## ANNA UNIVERSITY CHENNAI :: CHENNAI 600 025
### UNIVERSITY DEPARTMENTS
### CURRICULUM – R 2009
### B.TECH. (PART TIME) LEATHER TECHNOLOGY

### SEMESTER I

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>COURSE TITLE</th>
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**TOTAL CREDITS = 109**

### ELECTIVE LIST

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UNIT I MATRICES

UNIT II FUNCTIONS OF SEVERAL VARIABLES

UNIT III ANALYTIC FUNCTION
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
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

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
UNIT I  ULTRASONICS
Introduction – Production – magnetostriction effect - magnetostriction generator- piezoelectric
effect - piezoelectric generator- Detection of ultrasonic waves properties – Cavitations - Velocity
measurement – acoustic grating - Industrial applications – drilling, welding, soldering and
cleaning – SONAR - Non Destructive Testing – pulse echo system through transmission and
reflection modes - A, B and C –scan displays, Medical applications - Sonograms

UNIT II  LASERS
Introduction – Principle of Spontaneous emission and stimulated emission. Population inversion,
pumping. Einstein’s A and B coefficients - derivation. Types of lasers – He-Ne, CO₂, Nd-YAG,
Semiconductor lasers - homojunction and heterojunction (Qualitative)- Industrial Applications -
Lasers in welding, heat treatment and cutting – Medical applications - Holography (construction
and reconstruction).

UNIT III  FIBER OPTICS & APPLICATIONS
Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle -
Types of optical fibres (material, refractive index, mode) – Double crucible technique of fibre
drawing - Splicing, Loss in optical fibre – attenuation, dispersion, bending - Fibre optical
communication system (Block diagram) - Light sources - Detectors - Fibre optic sensors –
temperature and displacement - Endoscope.

UNIT IV  QUANTUM PHYSICS
Black body radiation – Planck’s theory (derivation) – Deduction of Wien’s displacement law and
Rayleigh – Jeans’ Law from Planck’s theory – Compton effect - Theory and experimental
verification – Matter waves – Schrödinger’s wave equation – Time independent and time
dependent equations – Physical significance of wave function – Particle in a one-dimensional
box - Electron microscope - Scanning electron microscope - Transmission electron microscope.

UNIT V  CRYSTAL PHYSICS
Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – ‘d’ spacing in cubic lattice –
Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing
factor for SC, BCC, FCC and HCP structures – NaCl, ZnS, diamond and graphite structures –
Polymorphism and allotropy - Crystal defects – point, line and surface defects- Burger vector.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
(2003)
company, Ltd., New Delhi, (2005).
UNIT I  WATER TREATMENT AND POLLUTION CONTROL  

UNIT II  FUELS  
Classification of fuels-Proximate and ultimate analysis of coal- coke manufacture-Otto Hoffman by product method-cracking-thermal and catalytic (fixed bed and fluidized bed)-petroleum-refining-factions-composition and uses synthetic petrol-fischer drops methods- Bergius process-knocking-octane number and cetane number-Preparation, composition and uses of producer gas , water gas and natural gas. Flue gas analysis- Orsat apparatus- gross and net calorific values- calculation of minimum requirement of air (simple calculations)- Explosive range – spontaneous ignition temperature

UNIT III THERMODYNAMICS AND SURFACE CHEMISTRY  

UNIT IV  CORROSION AND CATALYSIS  

UNIT V  POLYMERS-COMPOSITES AND NANOCHEMISTRY  
Polymers-definition-classification-thermoplastics and thermosetting plastics differences Preparation, properties and uses of polystyrene, bakelite, PET, polyurethane, Teflon, ureaformaldehyde, polycarbonates-Elastomers-Preparation, properties of Buna-S, nitrile, neoperene and butyl rubber, silicon rubber. Composites-FRP. Nanochemistry-introduction to nanochemistry- preparation and properties of nonmaterial-nano rods, nano wires-nanotubes-carbon nanotubes and their applications.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
AIM
To introduce the basics of computing and the fundamentals of C programming.

OBJECTIVES
• To introduce the fundamentals of computing systems.
• To introduce the concepts of internet and WWW.
• To teach programming in C.

UNIT I

UNIT II

UNIT III

UNIT IV

UNIT V
Pointers – Dynamic memory allocation – linked list - Applications

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
OBJECTIVES

- To develop in students the graphic skills that would enable them to communicate the concepts, ideas and design of engineering products
- To provide an exposure to the national/international standards related to technical drawings

INTRODUCTION

Importance of graphics in engineering applications – use of drafting instruments – BIS specifications and conventions – size, layout and folding of drawing sheets – lettering and dimensioning

UNIT I FREE HAND SKETCHING OF ENGG OBJECTS AND CONSTRUCTION OF PLANE CURVES 3+9=12

Pictorial representation of engineering objects – representation of three dimensional objects in two dimensional media – need for multiple views – developing visualization skills through free hand sketching of three dimensional objects.
Polygons & curves used in engineering practice – methods of construction – construction of ellipse, parabola and hyperbola by eccentricity method – Cycloidal and involute curves – construction of tangents to the above curves.

