture of the same.

TEXT BOOKS
3. CLRI Process Bulletins.

PTLT8403  THEORY AND PRACTICE OF POST TANNING PROCESSES  L T P C
3 0 0 3

AIM
To impart knowledge on chemicals and processes involved in post tanning operations of leather manufacture.

OBJECTIVES
- Post tanning processes like neutralization and its importance to the manufacture of various types of leathers.
- Chemistry of post tanning auxiliaries.
- Mechanism of dyeing, fatliquoring and retanning

UNIT I  DYSES AND DYEING OF LEATHER  10
Theory of colours, chromophoric groups and their optical absorption, structural features of dyes, factors affecting hue and colour, intensity; Classification of dyes based on their chemical nature, application and colour index, properties; blending of dyes, theory and practice of colour matching, theory and mechanism of dyeing, chemistry and application of dyeing auxiliaries such as leveling agents, dispersing agents and dye fixatives.
UNIT II   FATLIQUORS AND FATLIQUORING OF LEATHER    10

UNIT III   SYNTANS AND RETANNING OF LEATHER    10
Classification of syntans, auxiliary, intermediate, replacement syntans and resin tanning agents Sulphonation of naphthalene, naphthols, phenol-formaldehyde condensation reactions, characterisation and photo oxidation mechanisms of phenolic syntans. Bleaching agents and mordants. Light fast, amino resin, formaldehyde-free, acrylic and PU syntans. Chemistry and mechanism of retanning.

UNIT IV   PRACTICE OF POST TANNING PROCESSES AND OPERATIONS    10
Practice of post tanning processes viz., neutralization, retanning, dyeing, fatliquoring and Post tanning process technologies for products from different types of leathers.

UNIT V   POST TANNING MECHANICAL OPERATIONS    5
Sammying, splitting and shaving, drying, staking, toggling, buffing etc operations – understanding and judicious application of these operations to meet the end product parameters;

TOTAL : 45 PERIODS

OUTCOMES:
The students will be able to understand the theory and practice of post tanning processes involved in the making of different leathers

TEXT BOOKS

PTLT8404   THEORY OF MATERIAL TESTING OF LEATHERS – II    L T P C
3 0 0 3

AIM
To impart knowledge on analytical methods for physical testing of leathers and related microscopical and bacteriological tests of leather and leather chemicals
OBJECTIVES
At the end of the course, the student would understand the

- Principle in microscopical and bacteriological testing related to leather processes
- Mould and pest growth and control in leather
- The analytical methods/principles and instrumental techniques used in physical testing leathers
- Standard and quality control measures of physical testing of leathers

UNIT I MICROSCOPY 10
Mechanical and optical parts of compound microscope, images formed, defects in eye pieces - and their rectification etc. Preparation of microscopical slides, fixing, embedding, sectioning, staining and mounting etc. Fibre structure and assessment - Orientation of fibre structure in curing, soaking, liming, pickling, tanning, post tanning and finishing. Optimal condition of fibre structures in various types of leathers. Assessment of finished leather, heavy leathers and light leathers.

UNIT II BACTERIOLOGY 8

UNIT III MOULD & PEST CONTROL 10

UNIT IV PHYSICAL TESTING OF LEATHERS 14
Sampling position for physical testing of leathers. Different physical testing methods - principles involved. Static and Dynamic methods, Non-destructive testing of leathers.

UNIT V STANDARDS AND QUALITY CONTROL 3
Physical characteristics and specifications of various types of leathers

TOTAL : 45 PERIODS

OUTCOMES
This subject provides the students an understanding on the theoretical background on the microbial and physical testing of leathers

TEXT BOOKS
OBJECTIVES:
To educate students about the importance of studying environmental science and engineering in course curriculum and to create awareness in protection of environment.

UNIT I  ENVIRONMENT, ECOSYSTEMS, BIODIVERSITY AND SUSTAINABLE DEVELOPMENT  8
Definition of environment and components in the environment - definition of an ecosystem, concept and functions of different ecosystems like (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) - biodiversity, threats to biodiversity and conservation of biodiversity - sustainable development and significance of sustainable development in environmental related issues.

UNIT II ENVIRONMENTAL POLLUTION AND CHEMISTRY  14
Definition of pollution - different types of environmental pollution - classification of pollutants in water and wastewater - characterization of pollutants in water and wastewater - environmental significance - types of sampling, significance of sampling, precautions to be taken while sampling and preservation of samples. Atmospheic structure and composition - definition of air pollution - sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility - ambient air quality and emission standards - photochemical smog, ozone layer depletion, greenhouse gases, global warming, acid rain and their effect on environment. Definition, types and sources of solid and hazardous wastes - need for solid and hazardous waste management - elements of integrated waste management and role of stakeholders - definition, types and sources of nuclear and radioactive wastes - waste management and disposal.

UNIT III WASTEWATER TREATMENT AND DISPOSAL  10
Unit operations and processes - principles of physical treatment: screening, mixing, equalization, sedimentation, filtration - principles of chemical treatment: coagulation, flocculation, precipitation, flotation - objectives of biological wastewater treatment and various process - need for tertiary treatment.

UNIT IV ENVIRONMENTAL IMPACT & RISK ASSESSMENT  9

UNIT V ENVIRONMENTAL POLICIES AND LEGISLATION  4
Environmental legislations in India - environment protection act - air (prevention and control of pollution) act - water (prevention and control of pollution) act - wildlife protection act - forest conservation act - solid and hazardous waste management rules - biomedical waste rules - responsibilities of generators - role and responsibility of pollution control boards.

TOTAL : 45 PERIODS
OUTCOMES:  
The students will be able to understand
  
  - Biodiversity and the importance of maintaining the environment
  - How industrial activities affect the environment and methods available to protect them
  - Policies to protect the environment

REFERENCES

PTLT8502 LEATHER GOODS AND GARMENTS TECHNOLOGY  L T P C  3 0 0 3

OBJECTIVES
To impart knowledge on making leather goods and garments

UNIT I OVERVIEW  8
Classification of Leather Goods and Garments; Selection of Materials, grading and assorting of leathers for leather goods & garments; Property requirements for leather and other materials; Accessories for Leather goods & garments - Various types of fasteners, fittings and other accessories. Alternative materials and their adaptability for goods and garments. Operational sequences in leather goods and garments production.

UNIT II  12
i) Production planning - Nomenclature used for component identification in various leather garments skirts, jackets, troucers etc and various leather goods – Wallet, hand bags, Executive bags etc. Process scheduling and line balancing.


iii) Assembling - Pre assembly and assembly operations – skiving, splitting, folding, sewing etc. Various types of assembly techniques for leather goods and garments.

iv) Quality - Quality control measures in leather products manufacture.

UNIT III MACHINERY  9
Machinery needs for leather goods and garments manufacture. Various types of sewing machines – flat bed, cylinder bed, post bed and other special sewing machines – different feed mechanisms. Clicking, splitting, skiving, folding, embossing, creasing machines – their working principles operation and maintenance.
UNIT IV DESIGN & DEVELOPMENT

Pattern design and development – measurement/ sizing for various types of leather goods & garments, pattern grading for leather garments. CAD applications for leather goods and garments. Fashion and material trends.