UNIT II ORTHOGRAPHIC PROJECTION: PROJECTION OF POINTS, LINES AND PLANE SURFACES 6+9=15

General principles of orthographic projection – first angle projection – layout of views – projections of points, straight lines located in the first quadrant – determination of true lengths of lines and their inclinations to the planes of projection – traces – projection of polygonal surfaces and circular lamina inclined to both the planes of projection.

UNIT III ORTHOGRAPHIC PROJECTION: PROJECTION OF SOLIDS AND SECTIONS OF SOLIDS 6+9=15

Projection of simple solids like prism, pyramid, cylinder and cone when the axis is inclined to one plane of projection – change of position & auxiliary projection methods – sectioning of above solids in simple vertical positions by cutting plane inclined to one reference plane and perpendicular to the other and above solids in inclined position with cutting planes parallel to one reference plane – true shapes of sections.

UNIT IV DEVELOPMENT OF SURFACES AND INTERSECTION OF SOLIDS 6+9=15

Need for development of surfaces – development of lateral surfaces of simple and truncated solids – prisms, pyramids, cylinders and cones – development of lateral surfaces of the above solids with square and circular cutouts perpendicular to their axes. Intersection of solids and curves of intersection – prism with cylinder, cylinder & cylinder, cone & cylinder with normal intersection of axes and with no offset.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 4+9=13

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones – principles of perspective projections – projection of prisms, pyramids and cylinders by visual ray and vanishing point methods.
COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY)
Introduction to computer aided drafting software packages and demonstration of their use.

LECTURE: 45  TUTORIAL: 15  TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES

CODES FROM BUREAU OF INDIAN STANDARDS
2. IS 9609 (Parts 0 & 1)-2001: Technical Products Documentation – Lettering
4. IS 11669-1986 & SP 46-2003: Dimensioning of Technical Drawings
5. IS 15021(Parts 1 to 4)-2001: Technical Drawings-Projection Methods

SPECIAL POINTS APPLICABLE TO UNIVERSITY EXAMINATIONS ON ENGINEERING GRAPHICS:
1. There will be five questions one from each unit covering all units of the syllabus
2. All questions will carry equal marks of 20 each making a total of 100
3. Answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solutions within A3 size
4. The examination will be conducted in appropriate sessions on the same day
UNIT I  STRUCTURE AND FUNCTIONS OF SKIN  
Structure and functions of epidermis, dermis, cutaneous and subcutaneous tissues, hair, fat tissue, nerve, erectopilli muscle, sweat glands. Organization of skin components in different animals.

UNIT II  INTRODUCTION TO BIOMOLECULES  
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, pKa & pKb values, Titration curves of amino acids, reaction of amino acids – Ninhydrin, Edmann’s reagent, Sanger’s reagent, Aldehydes. Iso electric pH, buffer, Henderson Hasselbalch equation. Structure and properties of RNA and its bases, Structure & properties of DNA and its bases, different forms of DNA and RNA.

UNIT III  ENZYMES & PROTEINS  
General and Physical Chemistry of enzymes & proteins in animal skin, Enzyme classification and their functions, enzyme kinetics, Protein classifications; Reactions of proteins with acids, bases and salts; Protein purification – Ion exchange chromatography, Molecular sieve chromatography, affinity, dialysis, HPLC, Gel electrophoresis, Structural organization of proteins. Structure and chemical features of collagen; Reactive groups; Cross linking.

UNIT IV  POLYMORPHISM & AGGREGATION PHENOMENA OF COLLAGEN  
Tropocollagen molecules; Sub-units of collagen; Types of collagen; Structure and function. Kinetics of fibril formation; precipitated forms of collagen; Electron microscopy of the collagen fibre; Biosynthesis.

UNIT V  THERMAL TRANSITION AND DEGRADATION OF COLLAGEN  
Denaturation temperature; Mechanism of denaturation process; Thermal shrinkage; Factors influencing melting transition. Degradation of collagen - collagenases; Physico - chemical properties methodology, mechanism of action.

TOTAL: 45 PERIODS

TEXT BOOKS
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 stage wise 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


UNIT IV PRINCIPLES OF UNIT PROCESSES
General concepts for unit processes; 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
UNIT V  WATER AND INORGANIC CHEMICALS  5
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.

REFERENCES

PTEE9161  BASIC ELECTRICAL AND ELECTRONICS ENGINEERING  L T P C
3 0 0 3

UNIT I  ELECTRICAL CIRCUITS  9

UNIT II  ELECTRICAL MACHINES  15
Principles of operation and characteristics of D C machines. Transformers (single phase and three phase) – Synchronous machines – 3 phase and single phase Induction motors – (op. principles).

UNIT III  SEMI CONDUCTORS  5
Classification of solids as conductors and semiconductors – Intrinsic, Extrinsic semiconductors – P type and N type semiconductors – Junction diode – Zener effect – Zener diode – VI characteristics of junction and Zener diodes.

UNIT IV  TRANSISTORS  5
Bipolar Junction Transistor – CB, CE, CC – Configurations – Simple treatment of characteristics and biasing. Elementary treatment of FET, MOSFET, UJT, DIAC and TRIAC.