UNIT V ORGANISATION & MANAGEMENT


TOTAL : 45 PERIODS

OUTCOMES:
Through this course students will be able know
- various components for the manufacture of leather goods and garments
- processing steps involved in the making of leather goods and garments
- different machineries involved in the products manufacture
- techniques to design and develop leather goods and garments
- organisation and management of leather goods and garments manufacturing unit

REFERENCES
6. A course manual on leather garment pattern designing.
8. Leather and sports goods – Pattern and Template marker, NIMI Publications, 2011

PTLT8503 LEATHER MACHINERIES

OBJECTIVES:
To impart theory and practical knowledge on the working principles, use and maintenance of machineries used in leather manufacture.

UNIT I GENERAL PRINCIPLES AND MECHANISM OF LEATHER MACHINERY 12
involved in various tannery machines. Mechanism of cutting and shearing action of helical blade systems. Bush, ball, roller and ring oil bearing, cam springs and their application and function in tannery machinery.

UNIT II DESIGN, MATERIAL SELECTION AND CONSTRUCTION OF EQUIPMENT 12
Basic design, material selection and construction of pits, drums and paddles. Pneumatic steering mechanism and control as applied to dust control equipment, air compressor, auto spray, etc. Hydraulic steering mechanism in case of shaving, staking, embossing machines, etc.
UNIT III MECHANICAL FEATURES OF LEATHER MACHINERY
Salient features and purpose of the various machinery used in beam house, tanning and finishing yards, unhairing, fleshing, scudding, sammying, setting, shaving, staking, buffing, dedusting, glazing, machines, finiflex, hydraulic press, curtain coating, roller coating, transfer coating, autospy, driers and measuring machine etc.

UNIT IV TANNERY LAYOUT
Drawing a neat lay out for a small/medium tannery showing the wet yard and finishing yard by arranging the machines as per the sequence of operation for standard leather processing.

UNIT V PREVENTIVE MAINTENANCE AND SAFETY
Preventive maintenance and safety in the use of leather machinery

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the students would understand the
- General principles involved in various machineries used in leather manufacture.
- Salient features and purpose of the various machinery used
- Preventive maintenance and safety in the use of leather machinery
- Adjustment of machinery parts for proper functioning of different machines used in leather processing
- Design of optimal machinery layout of tannery

REFERENCES:

PTLT8504 THEORY AND PRACTICE OF LEATHER FINISHING L T P C
3 0 0 3

OBJECTIVES
To impart knowledge on materials and processes/operations involved in leather finishing.

UNIT I COATING SCIENCE
Theory of surface coating; Characteristics of various components of coating system; Parameters of the process of coating and its influence on coating characteristics; Testing of coatings.

UNIT II PIGMENTS
Classification of pigments; Inorganic, organic, nacreous (pearlescent) and interference pigments - their representation code in the colour index. Different forms of pigments - powders and pastes. Evaluation and control of their brilliance, opacity, particle size, resistance to solvent, heat and light and colour matching.
UNIT III POLYMERIC MATERIALS AND THEIR DISPERSION FORMS

General introduction to addition and condensation polymerization; various methods of polymerisations, resins binders - acrylics, vinyls and urethanes, protein binders, cellulose nitrate, cellulose acetate butyrate, - protein binders - lacquers - emulsion and emulsifiers - evaluation and control - solvents and thinners.

UNIT IV PRINCIPLES OF FINISHING, FINISH FORMULATIONS AND THEIR APPLICATION

Impregnation: Terminology, types of impregnating binders, characteristics, selection of systems for corrected and full grain impregnation, formulations, application methods and precautions

Finishing: Definition, aims, film formation mechanisms, properties of films such as glass transition temperature/ minimum film forming temperature, transparency, gloss and resistance to heat, light and solvent. Pigment volume concentration, plasticizer, wetting agents, role in dispersion and stability - requirements in multiple coat technique – such as clearing coat, sealer coat, base coat, top and feel coat. Single coat composition methods like spraying, curtain coating, roller coating etc. Cationic finishes and their relative merits. Foam finish; Eco-friendly finishing - Volatile Organic Compounds (VOC) reductions. Finish formulation for various types of leathers.

UNIT V COATING METHODS AND NOVEL FINISHING SYSTEMS

Role of equipments like HVLP spray Roller coats, Continuous embossing machines, Dorn Busch, Finiflex, etc. Methods such as oil pull-up, waxy, burnishable, antique, grain suede, screen printing, roller printing, tie and dye finishing. Pearl finishing, easy-care and patent finishing, cationic finishing, foam finishing, transfer foil, lamination, etc.,

TOTAL : 45 PERIODS

OUTCOMES

At the end of this course, the students would be in a position to

- Appreciate the role of various finishing agents and auxiliaries used in leather finishing
- Formulate strategies for finishing different types of leathers
- Study various upgradation techniques
- Methods of drying – Toggle drying, paste drying, vacuum drying etc. and preparing the crust

REFERENCES

OBJECTIVES
To impart knowledge of various materials and components used in footwear manufacture.

UNIT I FOOTWEAR MATERIALS AND COMPONENTS
Different types of upper and lining leathers; Different types of soling materials; Different types of adhesives used in footwear industry; Kinds of insole boards, Grinderies; Fasteners; Shoe dressing materials etc.

UNIT II DESIGN AND PATTERN DEVELOPMENT
History of shoe; Purposes and styles; Fashion & designs; Preparation of standards and section for men, ladies & children; Classic and other types of shoes and boots.

UNIT III CUTTING, PRE-CLOSING AND CLOSING
Principles of cutting – Hand, machine; Clicking room design and management. Checking incoming work, stitchmaking, skiving, punching and gimping, heat embossing, flow moulding, toe puff attachment, attaching linings and scrims, trimming linings, finishing off closed seams. Top line and other edge treatments, local reinforcements, attaching fastners and trims.

UNIT IV PRELASTING AND LASTING
Principles and methods of pre-lasting and lasting for different types of construction; Sole attaching; Lasted margin; Upper preparation; Sole preparation; Sole cementing; Upper cementing; Bottom fillers and shanks; Adhesive drying, Heat activation, Spotting, Pressing, Last slipping, Health and safety, Quality control and fault finding problems-solving.

UNIT V METHODS OF SHOE CONSTRUCTION
Various methods of shoe construction; shoe room techniques.

TOTAL : 45 PERIODS

OUTCOMES
At the end of this course students will be able know about
- various components used for the manufacture of footwear
- processing steps involved in the making of leather footwear
- different machineries involved in the footwear manufacture
- techniques to design and develop leather footwear

REFERENCES
3. “Shoes and Leather News”, Published by bureau of foreign and domestic commerce, Dept of commerce, US, 1940.
OBJECTIVES:

- The objective of this course is to teach principles of cost estimation, feasibility analysis, management, organization and quality control that will enable the students to perform as efficient managers.

UNIT I PRINCIPLES OF PRODUCTION MANAGEMENT AND ORGANISATION 15
Planning, organization, staffing, coordination, directing, controlling, communicating, organization as a process and a structure; types of organizations
Method study; work measurement techniques; basic procedure; motion study; motion economy; principles of time study; elements of production control; forecasting; planning; routing; scheduling; dispatching; costs and costs control, inventory and inventory control.

UNIT II ENGINEERING ECONOMICS FOR TECHNOLOGISTS-INTEREST, INVESTMENT COSTS AND COST ESTIMATION 10
Time Value of money; capital costs and depreciation, estimation of capital cost, manufacturing costs and working capital, invested capital and profitability.

UNIT III PROFITABILITY, INVESTMENT ALTERNATIVE AND REPLACEMENT 8
Estimation of project profitability, sensitivity analysis; investment alternatives; replacement policy; forecasting sales; inflation and its impact.

UNIT IV ANNUAL REPORTS AND ANALYSIS OF PERFORMANCE 4
Principles of accounting; balance sheet; income statement; financial ratios; analysis of performance and growth.

UNIT V ECONOMIC BALANCE AND QUALITY CONTROL 8

TOTAL : 45 PERIODS

OUTCOMES
Process economics and industrial management principles introduced to the students will facilitate them in better management of the leather industry.

TEXT BOOKS

REFERENCE
AIM
This course aims at providing necessary skills for the students in becoming a technocrat.

OBJECTIVE
- To understand the entrepreneurship in leather sector related to industrial enterprise, venture planning and development, techno economic feasible reports, resource management and production. To gain knowledge on market management.

UNIT I  GLOBAL LEATHER AND ALLIED INDUSTRIES

UNIT II  VENTURE PLANNING AND DEVELOPMENT AS APPLIED TO LEATHER AND ALLIED SECTOR

UNIT III  TECHNO - ECONOMIC FEASIBILITY REPORTS (TEFR) FOR LEATHER AND ALLIED SECTOR
Components of TEFR - size of projects, Project costing - Selection and means of finance - cash-flow projections - Costing and pricing - Implementation schedules - PERT and related project scheduling charts - TEFR for tannery, shoe plants, leather chemical, leather garments and leather goods units.

UNIT IV  RESOURCE MANAGEMENT AND PRODUCTION PLANNING FOR LEATHER AND ALLIED SECTOR
Material and money flow - Labour management - Principles of production management - TQM concepts - ISO and related certification methods - Purchase management in leather sector - Credit financing and labour issues in leather sector - Productivity bottlenecks in tanneries and shoe plants and debottlenecking strategies - Inventory control measures for leather sector.
- Operations research - time-motion studies - Principles of time management - Management information system - Intranet and Internet communication and its relevance in managing enterprises - Factors concerning system productivity in leather sector.

UNIT V  MANAGING GLOBAL LEATHER MARKETS

TOTAL : 45 PERIODS
OUTCOMES
This course would enable the students to explore their feasibilities of turning into efficient entrepreneurs.

REFERENCES
8. SIDBI Report on Small Scale Industries Sector (Latest Editions)

PTMG8651 TOTAL QUALITY MANAGEMENT
(Common to EEE, Mechanial, Automobile, Printing, Industrial, Manufacturing,
CSE, ECE, IT, Leather, Production)

AIM
To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

OBJECTIVES:
- To understand the various principles, practices of TQM to achieve quality.
- To learn the various statistical approaches for Quality control.
- To understand the TQM tools for continuous process improvement.
- To learn the importance of ISO and Quality systems

UNIT I INTRODUCTION

UNIT II TQM PRINCIPLES
Quality statements - Customer focus –Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement – PDCA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.
UNIT III  TQM TOOLS & TECHNIQUES I  9

UNIT IV  TQM TOOLS & TECHNIQUES II  9

UNIT V  QUALITY SYSTEMS  9

TOTAL : 45 PERIODS

OUTCOMES:
At the end of this course the students will be to
• understand the TQM concept and principles and the various tools available to achieve total quality management.
• understand the statistical approach for quality control
• have awareness about the ISO and QS certification process and its need for the industries.

TEXT BOOK

REFERENCE BOOKS

PTLT8713  PROJECT WORK  L T P C
0 0 9 6

OBJECTIVE:
Each student is required to submit a report on the project undertaken by and assigned to him by the Department. The report should be based on the information available in the literature or data determined in the laboratory/industry. The objective of the project is to make use of the knowledge gained by the student at various stages of the degree programme. This helps to judge the level of proficiency, originality and capacity for application of the knowledge attained by the student at the end of the programme.
VIVA VOCE
The object of the viva-voce examination is to determine whether the objectives of the Project work have been met by the student as well as to assess the originality and initiative of the student as demonstrated in the Project Work.

TOTAL : 240 PERIODS

OUTCOMES
The project work is expected to shape the student to think originally, plan/execute work properly, analytical abilities and reporting/communication skills
Each student is required to submit a report on the project undertaken by and assigned to him by the Department. The report should be based on the information available in the

PTLT8001 ADVANCED PHYSICS AND CHEMISTRY OF LEATHER – I (APCL – I) L T P C 3 0 0 3

AIM
To impart knowledge on the advanced physical and chemical concepts of native collagen and collagen processed into leather.

OBJECTIVES
• At the end of the course the students would have gained comprehensive knowledge on the chemistry and physics of molecular architecture, hydration, swelling, phase transitions, dimensional stability, relaxation, shrinkage and cross-linking phenomena of collagen/processed collagen/leather.

UNIT I
Histology and fibre packing in Skins. Techniques for study of macro-ultra and microstructural details of skins. Primary, secondary, tertiary and quarternary structure of collagen.

UNIT II
Molecular architecture of collagen. Inter and intra-change forces in the stabilisation and aggregation of collagen molecules. Three dimensional network of collagen fibres in skins and leather matrix.

UNIT III
Hydration, fibre swelling and phase transitions in collagen fibres and their role in dimensional stability of skin and leather matrix.

UNIT IV
Molecular mechanisms in relaxation and folding with special reference to native collagen and tanned collagen. Helix to coil transition and effects of thermo-mechanical stress on connective tissue fibres.
UNIT V
Shrinkage and cross linking phenomena in native, chrome tanned and vegetable tanned collagen.
Influence of electromagnetic and high energy radiation on native collagen.

OUTCOMES
At the end of the course the students would have gained comprehensive knowledge on the chemistry and physics of molecular architecture, hydration, swelling, phase transitions, dimensional stability, relaxation, shrinkage and cross-linking phenomena of collagen/processed collagen/leather.

TEXT BOOKS AND REFERENCES

PTLT8002  ADVANCED PHYSICS AND CHEMISTRY OF LEATHER II  L T P C
(Prerequisite: Elective APCL-I)  3 0 0 3

AIM
To attempt micro-level understanding of leather making

OBJECTIVES
This subject is to impart advanced physical and chemical concepts associated with the hydration of skin, diffusion and transport of chemicals and surface treatment associated with leather manufacture

UNIT I
Macro and microporosity of skin and influence of hydration and water structure on the pore size pattern in skin. Functional sites in protein for interactions with vegetable and pretanning materials, Electrophilic and nucleophilic reactions at protein sites.