UNIT V  TRANSDUCERS AND COMMUNICATION SYSTEM  11

TOTAL: 45 PERIODS
TEXT BOOKS

REFERENCES

PTCH 9204 MECHANICAL ENGINEERING L T P C
3 0 0 3

AIM
To impart knowledge on thermodynamics and thermal engineering Power generating units such as engines and theory of machines

OBJECTIVE
• Students should learn thermodynamics and thermal engineering and should understand the principles behind the operation of thermal equipments like IC engines and turbines etc., Students should be able to appreciate the theory behind operation of machinery and should be able to design simple mechanisms

UNIT I LAWS OF THERMODYNAMICS 10
Basic concepts and hints; Zeroth law; First Law of Thermodynamics - Statement and application; Steady flow energy equation; Second law of Thermodynamics – Statement, Limitations; Heat Engine, Refrigerator and Heat Pump, Available energy, Kelvin - Plank statement and Clausius statements; Equivalence entropy; Reversibility: Entropy charts; Third law of Thermodynamics - Statement.

UNIT II HEATING AND EXPANSION OF GASES 6
Expressions for work done, Internal energy and heat transfer for constant pressure, constant volume, isothermal, adiabatic and polytropic processes; Free expansion and Throttling.

UNIT III AIR STANDARD EFFICIENCY 6
Carnot cycle; Stirlings Cycle; Joule Cycle; Otto Cycle; Diesel Cycle; Dual combustion Cycle.

UNIT IV I.C. ENGINES, STEAM AND ITS PROPERTIES AND STEAM TURBINES 12
Engine nomenclature and classifications; SI Engine; CI Engine; Four Stroke cycle, Two stroke cycle; Performance of I.C.Engine; Brake thermal efficiency; Indicated Thermal Efficiency, Specific fuel consumption.
Steam - Properties of steam; Dryness fraction; latent heat; Total heat of wet steam; Dry steam; Superheated steam. Use of steam tables; volume of wet steam, volume of superheated steam; External work of evaporation; Internal energy; Entropy of vapour, Expansion of vapour, Rankine cycle.
Steam turbines – Impulse and Reaction types - Principles of operation.

UNIT V  SIMPLE MECHANISM, FLY WHEEL, DRIVES AND BALANCING                  11
Kinematic Link, Kinematic Pair, Kinematic Chain; Slider Crank mechanism and inversions; Double slider crank mechanism and inversions.
Flywheel-Turning moment Diagram; Fluctuation of Energy. Belt and rope drives; Velocity ratio; slip; Creep; Ratio of tensions; Length of belt; Power Transmitted; simple and compound gear trains.
Balancing of rotating masses in same plane; Balancing of masses rotating in different planes.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES

PTCY9211  ORGANIC CHEMISTRY L T P C
3 0 0 3

AIM
To learn fundamental and applied aspects of organic chemistry towards different applications.

OBJECTIVES
- To acquire knowledge about chemical bonding, hybridization, bond fission, different types of chemical reactions and their mechanism, isomerism in organic molecules, synthesis of organic compounds and various applications of organic products.

UNIT I   STRUCTURAL CONCEPT OF ORGANIC MOLECULES                                    5

UNIT II    REACTION AND THEIR MECHANISM                                               10

UNIT III ISOMERISM 6

UNIT IV HYDROCARBONS AND THEIR CLASSIFICATION 10

UNIT V SYNTHETIC ORGANIC CHEMISTRY 7

APPLIED ORGANIC CHEMISTRY: 7

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
AIM
To know the basic concepts of inorganic and physical chemistry aspects of chemical compounds and their behaviour at different processing conditions.

OBJECTIVES
• At the end of this course students would have gained knowledge on the structure and symmetry of inorganic compounds and theories of coordination compounds. Students will also be in a position to appreciate the concepts of phase rule and their applications in separation of liquids, behavior of ions and colloids in different processing conditions.

UNIT I   INTRODUCTION TO INORGANIC COMPOUNDS
A brief survey of the s block - binary compounds, complexes, alkalides and electrides. Features in the chemistry of the p block - expansion of the octet, Lewis structures; d orbitals – transition metals; coordination compounds – basic terms, nomenclature, Coordination theory, Werner’s theory, Stereo chemistry

UNIT II   MOLECULAR BONDING AND THEORIES OF INORGANIC COMPOUND
Shapes of molecules by application of the 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  PHASE RULE
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 IV   IONIC EQUILIBRIA

UNIT V    COLLOIDS

TOTAL: 45 PERIODS
TEXT BOOKS

REFERENCES
1. Website – http://www.prenhall.com/brown

PTLT9253   THEORY AND PRACTICE OF PRESERVATION AND PRETANNING PROCESSES

UNIT I   PRESERVATION
Principles involved in long and short term preservation techniques for hides and skins; Preservation defects

UNIT II   PRETANNING PROCESSES
Chemistry and principles of different pretanning processes - Soaking, liming, deliming, bating, pickling, depickling and degreasing.

UNIT III   CLEANER PROCESSING IN BEAM HOUSE PRACTICES
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 IV   PRACTICE OF PRETANNING PROCESSES
Different methods of pretanning processes as applied to light, heavy and industrial leathers.

UNIT V   QUALITY CONTROL IN BEAM HOUSE PRACTICES
Quality control in pretanning operations. Identification of defects in hides and skins, assessment and grading of hides and skins in pretanning operations.