UNIT II

UNIT III
Molecular level processes and changes in soaking, liming/dehairing, deliming/bating, pickling, tanning, dyeing and Fatliquoring.

UNIT IV
Dimensional changes and Ultra and micro structural variations of skins during soaking,liming, deliming/bating, pickling, tanning, retanning, Fatliquoring and drying as well as finishing with resin and casein finishes.
UNIT V

Surface science application to leather. Surface charge and energy of full chrome and chrome retanned leather. Emulsions in leather processing and the surface charge and potential of leather finish films, adhesion, mechanisms, influence of opacity, refractive index and scattering coefficient of pigments and pigment formulations and factors controlling the stability of leather finish films.

TOTAL : 45 PERIODS

OUTCOMES

- To understand hydration of skin protein and its functional sites
- To understand diffusion and transport phenomena in collagenous matrices
- To understand molecular level changes and dimensional changes during various unit processes in leather making
- To relate surface science to leather making.

TEXT BOOKS AND REFERENCES


PTLT8003 CAD/CAM FOR LEATHER PRODUCTS DESIGN AND MANUFACTURE

AIM

To impart knowledge on CAD/CAM for leather products design and manufacture.

OBJECTIVES

- To focus on the computer applications in leather products sector, hardware in cad, pattern engineering, last and sole modelling for footwear and advanced computational techniques in cad, rapid prototyping.

UNIT I COMPUTER APPLICATIONS IN LEATHER AND PRODUCT SECTOR

Definition, historical development, scope of applications and advantage. CNC devices for computer aided cutting including laser and water jet, computer aided manufacturing.

UNIT II HARDWARE IN CAD

Introduction, Principles, Capabilities and operation of graphical workstations, central processing units, graphic terminals, input/output devices, interface and storage devices, networking concepts of LAN and WAN. Digitization: 2D & 3D Coordinate extracting, principles of digital and analog conversion, digital input/output processing systems. Output devices: Prints, plotter and cutter. Various types, their working principles and applications.
UNIT III  PATTERN ENGINEERING 8
Computerized techniques for pattern generation, grading and assessment of leather products patterns, consumption calculations, pattern nesting and costing, stitching etc. through computerized techniques.

UNIT IV  LAST AND SOLE MODELLING FOR FOOTWEAR 7
Digitization with Microscribe; manipulation and optimization of digitized last; use of macros; last comparison; grading wizard; flattening; 3D visualization of last and styles; concept of e-last; introduction to sole and sole mould design.

UNIT V  ADVANCED COMPUTATIONAL TECHNIQUES IN CAD, RAPID PROTOTYPING 6
Principles and practice; simulation – concepts and applications.

TOTAL : 45 PERIODS

OUTCOMES
The students would have exposure on the use of computer based application in designing leather products

REFERENCES
6. Desai and Abel, “Introduction to FEM”. “Step by Step guide to CAD for footwear”: CAD Centre, SDDC, CLRI.

PTLT8004  COMPUTER APPLICATIONS FOR LEATHER AND LEATHER PRODUCTS 3 0 0 3

OBJECTIVES
To make students capable of using Computer and related technologies for an effective management of leather and leather products industry

UNIT I  SYSTEMS ANALYSIS & DESIGN AND IT INFRASTRUCTURE 8
Definition of a System; System development life cycle- System study; System analysis; System Design (input, output, files, procedure); Implementation and maintenance; Need for the IT Infrastructure; Form factor; Data Center & Disaster Recovery; Security & Threads.
UNIT II DATABASE MANAGEMENT SYSTEM 7
Different types of Database Management Systems and SQL: DDL, DML - Retrieving, Manipulating, Updating tables; Concepts on Leather Industry specific database – with respect to Leather Processing and Product Industry;

UNIT III DATA COMMUNICATIONS 7
Concept of Data Communication, Modes of Transmission - Digital Vs Analog, Serial Vs Parallel, Synchronous Vs Asynchronous; Types of Communication - Simplex, Half Duplex, Full Duplex; Communication channels - Twisted pair cables, Coaxial cables, Optical Fiber, Radio Waves, Satellites; Communication Protocols - FTP, HTTP, TCP/IP, WAP; Data Communication Devices; Network topologies; Network Types (LAN, WAN and MAN), Data Communication Terminologies in Internet – WWW-Website-Webpage-HTML-URL.

UNIT IV CONCEPTS FOR WEB BASED APPLICATIONS 12
Tools for Web Designing, Management Information System, ERP System for Leather Processing – Material Management and Inventory Control, Production Planning.

UNIT V E-COMMERCE 11
E-Commerce-Definition; Traditional Commerce V/s E-Commerce; Benefits of e-commerce; Various e-commerce models-B2B, B2C;

CAD SYSTEMS
CAD Systems for Leather & Leather Products- Pattern grading & cutting for footwear, leather goods and garments; Design and development of Leather products; Computerised color matching systems – its principle and application.

TOTAL : 45 PERIODS

OUTCOMES
To expose the students to Systems analysis concepts, application aspects of DBMS, Data communication principles, Web Designing, ERP, MIS, E-Commerce and CAD applications in leather/leather products manufacture

TEXT BOOK

REFERENCES
4. Kendall & Kendall, Systems Analysis and Design (Prentice Hall India)
6. Understanding SQL (BPB Publications)
7. Hands-on HTML(BPB Publications)
10. Reference Manuals for CAD systems for Footwear and Garments.
AIM
To impart consumer behaviour and business orientation skills to students.

OBJECTIVE
- The purpose of this course is to provide an overview of consumer decision making, marketing implications, consumer behaviour, business orientation and issues in business marketing catering to leather sector.

UNIT I CONSUMER DECISION-MAKING AND MARKETING IMPLICATIONS 6
Introduction to the study of consumer behaviour- Stages in Consumer Decision Making-Types of Consumer decision-making -Consumers shopping styles and Trends-Information search and consumers decision-making-Information search and marketing strategies- Dimensions of information search - Impulse Buying of Consumer- an emerging trend.

UNIT II CONSUMER DECISION-MAKING AND BEYOND 7

UNIT III DETERMINANTS OF CONSUMER BEHAVIOUR 10
a) Motivation-Abraham Maslow's need Herz-berg's two factor theory, Sigmund freud's Psycho-analytical model of Motivation.
b) Perception - Selective attention, Exposure and Subliminal Perception Process- Factors for perceptual distortion.
d) Beliefs and Attitudes- Cognitive , Affective and Action oriented Attitude.

UNIT IV BUSINESS ORIENTATION 8

UNIT V ISSUES IN BUSINESS MARKETING 14
The concept and application of product life cycle [plc], advertising and publicity, sales and distribution management. The idea of consortium marketing, competitive bidding/tender marketing, negotiating with principal customers. The contemporary perspectives on Infrastructure Development, Product and Procurement Reservation, Marketing Assistance, Subsidies and other Fiscal and Monetary Incentives. National state level and grass-root level financial and non-financial institutions in support of small business development. Credit risk management, contract management, interest rate management, forest risk management, leadership strategic planning.

TOTAL : 45 PERIODS
OUTCOMES
At the end of this course students are expected to understand the issues related to the consumer behavior and business orientation related to leather sector

REFERENCES
3. Research for Marketing decisions - Paul, Donald, Herald- Prentice Hall (India) Zikmund: Exploring Marketing Research, 8e, Thomson 2006

PTLT8006 ECO-BENIGN OPTIONS FOR LEATHER PROCESSING L T P C
3 0 0 3

AIM
To impart knowledge on eco friendly options for leather processing.

OBJECTIVE
The objective of this course is to provide theoretical orientation on the cleaner options in beamhouse, tanning, post tanning and finishing process in leather manufacture.

UNIT I CLEANER PROCESSING - BEAMHOUSE 9
Eco-friendly process technologies: Salt free curing options, sulphide free unhairing systems, ammonia - free deliming, salt free pickling systems, solvent free degreasing systems. Paradigm shift from chemical processing of hides and skins to bio beam house processing.

UNIT II CLEANER PROCESSING: TANNING 9
Less chrome and chrome-free tanning systems. Latest concepts and trends in leather processing. Eco-labelling. Integrated strategies to achieve permissible BOD, COD and TDS standards of tannery effluents.

UNIT III CLEANER PROCESSING: POST TANNING 9
Formaldehyde, Phenol, AOX free post tanning systems; Latest concepts and trends in leather processing. Eco-labelling. Integrated strategies to achieve permissible BOD, COD and TDS standards of tannery effluents.

UNIT IV CLEANER PROCESSING: FINISHING 9
Cleaner processing and solvent free finishing systems; Eco-labelling. integrated strategies to achieve permissible BOD, COD and TDS standards of tannery effluents.
UNIT V ADVANCED FINISHING, SPLIT PROCESSING AND UPGRAＤАTION
TEΧΝＩQUES – CLEANER TECHNOLOGIES
Role of following finishing equipment like autospray, roller coats, embossing machines, finiflex, auto togglers, stacking machines etc. Techniques such as oil pull-up, waxy, burnishable, crazy horse, antique finish, screen printing, roller printing, tie and dye finishing, metallic effects, patent finishing, cationic finishing, other novel finishing techniques like electrostatic finishing. Shoe suede, garment suede, grain finished effect and specialty finishes at split leather processing technologies and finishing techniques specially suited for the purpose. Upgradation of lower ends for better utilisation. Transfer foil, lamination techniques, etc in split finishing. Latest trends.

TOTAL : 45 PERIODS

OUTCOMES
- At the end of the course the students would have gained knowledge on the cleaner process technology in the leather processing during tanning, post tanning and finishing systems. The emphasis on the course content will be on the fundamentals of bio beam house processing.

REFERENCES

PTLT8007 ENGINEERING ECONOMICS AND FINANCE MANAGEMENT

AIM
To impart knowdege on financial management concepts and principles of engineering economics

OBJECTIVE
Knowledge on the economic aspect of leather industry and financial management of tanneries will be gained

UNIT I FINANCIAL ACCOUNTING

UNIT II PROFIT VALUE ANALYSIS

UNIT III WORKING CAPITAL MANAGEMENT

UNIT IV CAPITAL BUDGETING
Significance of capital budgeting – payback period – present value method – Accounting rate of return method.
UNIT V  ENGINEERING ECONOMICS

TOTAL : 45 PERIODS

OUTCOMES
Students would understand and would have learnt the engineering economics and how to manage finance in leather industry

TEXT BOOK

REFERENCES
2. Charles T.Homgren, Cost Accounting, PHI 1985

PTLT8008 ENTERPRISE RESOURCE PLANNING FOR LEATHER SECTOR  

AIM
To introduce enterprise resource planning principles to leather technologists.

OBJECTIVE
- The objective of this course is to teach the principles of ERP technologists involved in enterprise resource and various case studies in the pre and post implementation of ERP,s that will enable the students to perform as an efficient entrepreneur.

UNIT I INTRODUCTION
1. What is ERP?
2. Need of ERP
3. Advantages of ERP
4. Growth of ERP

UNIT II ERP AND RELATED TECHNOLOGIES
1. Business process Reengineering (BPR)
2. Management Information System (MIS)
3. Decision Support Systems (DSS)
4. Executive Support Systems (ESS)
5. Data Warehousing, Data Mining
6. Online Analytical Processing (OLTP)
7. Supply Chain Management (SCM)
8. Customer Relationship Management (CRM)

UNIT III ERP MODULES & VENDORS
1. Finance
2. Production planning, control & maintenance
3. Sales & Distribution
4. Human Resource Management (HRM)
5. Inventory Control System
6. Quality Management
7. ERP Market
UNIT IV    ERP IMPLEMENTATION LIFE CYCLES  10
1. Evaluation and selection of ERP package
2. Project planning
3. Implementation team training & testing
4. End user training & Going Live
5. Post Evaluation & Maintenance

UNIT V    ERP CASE STUDIES  6
Post implementation review of ERP Packages in Manufacturing, Services, and other Organizations

TOTAL : 45 PERIODS

OUTCOMES
This course is expected to augment the entrepreneurship skills of the students

REFERENCES

PTLT8009    FASHION FORCASTING FOR LEATHER AND LEATHER PRODUCTS  L T P C
            3 0 0 3

AIM
To impart knowledge on fashion forercating for leather and leather products.

OBJECTIVES:
- To give focus on the historical evaluation & international trends, fashion considerations, product development, presentation techniques and fashion forecasting of leather and leather products.

UNIT I    HISTORICAL EVALUATION & INTERNATIONAL TRENDS  10
Historical evaluation of leather and leather products styling. Seasonal influences on fashion, cultural and geographical instances on leather and products fashion. Market research and track record.

UNIT II    FASHION CONSIDERATIONS  9
Design Criteria through effect of shape, colour, pattern, texture and decorative materials. Life cycle of fashion

UNIT III    PRODUCT DEVELOPMENT  9

UNIT IV    PRESENTATION TECHNIQUES  9
Organisation of shows and preparation of art portfolios; advertising; effect of foreign languages in the presentation and promotional activities.
UNIT V  FASHION FORECAST
Direction of fashion trends in leather and leather products production and marketing.

OUTCOMES:
At the end of the course, students will have knowledge in various fashion trends in leather and
leather products sector.

REFERENCES
3. “Shoes and Leather News”, Published by bureau of foreign and domestic commerce, Dept
of commerce, US, 1940.

PTLT8010  HUMAN RESOURCE DEVELOPMENT
L T P C
3 0 0 3

AIM
To impart human resource management skills to the students.

OBJECTIVES
• The purpose of this course is to provide an overview of human resource management
  concepts and relate them to contemporary issues.