TOTAL: 45 PERIODS

TEXT BOOKS
UNIT I  GENERAL TANNING PRACTICES & SOLE LEATHERS 9

UNIT II  INDUSTRIAL LEATHERS 9
Belting leathers, honing leathers, picking band leathers, picker as Apron leathers. Hydraulic and pneumatic leathers such as hand pump leathers, deep bore well leathers.

UNIT III  SPORTS GOOD LEATHERS 9
Sports good leathers such as football, Rugby balls, Volley balls, hockey balls, Cricket balls, etc. Glove leathers for wicket keepers, belting boxing etc. Harness, Saddlery, Bridle leathers.

UNIT IV  LIGHT LEATHERS 9
Full chrome, retan, hunting suede, softy nappa and burnishable upper leathers from cattle hides. Printed and shrunken grain leathers. Dressing of E.I. kips into upper, lining, bags and for leathergoods, hides and their dressing into Kattai, Bunwar Upper and Case hides, Chrome tanned buffalo upper, upholstery and printed leathers.

UNIT V  METHOD OF FINISHING 9
Formulation and methods of application of different dye-stuffs, fatliquors, leather auxiliaries like casein and acrylic binders, pigments, wax emulsions, lacquers and lacquer emulsions, silicones and slip agents. Pretanning syntans, neutralising syntans etc. in the manufacture and finishing of the above leathers. Methods of drying of above leathers. Different types of finished leathers made from bag tanned leathers. Processing of splits for shoe suedes garments suede, grain finished leather and speciality finishes.

TOTAL: 45 PERIODS

REFERENCES
UNIT I  ANALYSIS OF VARIOUS LEATHER CHEMICALS AND AUXILIARIES / PROCESS LIQUORS 8
Salt, lime, sodium sulphide, ammonium salts, deliming acids, bates, Vegetable tanning materials and extracts, chrome extracts and liquors, zirconium and aluminium tanning agents, formaldehyde, neutralising agents, oils and fats, sulphated oils, soap, fatliquors and other auxiliaries like resin binders, wax emulsions, etc. Principles of analytical methods employed in analysis of water. Analysis of Soak liquor, lime liquor and Pickle liquor.

UNIT II  CHEMICAL ANALYSIS OF LEATHERS 6
Chemical analysis of pelts and leathers; Analysis of limed and pickled pelts and chemical testing of vegetable tanned/chrome tanned/aluminium tanned/zirconium tanned/formaldehyde tanned/combination tanned leathers.

UNIT III  INSTRUMENTAL METHODS OF ANALYSIS USED IN LEATHER CHEMISTRY 10
Potentiometry, non-aqueous titration, conductometry, chromatography, spectro-photometry and colorimetry, ion exchange resins, electrophoresis - principles and their application in analysis of leather and leather auxiliaries.

UNIT IV PHYSICAL TESTING OF LEATHERS: 9
Statistical testing - sampling position for physical testing of leathers. Different methods employed for physical testing of leathers - principles involved. Static and Dynamic methods, Non-destructive testing of leathers.

UNIT V STANDARDS AND QUALITY CONTROL 12
Quality control in leather processing, Rectification of defects in hides, skins and leathers, control of yield, colour and finish of leathers, etc. Physical and chemical characteristics (specifications) of various types of leathers.

TOTAL: 45 PERIODS

REFERENCES
UNIT I  INTRODUCTION TO COMPUTER HARDWARE  6
Evaluation of computers, Generation of computers, Basics of computer Architecture, Processor basics, Input/Output systems, RISC versus CISC.

UNIT II  OPERATING SYSTEMS  6
Overview of operating systems, operation system concepts, DOS, UNIX and Windows operating systems.

UNIT III  INFORMATION TECHNOLOGY AND SYSTEMS  7
Types of information systems, Computer Networks – LAN, WAN, MAN and topologies, Internet and Intranet, e-mail and e-commerce, Decision making and support systems, introduction to computer security

UNIT IV  PROGRAMMING LANGUAGES, DATABASE AND ITS APPLICATIONS  9
C++ programs using the following concepts:
Object oriented programming concepts, Constructor, Destructor, Friend function, operator overloading, Inheritance.

UNIT V  INTRODUCTION TO JAVA  10
Database And Its Applications
Introduction to Visual Basic, Creating, Saving and Running the Projects, Data types and control structures, Creating and using menus, Visual Basic Events.

CAD Systems For Leather & Leather Products  7
Pattern grading & cutting for Footwear and garments.
Design and Development of Leather products.
Computerised color matching systems – its principle and application.

TOTAL: 45 PERIODS

REFERENCES
3. Reference Manuals for CAD systems for Footwear and Garments
UNIT I
General principles and mechanism involved in various tanning 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
Basic design, material selection and construction of pits, drums and paddle.

UNIT III
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 IV
Salient features and purpose of the various machinery used in beam house, tanning and finishing yards, unhairing, fleshing, scudding, sammying, setting, shaving, staking, buffing, deducting, glazing, machines, finiflex, hydraulic press, curtain coating, roller coating, transfer coating and measuring machine etc.