UNIT I  MANAGEMENT AND GENERAL EMPLOYMENT PRACTICES
Human resource planning, Organizational design, HR budgeting, Motivation, Leadership,
Employee involvement, Ethics, International issues, Job design: Job analysis-Job description,
Performance management: Performance appraisals, Workplace behaviour problems

UNIT II  STAFFING
Equal employment opportunity, recruitment, selection, career planning, organizational exit

UNIT III  HUMAN RESOURCE DEVELOPMENT
HRD role clusters: Analysis/Assessment roles- Evaluator, Needs analyst, Researcher
Development roles - Evaluator, HRD materials developer, Program designer Strategic roles –
HRD manager, Marketer, Organization – Change agent, Individual – Career development
advisor, Instructor/Facilitator, Administrator

Competency development: Technical competence, Managerial competence, Process
competence, Helping Competence and Coping Competencies; Training and Development;
Organizational Development, Career Development;

Contemporary issues: Knowledge management and learning organizations, BPR, TQM and
Intellectual capital management.

UNIT IV  COMPENSATION AND BENEFITS
Job evaluation, Pay structures, Benefit programs, Pay delivery administration.
UNIT V  HEALTH, SAFETY, SECURITY AND LABOUR RELATIONS  12
Employee assistance programs, safety programs, theft, fraud, investigations, corrections;
Labour laws, unfair labour practices, collective bargaining

TOTAL : 45 PERIODS

OUTCOMES
This course will aid the students in appreciating the role, relevance and importance of human
resource in any organization.

TEXT BOOKS AND REFERENCES
Ohio: Thomson-Southwestern.

PTLT8011  INTERNATIONAL MARKETING AND FOREIGN TRADE  L T P C
3 0 0 3

AIM
To impart knowledge on international marketing and foreign trade aspects of leather industry

OBJECTIVE
The knowledge on marketing leather and leather products in international market and foreign
trade policies will be gained.

UNIT I
Basics of International trade - India's trade policy, International trade and Monetary Systems-
Marketing Services in International trade Pricing and trade cycles-Precautionary measures to
prevent fraud in International trade - International trade Multimodal Transport Operations-
Consumer Behavior and Role of international Marketing and Role of international Marketing -
Indian market Analysis.

UNIT II
Introduction-Import to India-An over view, Import and the Customs in India-Importation of
Goods, Customs Duty and Exemptions-Valuation of Goods under Customs, Clearance of
India's new foreign trade Policy-Legal frame work of foreign trade Policy-Special focus -
General provision on Import and Export-Promotional Measures- Duty exemption/ Duty
remission scheme EPCG Scheme -EOU/ EHTP/ STP/ BTP- SEZs.

UNIT III
Marketing concepts and Import-Forms of organization in Import and domestic Trade- Products,
Sales forecasting and sales Management-pricing, Promotion, Branding and Advertising.
Retail Management - Introduction to Logistics - Parameters of Supply Chain Management -
Management of logistics and Supply Chain - Consumer Supply Chain Relationship.

UNIT IV
The Customs Tariff Act-Exemptions in Import-by UN and its agencies and their officials-Import
by UN or international organizations for execution of projects in India-Imports by Government
Diplomats, Trade representatives etc.-Customs Tariff
UNIT V

OUTCOMES
• At the end of the course the students would understand the basics of international trade, government policies in export aspects of world trade related to leather sector, custom tariff and international marketing.

TEXT BOOKS
1. Wagdre, H. International Marketing Management, Adhyayan Publisher, 2007

PTLT8012 LEATHER AND LEATHER PRODUCTS COSTING

OBJECTIVES
The sorting, assessment and valuation of various leather and leather products will be learnt.

UNIT I
Cost accounting, elements of cost, classification of cost elements – examples from textile industry, methods of costing

UNIT II
Cost profit volume analysis, breakeven analysis; standard costing, analysis of variance

UNIT III
Costing of leather and leather products – material, labour, power and overhead expenses

UNIT IV
Foreign exchange mechanisms, exchange rates; foreign exchange exposure management – risks, strategies to reduce risk

UNIT V
Budget, types of budgets, budgeting and control in tanneries and leather products industry

TOTAL : 45 PERIODS

OUTCOMES
At the end of the course the students would have gained expertise in assigning valuation to various leather and leather products
REFERENCES

PTLT8013 LEATHER AND PRODUCT MERCHANDISING

AIM
To impart knowledge on leather products merchandising that relates to the domestic and global leather and leather product merchandising.

OBJECTIVES
To understand
- Fundamentals of purchasing
- Retail sector
- Global Market

UNIT I PRINCIPLES OF MARKETING MANAGEMENT

UNIT II PURCHASING PRINCIPLES AND MANAGEMENT
Purchasing scope and development - Strategic aspects of purchasing - Key purchasing variables consideration - Purchasing negotiations & competitive – Bidding - Outsourcing - purchasing operation - Buying capital goods & services - Purchasing for resale - Purchasing systems and technology - Evaluation of purchasing performance - Purchasing ethics and legal issues

UNIT III PRINCIPLES AND PRACTICE OF MERCHANDISING
Merchandising concepts, technology, systems, planning - Merchandise pricing and budgeting, sample handling - Managing merchandise assortments - Developing and - presenting product lines - Introduction to shipping operation

UNIT IV RETAIL SECTOR OF LEATHER
Overview of retailing; Changing retail environment - Typology of retail buying - Understanding the consumer - Competitive strategies in the retail industry - Retail location strategy; Store layout & Design - Product planning and selection; Inventory management - Retail pricing; Retail communication - Customer Service
UNIT V  GLOBAL SOURCING OF LEATHER

Globalization and its influences - The role and importance of global sourcing - Global sourcing process and strategy - Investigation and tendering - Supplier selection and development - Operationalization of global sourcing strategy - Performance Measurement - The benefits and challenges of global sourcing - Coping with custom clearance uncertainties - Sourcing on the Internet - Supplier relationship development - Merchandising language for sourcing

OUTCOMES
At the end of this course students will be in a position to understand the nuances of merchandising associated in leather and leather products manufacture

REFERENCES
1. Apparel Product Design and Merchandising Strategies by Cynthia L. Regan. Publisher: Prentice Hall

PTLT8014  LEATHER BIOTECHNOLOGY AND ITS APPLICATION IN LEATHER  L T P C

OBJECTIVE
Objective is to understand the role of biotechnology in various leather processing steps like use of enzymes in beam-house operations

UNIT I  PROTEINS AND NUCLEIC ACID & ENZYMOLOGY

UNIT II  GENETIC ENGINEERING (RECOMBINANT DNA TECHNOLOGY
Principles and methods: Essentials of biotechnology - products of biotechnology, Restriction enzymes, vectors, DNA cloning strategies.

UNIT III  BIOTECHNOLOGY FOR HIDES/SKINS IMPROVEMENT
UNIT IV WASTE MANAGEMENT FOR LEATHER 8
General features of the organic and inorganic pollutants of tannery. Stabilisation and disposal of organic and chemical wastes and their biological treatment. Possible energy generation from wastes.

UNIT V UTILISATION OF COLLAGENOUS TISSUES FOR BIOMEDICAL AND OTHER APPLICATIONS 4
Collagen and its application in food, cosmetic and medical fields.

TOTAL : 45 PERIODS

OUTCOMES
At the end of the course the students would have gained knowledge on various enzyme-based leather processing operations.

REFERENCES

PTLT8015 LEATHER PRODUCTS MACHINERY L T P C
3 0 0 3

AIM
To impart knowledge on leather products machinery used in leather sector.

OBJECTIVES
- To focus on the hand tools and machines, machines for shoe and footwear construction, system, automation in leather product machines and modular manufacturing and layout.

UNIT I HAND TOOLS AND MACHINES 8
Hand tools and machinery used in leather and leather products making and other auxiliaries operations – General constructions - Principles involved in their working - Power transmissions systems. The machinery: Pattern grading, clicking Press, splitting, skiving, edge-folding, stamp Marking, sewing, punching, crimping, eyeleting, Seam-rubbing and taping, thermo-cementing, Pre-forming, etc.

UNIT II MACHINES FOR SHOE AND FOOTWEAR CONSTRUCTION 8
Machines used in cemented, stitch down, welted, string lasted, DVP & DIP and other types of construction. Principles involved in their working - trouble shooting and & preventive maintenance. Spare parts planning and inventing control.
UNIT III TRANSPORT SYSTEM
Different types of material handling system in leather products industry. Manual, semi-automatic and automatic conveyors.

UNIT IV AUTOMATION IN LEATHER PRODUCT MACHINES
Application of computer/microprocessor base leather products making machines, principle and operation technique, safety measurements computerized controls, micro-processor links, and used of Robotics Die Less Cutting Systems. CAM for automatic stitching and other advance footwear machinery.

UNIT V MODULAR MANUFACTURING AND LAYOUT
Productivity improvements: scheduling, Simulation, Toyota and rink system and Lean manufacturing system.
Factors affecting plant location and construction of factory building for balancing the production line in footwear Industry. Application of Neural-network software in layout preparation.

TOTAL : 45 PERIODS

OUTCOMES
At the end of the course working knowledge and principles behind all the machineries used during leather making will be gained.

REFERENCES

PTLT8016 ORGANISATION AND MANAGEMENT OF LEATHER MANUFACTURE

OBJECTIVE
This course covers the trends in livestock & marketing of skins etc.

UNIT I TRENDS IN LIVESTOCK POPULATION
Categories of livestock, global distribution, India’s share, distribution livestock in India, growth rates, trends and relative importance , projections.

UNIT II AVAILABILITY AND MARKETING OF HIDES AND SKINS
Concepts, global availability , India,s share in the world , trends in meat production and consumption practices , fallen animal recovery systems , off-take rates( slaughter and mortality rates), availability of hides and skins , projections Collection and mobilization of hides and skins, Origin and characteristics, Transportation, Grading systems, Pricing, major markets and sourcing of hides and skins, Broad features of marketing.
UNIT III  STRUCTURE OF TANNING INDUSTRY AND LEATHER PRODUCT INDUSTRIES IN INDIA
Distribution of tanneries in India, scale of operation, type of ownership, line of specialization, capacity and production, employment pattern, industrial policy, environmental issues, leather complexes
Categories of products, distribution of footwear, leather garments, leather goods industries, scale of operation, ownership pattern, capacity and production, industrial policy, employment, exports and domestic market.

UNIT IV  INDIA’S FOREIGN TRADE AND POLICY
Economic and social importance of leather sector, trade terms, trends in the exports, major importing countries, imports of India, review of trade policy and impact.

UNIT V  GLOBAL MARKET FOR LEATHER AND LEATHER PRODUCTS
Shifts in production bases, structure of global market, trends in the global trade, major markets, competitors for India, dynamics of global leather trade.

EMERGING DIMENSIONS IN THE GLOBAL TRADE:  Non-price Competition, Trade related Environmental and Social issues, Eco-labels and Social certification, E-Commerce, impact of World Trade Organisation.

STRATEGIES FOR EXPORT PROMOTION: Identification of critical factors, Role of various organizations, Planning and sustainable development, Trade policy, Developing market network and market intelligence, Resource and product related strategies.

TOTAL: 45 PERIODS

OUTCOMES
At the end of the course working knowledge and principles all the organization and Management

TEXT BOOKS AND REFERENCES
1. Report of All India Survey on Raw Hides and Skins, CLRI, 1987 and 2004
2. Report on Capacity Utilisation and Scope for modernization of Indian tanning industry, CLRI, 1990
3. Report of the Committee on The Development of Leather and Leather Manufactures for Exports (Seetharamaiah Committee Report), Govt of India 1972
6. Bulletins of India’s Foreign Trade in Leather and Leather Products, CLRI
AIM
To impart knowledge on Occupational Safety and Hazard aspects in leather manufacture

OBJECTIVES
To understand
1. legal framework of safety & health in India and international conventions
2. hazard identification and assessment
3. productive machine safety in the leather industry
4. work ecology and ergonomics
5. emergency prevention and preparedness safety & health management

UNIT I SAFETY PHILOSOPHY, HAZARD IDENTIFICATION AND ASSESSMENT 10
Legal framework of safety & health in India International conventions and trends
Responsibilities and enforcement mechanism. Need for safety & health (cost/benefit rational;
safety, environment and productivity triangle); Role of industrial hygiene, Hazard classification
(hazard categories and groups), Hazard identification and assessment (tools and methods).

UNIT II SAFETY IN USE OF HAZARDOUS SUBSTANCES AT WORK 8
Chemical and biological hazards in the work place in the leather industry; Health effects of
chemical and biological exposure Hazard information systems on hazardous substances
(material safety data sheets, labelling) Workplace exposure monitoring and evaluation Hazard
prevention and control measures (storage, handling and disposal) in the leather industry.

UNIT III PRODUCTIVE MACHINE SAFETY IN THE LEATHER INDUSTRY, WORK
ECOLOGY AND ERGONOMICS 17
Safety hazards of machinery, machine tools and electrical installations; Hazard
prevention and safeguarding of machinery (guards, machine controls, ergonomics); Role of
preventive maintenance; Safe workstation design and layout, Manual handling of material;
Lighting (standards, use of natural and artificial illumination); Climate control (standards,
temperature/humidity, improving general ventilation); Noise management (standards,
prevention and protection); Safety of factory premises and installations (railings, flooring, safe
structures); Welfare measures; Personal protection and hygiene (selection, use,
maintenance);

UNIT IV EMERGENCY PREVENTION AND PREPAREDNESS 7
Planning for emergencies; Control of fire and explosion; Dealing with medical emergencies

UNIT V SAFETY & HEALTH MANAGEMENT AND PROMOTION 3
Promoting safety & health practices at the workplace (training, safety and warning signs);
Role and responsibilities of managers, supervisors and workers.

TOTAL : 45 PERIODS

OUTCOMES:
The importance of safety in tanneries will be known and implementation of safety procedures
will be gained at the end of the course.
REFERENCES

PTLT8018 SCIENCE AND TECHNOLOGY OF LEATHER AUXILIARIES

AIM
This course aims to impart knowledge on the chemistry and properties of various auxiliaries used in leather processing.

OBJECTIVE
The course provides overview on different auxiliaries viz., fatliquors, syntans, dyes and finishing chemicals used in leather manufacture.