UNIT V
Preventive maintenance and safety in the use of leather machinery

TOTAL: 45 PERIODS

REFERENCES

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

UNIT II
Tannins as well as non-tannins, polyphenolic constituents present in popular indigenous tanning materials like avaram, konnam, wattle, cutch, babul, myrobalan, etc and their Physico-chemical properties and effect on the physical properties of leathers.
UNIT III 8
Mechanism of reaction of vegetable tannins with collagen. Electrolytic equilibria, diffusion equilibria, fixation and absorption equilibria.

UNIT IV 7
Synthetic tannins - Classification - properties, uses in leather industry and their general methods preparation. Mechanism of reaction with collagen.

UNIT V 7
Formaldehyde, glutaraldehyde, oil, sulphonyl chloride and quinone tannages.

TOTAL: 45 PERIODS

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

PTLT9305 TECHNOLOGY OF LIGHT LEATHER PROCESSING L T P C 3 0 0 3

UNIT I 9
Finished Leathers and Composition of finishes Tanned leathers/semi finished leathers EI leathers - Wet blue - Wet white - properties of these leathers - short description of their manufacture. Function of different ingredients - Newer approaches in finishing. Problems encountered in finishing and their solutions.

UNIT II 9
Finished leathers from goat skins Glace kid - Resin uppers - Glazed uppers - lining leathers - shoe suedes - garment suedes - Details of processing techniques.

UNIT III 9
Finished leathers from hair sheep and wool sheep skin. EI and Wet blue leathers - various types of finished leathers from them - sheep nappa, suede garments, upper-lining, diaphragm leathers, glove leathers, Assortment of leathers.
UNIT IV
Upgradation of leathers & Special effects Retannages - Embossing - Special effects by screen and block printing - Roller coating and other modern equipments Tie and dye leathers; Burnishable leathers and oil pull up leathers.

UNIT V
Speciality leathers - exotic leathers and furs Morocco, pleated leathers, book binding and chamois leathers; reptiles: crocodiles, lizards, etc: Dressing of fur skins

REFERENCES
3. CLRI Process Bulletins.

PTLT9302 THEORY AND MECHANISM OF INORGANIC TANNAGES L T P C 3 0 0 3

UNIT I INTRODUCTION TO COORDINATION CHEMISTRY; METAL IONS IN TANNING
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
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, Mc Clandish precipitation point.

UNIT III FACTORS CONTROLLING CHROME TANNING
Single and double bath chrome tannages and their relative merits and demerits, preparation of Basic chromium sulphate 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
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, chromium induced structural changes in collagen.
UNIT V OTHER INORGANIC TANNAGES

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, mechanistic classification of inorganic tannages and their relevance to combination tanning.

TOTAL: 45 PERIODS

REFERENCES
UNIT V      FINISHING AUXILIARIES
The role of plasticizers, internal and external plasticizers. Principles of feel modification of polymer surfaces, types of feel modifiers, matting agents and waxes for different applications. Different types of oil pull ups, principles involved in burnish, brush off and other novel finishes for leather.

REFERENCES

TOTAL: 45 PERIODS

PTLT9378      DESIGN AND MANUFACTURE OF LEATHER GOODS AND GARMENT

AIM
To impart knowledge on making leather goods and garments

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

UNIT I      OVERVIEW
Classification of Leather Goods and Garments Selection of Materials, grading and assorting of leathers for leather goods & garments; Property requirements for leather and lining materials; Accessories for Leather goods & garments. Various types of fastners, fittings and other accessories. Alternative materials and their adaptability for goods and garments

UNIT II      PRODUCTION & PLANNING
Nomenclature used for component identification in Leather garments and various leather goods – Wallet, hand bags, Executive bags etc. operational sequences in Leather goods & garment production.

i) Cutting and clicking

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

iv) Process scheduling and line balancing
Quality control measures in leather products manufacture.
UNIT III  MACHINERY  
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  
Basic design development – measurement/ sizing for various types of leather goods & garments – pattern grading for leather garments. CAD applications for leather goods and garments design & production. Analysis of fashion and material trends.

UNIT V  ORGANISATION & MANAGEMENT  
Project Feasibility reports for leather plant lay out, costing and pricing for leather goods and garments. Analysis of International market trends for goods and garments – Eu, USA & other markets.

Social auditing of leather goods & garment units occupational Health & Safety, ISO 9000 & 14000.

REFERENCES  

TOTAL: 45 PERIODS

PTLT9326  ENTREPRENEURSHIP IN LEATHER SECTOR  
UNIT I  INDUSTRIAL ENTERPRISE  

UNIT II  VENTURE PLANNING AND DEVELOPMENT  
UNIT III   TECHNO - ECONOMIC FEASIBILITY REPORTS (TEFR)                         5
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                        10
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 MARKETS                                                     12
Market demand assessment techniques - Taxation and internal revenue issues - Market
forecasting tools and techniques - Brand building - Export - import guidelines and trade issues -
Market sensitivity analysis - Global trade in leather - inter-country comparison of strengths and
weaknesses at market place - WTO and related issues influencing leather - Eco-criteria and
its influence in leather market - Forecasting domestic market for leather products and market
driven planning of an enterprise in leather sector.

REFERENCES
1. Brandt, Steven C., The 10 Commandments for Building a Growth Company, Third
   (Latest edition).
   Holt, David H., Entrepreneurship: New Venture Creation, Prentice-Hall of India, New Delhi,
   latest Edition.
   (Latest Editions)
   1995.
7. SIDBI Report on Small Scale Industries Sector (Latest Editions)
8. Taneja, Satish and Gupta, S.L. Entrepreneurship Development-New Venture Creating,
11. Vesper, Karlsh, New Venture Strategies, (Revised Edition), New Jersey, Prentice- Hall,
    1990.
AIM: To impart knowledge on various environmental pollution aspects and issues.

OBJECTIVES:
- To create an awareness on the various environmental pollution aspects and issues. To give a comprehensive insight into natural resources, ecosystem and biodiversity. To educate the ways and means to protect the environment from various types of pollution. To impart some fundamental knowledge on human welfare measures.

UNIT I

UNIT II

UNIT III
Solid wastes- quantities and characterizations – industrial –hazardous waste- radio active waste- simple treatments and disposal techniques.

UNIT IV
Air pollution-types and sources of gaseous pollutants-particulate matter-hazardous air pollutants-global and atmospheric climatic change- acid rain. Industrial exhaust – characterization- various treatment techniques of industrial flue gas

UNIT V

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India,

PTLT 9261 TANNERY WASTE MANAGEMENT LTPC 3003

UNIT I PERSPECTIVES 9
Leather industries and environmental implications, Legislations on environmental protection, standards for discharge of liquid effluents, air emissions into environment.

UNIT II TANNERY EFFLUENTS 9
Sources of generation of liquid and solid wastes in tanneries. Characterisation of liquid wastes and assessment of critical parameters of pollution (solids, BOD, COD, nutrients, metals and phenolics).

UNIT III PRINCIPLES OF TREATMENT OF TANNERY WASTE-WATER AND DESIGN OF EFFLUENT TREATMENT PLANTS 9
Units of operation in controlling solids at primary stages of treatment, units of operation in controlling dissolved organics at secondary stages of treatment, units of operation in controlling pollutants at tertiary stage.

UNIT IV SOLID WASTE MANAGEMENT 9
Composition of solid wastes - physical, chemical and biological characteristics. Principles of treatment and disposal of solid wastes.

UNIT V IN-PLANT MANAGEMENT FOR REDUCTION OF POLLUTION 9
House-keeping, segregation of waste streams. Recovery and reuse of valuable waste materials found in liquid effluents including chromium, sulphides etc.

TOTAL: 45 PERIODS

REFERENCES:
1. Thomas, C. Thortensen, Fundamentals of Pollution Control for the leather industry.
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.

1. 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.

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

TOTAL: 45 PERIODS

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
UNIT I  ENGINEERING ETHICS  9
Senses of ‘Engineering Ethics’ – Variety of moral issues – Types of inquiry – Moral dilemmas –
Moral Autonomy – Kohlberg’s theory – Gilligan’s theory – Consensus and Controversy –
Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories

UNIT II  ENGINEERING AS SOCIAL EXPERIMENTATION  9
Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics -
Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

UNIT III  ENGINEER’S RESPONSIBILITY FOR SAFETY  9
The Government Regulator’s Approach to Risk - Chernobyl Case Studies and Bhopal

UNIT IV  RESPONSIBILITIES AND RIGHTS  9
Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality –
Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights –
Intellectual Property Rights (IPR) - Discrimination

UNIT V  GLOBAL ISSUES  9
Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in
Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership –
Sample Code of Conduct

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
AIM
To introduce process economics and industrial management principles to chemical engineers

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 PROCESS ENGINEERS - INTEREST, INVESTMENT COSTS AND COST ESTIMATION 10
Engineering economics for engineers, 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 AND QUALITY CONTROL 8
Essentials of economic balance – Economic balance approach, economic balance for insulation, evaporation, heat transfer.
Elements of quality control, role of control charts in production and quality control.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES

32
UNIT I UPPERS & LINING
i. Leathers : Different types of upper and lining leathers, manufacturing techniques, defects, grain characteristics, stretch direction, cuttability, area measurement, evaluation-strength, wear and comfort properties.

UNIT II SOLING MATERIALS
Different types of soling material - leather, rubber, PU, PVC, EVA, TPR, resin rubber, their method of manufacturing, assessment and application.

UNIT III ADHESIVES, INSOLES AND GRINDERIES
Different types of adhesives used in footwear industry - latex, polychloprene, polyurethane - single and double component, hot melt adhesives, method of manufacturing, evaluation techniques and applications.
Kind of insole boards, leathers, cellulose, synthetic fibre, non wovens, seat boards, manufacture, performance, evaluation.
Manufacture, performance and evaluation of toepuff, steel shanks, heels and tapes and bindings.

UNIT IV FASTENERS
Materials, Manufacture, use and properties of elastics, touch and close fasteners, slide fasteners, buckles and trims, and shoe laces.

UNIT V DRESSING MATERIALS
Shoe polishes, waxes, cream : Different types of dressing materials, crayons etc., formulation technique and application, evaluation.

TOTAL: 45 PERIODS

REFERENCES
6. Modern Shoemaking Series, SATRA, UK Publications
UNIT I INTRODUCTION 9
Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNIT II TQM PRINCIPLES 9

UNIT III STATISTICAL PROCESS CONTROL 9
The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

UNIT IV TQM TOOLS 9

UNIT V QUALITY SYSTEMS 9

TOTAL: 45 PERIODS

TEXT BOOK

REFERENCES
Each student is required to submit a Report on the project 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 object of the project is to make use 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.

UNIT I
Chemistry of the most common polymeric materials used in the leather industry as supplements.

UNIT II POLYMERISATION FUNDAMENTALS
Concept of a macromolecule, natural and synthetic polymer, modes of polymerisation, radical, condensation, stereo regular polymerisation, polymerisation kinetics, mechanism, anionic and cationic polymerisation.

UNIT III DIFFERENT TYPES OF POLYMERS
Polymers with linear, branched and cross-linked structures, thermoplastic and thermostat polymers, bulk, solution, suspension and emulsion polymerisation.

UNIT IV ANALYSIS AND TESTING OF POLYMERS
Molecular weight and distributions of polymers, different methods of molecular weight determinations, colligative properties, viscometry, light scattering techniques, thermal analysis of polymer, crystallinity and glass transitions and other mechanical properties, spectral analysis such as IR, UV, and NMR of polymers.

UNIT V POLYMERS FOR LEATHER APPLICATION
Polymers for leather processing, syntans, filling agents, base coats, top coats and adhesives.

TOTAL: 45 PERIODS

REFERENCES
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  
   a. Glue making from tannery wastes  
   b. Bone glue and deproteinisation of bone  
   c. Horn and hoof meal  
   d. Protein meals by different methods

REFERENCES  
UNIT I  CLEANER PRESERVATION TECHNOLOGIES  
Current level of pollution load in leather processing - Pollution control norms for various parameters - Eco-labelling concepts in leather sector. Less salt and salt-less curing techniques - controlled drying techniques - cooling and freezing - chemical alternatives of curing - use of biocides.

UNIT II  CLEANER PRETANNING TECHNOLOGIES  

UNIT III  CLEANER TANNING TECHNOLOGIES  
High exhaustion chrome tanning - Recycle and reuse methods - chrome recovery and reuse - closed pickle - tan recycling procedures. Less - chrome and chrome-free tanning - organic tannages - full vegetable tanning processes - alternative mineral tanning systems.

UNIT IV  CLEANER POST TANNING TECHNOLOGIES  
Cleaner wet finishing technologies - use of high performance auxiliaries - Screening of chemicals/auxiliaries based on biotreatability and exhaustion characteristics - process control for optimisation of use of chemicals/auxiliaries for pollution reduction - Formaldehyde - free retanning and AOX-free fatliquoring - Natural dyes Dyeing with Objectionable - arylamine - free dyes.

UNIT V  CLEANER FINISHING TECHNOLOGIES  
Water based Finishing technologies - Reduction of VOC - formaldehyde - free protein finishes - Safer pigments free from TOXIC metal ions. Newer finish applications for pollution reduction.

TOTAL : 45 PERIODS

REFERENCES
1. Leather Journals from 1990 onwards
2. Proceedings of the Workshop on "Cleaner Production Technology" conducted by UNIDO held in Chennai 1998
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, polyesters, 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

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

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, Napthols, 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, sulphaomidation, transesterification, phosphorylation reactions for fatliquor 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.

TOTAL : 45 PERIODS

TEXT BOOKS AND REFERENCES
UNIT I. INTRODUCTION TO VALUE ENGINEERING 9
   a. Value and value analysis
   b. Identification of its function/end use

UNIT II OBJECTIVES OF VALUE ANALYSIS 9
   a. Importance in import substitution

UNIT III VALUE ANALYSIS AT DIFFERENT STAGES 9
   a. Techniques of value analysis

UNIT IV VALUE ANALYSIS PROCEDURE 9
   a. the information phase
   b. The analytical phase
   c. Recommendation
   d. Implementation

UNIT V ORGANISATION FOR VALUE ANALYSIS 9
   a. Organisation structure
   b. Responsibilities of individual departments

PROJECT WORK
   Application of value analysis - A case study

TOTAL: 45 PERIODS

TEXT BOOK

REFERENCES
UNIT I  INTRODUCTION: HISTORY AND DEVELOPMENT OF WORK STUDY  10
- Nature and Scope of Work Study
- Productivity and workstudy
Method study : Process, Operation, activity, motion selection of jobs, Application of various tools and techniques - Development of improved methods Motion and micro-motion analysis.
Work measurement : Objectives, different methods, Stop-watch Time study technique, Performance - rating, allowance, work sampling.

UNIT II  INTRODUCTION OF TECHNOLOGY MANAGEMENT  12
Productivity Management - Japanese management practices - Meaning and functions of personnel management.

UNIT III  FACTORS INFLUENCING PLANT LOCATION - LOCATION  8
Analysis - Location decisions - Single facility and Multi - facility need for layout study - classification of lay-out.

UNIT IV  MATERIAL HANDLING IN TANNERIES  8
Objectives and benefits of better handling - relationship between layout and materials - principles of material handling - Basic handling equipment types, handling system design - equipment selection - packaging - storage systems

UNIT V  SERVICES AND ENVIRONMENT  7
Illumination, Noise Technology, Ventilation & climate, waste management.Methods and equipments for tannery waste treatment - water pollution from tanneries.

TOTAL: 45 PERIODS

REFERENCES
8. James Apple Material handling system design Ronald Press.
UNIT I  PROTEINS AND NUCLEIC ACID & ENZYMOLGY

UNIT II  GENETIC ENGINEERING (RECOMBINANT DNA TECHNOLOGY)

UNIT III  BIOTECHNOLOGY FOR HIDES/SKINS IMPROVEMENT

UNIT IV  WASTE MANAGEMENT

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

TOTAL : 45 PERIODS

REFERENCES
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

REFERENCES
1. Jeannie Mager Stellmann, Encyclopaedia of Occupational Safety & Health, 4th edition,
2. J. Buljan, A Sahasranaman, J Hannak, Occupational Safety and Health Aspects of
Leather Manufacture, 1st edition, United Nations Industrial Development Organization,
3. CLRI, Safety Manual on Leather Processing, 1st edition, Central Leather Research Institute,
UNIT I  INTRODUCTION
Brief description of tannery operations where measurement and control is needed. Discussion of parameters to be measured and controlled, viz. flow, temperature, pressure, pH. Discussion on necessity for controls. Advantages and disadvantages of process control, application in tannery.

UNIT II  PRINCIPLES, ILLUSTRATIONS AND METHODOLOGY OF THE FOLLOWING WITH REFERENCE TO THEIR APPLICATION IN THE LEATHER PROCESSING
Process Design
Process flowsheeting
Material and energy flows and networks
Process engineering flow schemes
Codes, Standards and Fabrication processes
Utilities/Offsite facilities
Inplant safety
Selection of Materials of construction

UNIT III  BASIC DESIGN OF PROCESS EQUIPMENTS & LAYOUT PRINCIPLES
Basic Design of process Equipments:
Stirred reactors (gas liquid and liquid - solid systems)
Tanning drums and supporting units
Forced circulation leather dryer
Distillation units
Principles of layout for Tanneries and Chemical Process Units
Factors to be considered for layout selection
Types of layouts and their design basis

UNIT IV  INDUSTRIAL INSTRUMENTATION

UNIT V  PROCESS CONTROL
Case studies in wet operation, Utility - Requirements

TOTAL: 45 PERIODS

REFERENCES
1. Eckman, D.P. Industrial Instrumentation.
2. Millard H. Lajoy, Industrial Automatic Control
8. 'Tannery design' - CLRI Publication.

PTLT9029 LEATHER AND PRODUCT MERCHANDISING L T P C
3 0 0 3

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

TOTAL: 45 PERIODS

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

PTLT9047   HUMAN RESOURCES MANAGEMENT

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, with particular emphasis in human resource planning and strategy, personnel selection, equal employment opportunity, training, performance appraisal, compensation, and contemporary issues.

UNIT I   MANAGEMENT AND GENERAL EMPLOYMENT PRACTICES
Human resource planning, organizational design, budgeting, motivation, leadership, quality, research, employee involvement, ethics, international issues Laws, job analysis, job description, performance appraisals, workplace behaviour problems

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

UNIT III   HUMAN RESOURCE DEVELOPMENT
Needs analysis, training programs, evaluation
UNIT IV  COMPENSATION AND BENEFITS              5
Philosophy, job evaluation, pay structures, benefit programs, strategy

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

TEXT BOOKS AND REFERENCES

PTLT9049            INTERNATIONAL MARKETING AND FOREIGN TRADE                   L T P C
3 0 0 3

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 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- Marketing
Management- 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 - Retail Management -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

TOTAL: 45 PERIODS

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

PTLT 9050 ENTERPRISE PLANNING FOR LEATHER SECTOR L T P C

UNIT I INTRODUCTION 6
What is ERP?
Need of ERP
Advantages of ERP
Growth of ERP

UNIT II ERP AND RELATED TECHNOLOGIES 13
Business process Reengineering (BPR)
Management Information System (MIS)
Decision Support Systems (DSS)
Executive Support Systems (ESS)
Data Warehousing, Data Mining
Online Analytical Processing (OLTP)
Supply Chain Management (SCM)
Customer Relationship Management (CRM)

UNIT III ERP MODULES & VENDORS 10
Finance
Production planning, control & maintenance
Sales & Distribution
Human Resource Management (HRM)
Inventory Control System
Quality Management
ERP Market

UNIT IV ERP IMPLEMENTATION LIFE CYCLES 10
Evaluation and selection of ERP package
Project planning
Implementation team training & testing
End user training & Going Live
Post Evaluation & Maintenance
UNIT V  ERP CASE STUDIES  
Post implementation review of ERP Packages in Manufacturing, Services, and other Organizations  

REFERENCES  

TOTAL: 45 PERIODS  

UNIT I  INTRODUCTION  

UNIT II  HARDWARE SOFTWARE AND COMMUNICATION  

UNIT III  COMMUNICATION TECHNOLOGY  

UNIT IV  IT APPLICATIONS  

UNIT V  IT MANAGEMENT  
BUSINESS APPLICATIONS IN E-COMMERCE  

TOTAL: 45 PERIODS
REFERENCES