UNIT I
Definition and function of leather auxiliaries, role of wetting agents, syntans, fatliquors, dyes, pigments, binder, top coats, feel modifiers and matting agents in leather processing. Surface tension and principles of wetting, importance of HLB, Chemical classification of wetting agents.

UNIT II
Chemical classification of syntans, sulphonation of naphthalene, phenols, Naphthols, Phenol formaldehyde condensation reactions, chemistry of light fast syntans, chemistry of amino resins and PU, Unit operations in syntan manufacture.

UNIT III
Composition of fatliquors; Functionalisation of oils for surface active function, chemical classification natural and synthetic oils, sulphation, sulphonation, sulphitation reactions of oils, role of double bonds and iodine value in functionalisation of oils, sulphochlorination, sulphoamidation, transesterification, phosphorylation reactions for fatliquror preparation. Stability of emulsions, grain and particle sizes of emulsions, factors controlling grain sizes of emulsions. Fatliquor manufacturing technology.
Theory of colors, chromphoric groups, structural features of dyes; acid, basic and reactive dye classification. Chemistry and technology of dye manufacture.

UNIT IV
Definition of pigments, groups of polymer bases for colour. Classification, formulations of pigments, particle size, refractive index, density, opacity criteria for the choice of pigment bases, Different techniques in particle size reduction and importance of particle size on functional properties of pigment formulation.
Functional definition of binders, chemical classification of binders, acrylic, protein, polyurethane, introduction to manufacturing of binder formulations.
UNIT V
Different types of top coat formulations, choice of polymers for surface protection, role of plasticizers, internal and external plasticizers.
Principles of feel modification of polymer surfaces, types of feel modifiers and matting agents.

OUTCOMES
At the end of the course students would know the chemistry of different types of leather auxiliaries and their effect on the end properties of leathers

TEXT BOOKS AND REFERENCES

PTLT8019 SCIENCE AND TECHNOLOGY OF LEATHER SUPPLEMENTS AND SYNTHETICS L T P C 3 0 0 3

AIM
To impart knowledge on the use of leather supplements used as substitutes for leather in the manufacture of leather products

OBJECTIVE
- At the end of the course the students would have gained knowledge on the chemistry of most common polymeric materials used in leather industry as supplements. The emphasis on the course content will be on the fundamentals of polymerization of various polymers used. Analytical skills on testing of polymers will be emphasized that will enable them to understand various polymer properties and manufacturing methods.

UNIT I
Technology of the most common polymeric materials used in leather industry as supplements. Polymer and Rubber industries in India.

UNIT II
Manufacture of industrially important polymers for plastics, fibres and lastomer - Polyethylene, polypropylene, polyvinyl chloride, polyvinyl alcohol, polyacrylonitrile, polystyrene, polyurethane, fluoro-carbon polymers, epoxy resins, polyamides, polyester, alkyd resins, silicone polymers, cellulosics.

UNIT III
Fabrication of polymeric materials, compounding and mixing, casting, extrusion, fibre spinning, molding, coating, foam fabrication.

UNIT IV
Testing of polymers. Mechanical and Thermal testing.
UNIT V

Manufacture of rubber and elastomers. Natural rubber, processing, vulcanizing synthetic elastomers, butadiene copolymer, neutral rubber, polyisoprene polybutadiene. Polymer and rubber industries in India.

TOTAL : 45 PERIODS

OUTCOMES

At the end of the course the students would have gained knowledge on the chemistry of most common polymeric materials used in leather industry as supplements.

REFERENCES


PTLT8020 TECHNOLOGY OF ANIMAL AND TANNERY BY PRODUCTS UTILISATION

AIM

To impart knowledge on the preparation and use of tannery by-products that emerge during the preservation and manufacture of leather and leather products.

OBJECTIVES:

The objective of the course is to impart knowledge on the various by products emanating from slaughter houses and tanneries, their composition and various utilization methods available till date.

UNIT I INTRODUCTION

Types of animal byproducts - from abattoirs, meat processing plants, poultry, fishing and other sources including fallen animals. Present methods of collection, processing and utilisation in developing countries vis-a-vis developed countries : conservation techniques and concept of two tier technology. Protein meals from animals by-products including fallen animals and their significance in livestock feeds.

UNIT II DIFFERENT METHODS OF RENDERING

Bone products and their utilisation. Keratinous proteins - various sources keratinous based products and their uses.

UNIT III ANIMAL BLOOD, ITS PRODUCTS AND THEIR UTILISATION


UNIT IV COLLECTION AND CONSERVATION OF ORGANS AND GLANDS FROM SLAUGHTERED ANIMALS : POSSIBLE SCOPE OF THEIR UTILISATION

Anaerobic digestion, its significance for the preparation of animal feed, fuel gas, fertilizer, etc. Quality control including microbiological aspects of products processed from animal by-products.
UNIT V PRESENT INDUSTRIAL STATUS OF VARIOUS BY-PRODUCTS IN THE COUNTRY

Process studies on Glue making from tannery wastes - Bone glue and deproteinisation of bone - Horn and hoof meal - Protein meals by different methods

TOTAL : 45 PERIODS

OUTCOMES
At the end of the course the students would have gained knowledge on the preparation of several by-products emerging out of the leather and leather products sector.

REFERENCES

PTLT8021 VALUE ENGINEERING IN LEATHER SECTOR L T P C
3 0 0 3

AIM
To impart knowledge of value engineering and reengineering and relating them to leather industry.

OBJECTIVES
• To address value engineering through the objectives, different stages, procedures and implementation of reengineering.
• To make students apply the learned concepts in a case study/project.

UNIT I FUNDAMENTALS OF VALUE ENGINEERING AS APPLIED TO LEATHER MANUFACTURE 8
Value- Types –How to add value-Job plan – techniques employed- Who will do value engineering- Organizing the value engineering study-Benefitsin leather and allied industries

UNIT II STEP BY STEP APPLICATION OF JOB PLAN IN LEATHER RELATED INDUSTRIES 10

UNIT III WORK SHEETS AND GUIDE LINES FOR LEATHER AND ALLIED INDUSTRIES 9
UNIT IV REENGINEERING PRINCIPLES IN LEATHER PROCESSING AND IN LEATHER PRODUCT SECTOR


UNIT V IMPLEMENTATION OF REENGINEERING IN LEATHER SECTOR


TOTAL : 45 PERIODS

OUTCOMES
Case studies based knowledge on value engineering will be obtained at the end of the course.

TEXT BOOKS
2. Del L. Younker, “Value Engineering” Marcel Dekker, Inc. 2003

REFERENCE

PTGE8071 DISASTER MANAGEMENT

OBJECTIVES:
- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don’ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR)
Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processesess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.
UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:
The students will be able to
- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarious in the Indian context,
- Disaster damage assessment and management.

TEXTBOOKS:

REFERENCES
1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005
OBJECTIVES:
- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I

UNIT II

UNIT III
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV
Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V

TOTAL : 45 PERIODS

OUTCOME:
- Engineering students will acquire the basic knowledge of human rights.

REFERENCES: