

ANNA UNIVERSITY CHENNAI :: CHENNAI 600 025

UNIVERSITY DEPARTMENTS

CURRICULUM – R 2009

B.TECH. (PART TIME) LEATHER TECHNOLOGY

SEMESTER I

CODE NO.	COURSE TITLE	L	T	P	C
PTMA9111	Applied Mathematics	3	0	0	3
PTPH 9111	Applied Physics	3	0	0	3
PTCY 9111	Applied Chemistry	3	0	0	3
PTGE 9111	Engineering Graphics	3	1	0	4
PTGE 9112	Fundamentals of Computing	3	0	0	3
TOTAL		15	1	0	16

SEMESTER II

CODE NO.	COURSE TITLE	L	T	P	C
PTLT9152	Skin Biology	3	0	0	3
PTLT9301	Principles of Unit Operations and Processes in Leather Manufacture	3	0	0	3
PTEE9161	Basic Electrical & Electronics Engineering	3	0	0	3
PTCH 9204	Mechanical Engineering	3	0	0	3
PTCY9211	Organic Chemistry	3	0	0	3
TOTAL		15	0	0	15

SEMESTER III

CODE NO.	COURSE TITLE	L	T	P	C
PTLT9252	<u>Inorganic and Physical Chemistry</u>	3	0	0	3
PTLT9253	<u>Theory and Practice of Preservation and Pre-tanning Processes</u>	3	0	0	3
PTLT9304	<u>Principles of Material Testing</u>	3	0	0	3
PTLT9255	<u>Technology of Heavy Leather Processing</u>	3	0	0	3
PTLT9403	<u>Computer Applications for Leather Technology</u>	2	0	1	3
TOTAL		14	0	1	15

SEMESTER IV

CODE NO	COURSE	L	T	P	C
PTLT 9353	<u>Theory and Mechanism of Leather Machinery</u>	3	0	0	3
PTLT 9254	<u>Theory and Mechanism of Organic Tannages</u>	3	0	0	3
PTLT 9305	<u>Technology of Light Leather Processing</u>	3	0	0	3
PTLT 9302	<u>Theory and Mechanism of Inorganic Tannages</u>	3	0	0	3
	Elective – I	3	0	0	3
TOTAL		15	0	0	15

SEMESTER V

CODE NO	COURSE	L	T	P	C
PTLT 9352	<u>Theory and Mechanism of Post Tanning and Finishing</u>	3	0	0	3
PTLT 9378	<u>Design and Manufacture of Leather Goods and Garments</u>	3	0	0	3
PTLT9326	<u>Entrepreneurship for Leather Sector</u>	3	0	0	3
	Elective II	3	0	0	3
PT LT 9306	<u>Environmental Science and Engineering</u>	3	0	0	3
TOTAL		15	0	0	15

SEMESTER VI

CODE NO	COURSE	L	T	P	C
PTLT 9261	<u>Tannery Waste Management</u>	3	0	0	3
PTLT 9465	<u>Organisation and Management of Leather Manufacture</u>	3	0	0	3
PTGE 9021	<u>Professional Ethics and Engineering</u>	3	0	0	3
	Elective – III	3	0	0	3
	Elective – IV	3	0	0	3
TOTAL		15	0	0	15

SEMESTER VII

CODE NO	COURSE	L	T	P	C
PTLT9401	<u>Process Economics and Industrial Management</u>	3	0	0	3
PTLT 9438	<u>Design and Manufacture of Leather Footwear</u>	3	0	0	3
PTGE9022	<u>Total Quality Management</u>	3	0	0	3
	Elective – V	3	0	0	3
PTLT9451	<u>Project Work</u>	0	0	12	6
TOTAL		12	0	12	18

TOTAL CREDITS = 109

ELECTIVE LIST

Code No.	Course	L	T	P	C
PTLT9022	<u>Science of Leather Supplements and Synthetics</u>	3	0	0	3
PTLT9031	<u>Animal By products Utilisation</u>	3	0	0	3
PTLT9032	<u>Cleaner Production in Tanneries</u>	3	0	0	3
PTLT9024	<u>Technology of Leather Supplements and synthetics</u>	3	0	0	3
PTLT9025	<u>Chemistry and Technology of Leather Auxillaries</u>	3	0	0	3
PTLT9023	<u>Costing and Value Engineering in Leather</u>	3	0	0	3
PTLT9027	<u>Industrial Engineering in Leather Sector</u>	3	0	0	3
PTLT9251	<u>Leather Biotechnology</u>	3	0	0	3
PTLT9021	<u>Safety in Leather Industries</u>	3	0	0	3
PTLT9028	<u>Principles of Plant Design for Leather and process control systems</u>	3	0	0	3
PTLT9029	<u>Leather and Product Merchandising</u>	3	0	0	3
PTLT9047	<u>Human Resources Management</u>	3	0	0	3
PTLT9049	<u>International Marketing and Foreign Trade</u>	3	0	0	3
PTLT9050	<u>Enterprise Planning for Leather Sector</u>	3	0	0	3
PTLT9051	<u>E- Business Strategies</u>	3	0	0	3

UNIT I MATRICES**9**

Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Cayley – Hamilton Theorem – Diagonalization of matrices - Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms .

UNIT II FUNCTIONS OF SEVERAL VARIABLES**9**

Partial derivatives – Homogeneous functions and Euler’s theorem – Total derivative – Differentiation of implicit functions – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor’s series for functions of two variables - Maxima and minima of functions of two variables.

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**

Existence conditions – Transforms of elementary functions – Basic properties – Transforms of derivatives and integrals – Initial and Final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

TOTAL: 45 PERIODS**TEXT BOOKS**

1. Grewal B.S., Higher Engineering Mathematics (40th Edition), Khanna Publishers, Delhi (2007).
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill Co. Ltd., New Delhi (2007).

REFERENCES

1. Glyn James, Advanced Modern Engineering Mathematics, Pearson Education (2007).
2. Veerarajan, T., Engineering Mathematics (For First Year), Tata McGraw-Hill Pub. Pvt Ltd., New Delhi (2006).

UNIT I ULTRASONICS 9

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 9

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 9

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 9

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 9

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**

1. Palanisamy, P.K., 'Engineering Physics' Scitech publications, Chennai, (2008).
2. Arumugam M. 'Engineering Physics', Anuradha Publications, Kumbakonam, (2007).
3. Sankar B.N and Pillai S.O. 'A text book of Engineering Physics', New Age International Publishers, New Delhi, (2007).

REFERENCES

1. R. K. Gaur and S.C. Gupta, 'Engineering Physics' Dhanpat Rai Publications, New Delhi (2003)
2. M.N. Avadhanulu and PG Kshirsagar, 'A Text book of Engineering Physics', S.Chand and company, Ltd., New Delhi, (2005).
3. Serway and Jewett, 'Physics for Scientists and Engineers with Modern Physics', 6th Edition, Thomson Brooks/Cole, Indian reprint (2007)

PTCY 9111

APPLIED CHEMISTRY
(Common to all branches of B.E / B.Tech (PT) Programmes)

L T P C
3 0 0 3

UNIT I WATER TREATMENT AND POLLUTION CONTROL

9

Treatment of water – impurities and disadvantages of hard water- Domestic and Industrial treatment - zeolite and ion exchange processes- Potable water- Boiler feed water – conditioning of boiler feed water. Scale and sludge formation – prevention – caustic embrittlement- boiler corrosion– priming and foaming Sewage treatment– Primary, secondary and tertiary treatment– significance of DO, BOD and COD- desalination – reverse osmosis. Control of water, air and land pollution.

UNIT II FUELS

9

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-fractions-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

9

Second law of thermodynamics-entropy and its significance- criteria for spontaneity- free energy-Gibbs, Helmholtz and Gibbs-Helmholtz equation-applications and problems – Adsorption –types of adsorption- adsorption of gases on solids- adsorption isotherm-Freundlich and Langmuir isotherms-adsorption of solutes from solutions- applications

UNIT IV CORROSION AND CATALYSIS

9

Reversible and irreversible cells-electrode potentials-types of electrodes-cell reactions-Nernst equations- electrochemical and galvanic series-fuel cells and solar cells-corrosion-chemical and electrochemical-factors affecting corrosion-sacrificial anode-impressed current cathodic protection-surface treatment and protective coating- Catalysis –classification-characteristics of catalysis – auto catalysis- enzyme catalysis

UNIT V POLYMERS-COMPOSITES AND NANOCHEMISTRY

9

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, neoprene 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

1. Dhara S S A text book of Engineering Chemistry, S.Chand & Co Ltd, New Delhi,2002
2. Jain. P.C and Monica Jain, Engineering Chemistry,Dhanpet Rai & Sons, New Delhi 2001

REFERENCES

1. Puri B R.,Sharma L R and Madhan S. Pathania, Principles of Physical Chemistry, Shoban Lal Nagin Chand & Co. Jalandar-2000.
2. G.B. Sergeev, Nanochemistry.Elsevier Science, New York,2006
3. V.R.Gowarikar, N.V.Viswanathan and Jayadev Sreedhar, Polymer Science, Wiley Eastern Limited, Madras (2006).

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**9**

Computer systems – Exploring computers – Inside the system – Processing data – CPUs – Types of storage devices - Operating systems basics – Networking basics.

UNIT II**9**

The internet and the WWW – Internet services – connecting to the internet - Working with applications software – productivity software – graphics and multimedia – Data base Management systems – Creating computer program.

UNIT III**9**

C programming fundamentals – compilation process – variables – Data types – Expressions – looping – decisions.

UNIT IV**9**

Arrays - Working with functions – structures – character strings – pre-processor.

UNIT V**9**

Pointers – Dynamic memory allocation – linked list - Applications

TOTAL: 45 PERIODS**TEXT BOOKS**

1. Peter Norton, "Introduction to Computers", Sixth Edition, Tata McGraw Hill, 2007.
2. Stephen G. Kochan, "Programming in C", Third Edition, Pearson Education, 2007.

REFERENCES

1. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006.
2. Ashok N. Kamthane, "Computer programming", Pearson Education, 2007.
3. Kenneth A. Reek, "Pointers on C", Pearson Education, 2007.
4. Dromey, R.G, "How to solve it by Computer", Pearson Education, 2007.

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

2

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 - drawing 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)

3

Introduction to computer aided drafting software packages and demonstration of their use.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 PERIODS

TEXT BOOKS

1. Bhatt,N.D, "Engineering Drawing", Charotar Publishing House, 46th Edition-2003
2. Natarajan,K.V, " A Textbook of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2006 .

REFERENCES

1. Shah,M.B and Rana,B.C., "Engineering Drawing", Pearson Education,2005,
2. Gopalakrishnan.K.R., "Engineering Drawing I & II", Subhas Publications 1998.
3. Dhananjay,A.J., "Engineering Drawing with Introduction to AutoCAD",Tata McGraw-Hill Publishing Company Ltd., 2008.
4. Venugopal,K. and Prabhu Raja, V., "Engineering Graphics", New Age International(P) Ltd.,2008.

CODES FROM BUREAU OF INDIAN STANDARDS

1. IS 10711-2001: Technical Products Documentation – Size and Layout of Drawing Sheets
2. IS 9609 (Parts 0 & 1)-2001: Technical Products Documentation – Lettering
3. IS 10714(Part 20)-2001 & SP 46 -2003: Lines for Technical Drawings
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 CONCEPTS & METERING OF FLUIDS 4

Concepts of Unit operations and Processes, Fundamentals: Unit and Dimensions, Material and Energy Balances. Fluid statics and dynamics, Compressible and incompressible fluids, Newtonian and Non-Newtonian fluids, Measurement of pressure drop and fluid velocity. Pumps, Compressor, Blowers.

UNIT II HEAT TRANSFER AND MASS TRANSFER 16

Fundamentals of Heat Transfer, Heat transfer equipment, Heat exchangers, Evaporators and Condensers and Simple Design Calculations.

- 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 3

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 17

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.

TOTAL: 45 PERIODS

REFERENCES

1. McCabe .W.L and Smith, J.C., Unit Operations in Chemical Engineering, McGraw Hill, Fourth Ed., 1993.
2. Treybal, R.E., Mass Transfer Operations, McGraw Hill Book Company, Third Ed. 1981.
3. Coulson, J.M., and Richardson, J.F., Chemical Engineering, Vol.I and II Third Ed. Pergamon press, 1978.
4. Welty, J.R., Wilson, R.E., and Wicks, C.E. Fundamentals of momentum, Heat and Mass Transfer, Third Ed., John Wiley, 1984.
5. Perry, J.H., Chemical Engineers Handbook, McGraw Hill, New York, Sixth Ed., 1984.

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

UNIT I ELECTRICAL CIRCUITS 9

Basic Principles involved in Power generation, transmission and use – Ohms Law – Kirchoffs Laws – steady state solution of D C circuits – Introduction to AC circuits – Waveforms and RMS value – power and power factor, single phase and 3 phase balanced circuits. House wiring, industrial wiring materials of wiring.

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

Introduction to transducers, Temperature measurement using thermistors. Piezo electric pressure sensors. Principles of AM, FM and PM modulation. Block diagram of AM, FM receivers. AM, FM and PM Demodulators. Gunn Diode and Microwave oscillators.

TOTAL: 45 PERIODS

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

1. Nag, P.K., " Engineering Thermodynamics ", II Edition, Tata McGraw Hill Publishing Co., Ltd., 1995.
2. Rajput, R .K, "Thermal Engineering", Laxmi publications (P) Ltd, 2001.

REFERENCES

1. Smith, "Chemical Thermodynamics ", Reinhold Publishing Co., 1977.
2. Bhaskaran, K.A.,and Venkatesh, A., "Engineering Thermodynamics ",Tata McGraw Hill, 1973.
3. Khurmi R.S., and Gupta J.K, "Theory of Machines", Eurasia Publishing House (P) Ltd., 2004.
4. Pandya A. and Shah, " Theory of Machines ", Charatakar Publishers, 1975.
5. Khurmi R.S., and Gupta J.K, "Thermal Engineering", S.Chand & Company (P) Ltd.,2001.
6. Kothandaraman and Dhomkundwar,": A course in Thermal Engineering (SI Units)", Dhanpat Rai and Sons, Delhi (2001).

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

Nature of bonding (covalent, hydrogen) – atomic orbitals – hybridization – electronegativity – conjugation – mesomerism and resonance – hyper-conjugation – inductive effect.

UNIT II REACTION AND THEIR MECHANISM 10

Homolytic bond fission – free radicals – heterolytic bond fission – electrophiles, carbonium ion, nucleophiles – acids and bases – Bronsted - Lowry concept, Lewis concept, strength of acids and bases. Substitution reactions – S_N1 , S_N2 , S_{Ni} , Addition reactions – carbon – carbon (double

bond), Addition of dienes – carbon – oxygen (double bond), carbon – carbon (triple bond) – poly addition reactions, Elimination reactions – E1, E2, Condensation –simple and polycondensation , Redox reactions.

UNIT III ISOMERISM 6

Structural isomerism – stereoisomerism – optical isomerism – racemic mixture – resolution, racemisation – asymmetric synthesis, Walden Inversion.

Geometrical isomerism – cis, trans isomerism, syn, anti isomerism – determination of configuration of geometrical isomers – tautomerism.

UNIT IV HYDROCARBONS AND THEIR CLASSIFICATION 10

Alkanes – alkenes – alkynes – alicyclic compounds – Bayers-strain theory - Hydrocarbons related to petrol, diesel, kerosene, lube oil and waxes. Benzene and its homologues – aromatic substitution, Friedel - Crafts reactions, Kolbe's synthesis – Riemer – Tiemann reaction, Benzoin condensation, Perkin reaction, Beckmann rearrangement, Claisen condensation, Hoffmann rearrangements.

UNIT V SYNTHETIC ORGANIC CHEMISTRY 7

Synthesis of different types of compounds – alcohol – aldehyde – carboxylic acid – ester – ether – nitrocompounds – amines – amides (industrial methods only). Synthetic reagents – acetoacetic ester – malonic ester and Grignard reagent.

APPLIED ORGANIC CHEMISTRY: 7

Polysaccharides – starch and cellulose – Proteins – amino acids and peptides – Dyes and dyeing – colour and constitution – classification of dyes based on chemical constitution and applications.

TOTAL: 45 PERIODS

TEXT BOOKS

1. B.S. Bahl and Arun Bahl, "Essentials of Organic Chemistry", S.Chand and Company, New Delhi (2005).
2. K.S. Tiwari, N.K. Vishnoi and S.N. Malhotra "A Text Book of Organic Chemistry", Third Edition, Vikas Publishing House Pvt. Ltd., New Delhi (2006).

REFERENCES

1. R.T. Morrison and R.N. Boyd "Organic Chemistry" VI Edition, Prentice Hall of India Pvt. Ltd., New Delhi (2000).
2. I L Finar "Organic Chemistry", Volume – I, IX Edition, Pearson Education \ (Singapore) Pte. Ltd., New Delhi (2004).
3. I L Finar "Organic Chemistry", Volume – II, VII Edition, Pearson Education (Singapore) Pvt. Ltd., New Delhi (2004).

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 9

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 9

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 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 IV IONIC EQUILIBRIA 9

Acids and bases- Arrhenius concept-Lewis concept- Dissociation of weak acid, weak base- Ionic product of water-Buffer solutions –calculation of pH-Henderson's equation-Hydrolysis of salts-Degree of hydrolysis-Determination –acid-base indicators-their applications-solubility product principle-Ionic equilibria involving complex ions

UNIT V COLLOIDS 9

Introduction to colloids – properties of colloids – coagulation of solutions –Origin of charge on colloidal particles –Determination of size of colloidal particles- Donnan Membrane equilibrium – Emulsions – Gels – Applications of colloids

TOTAL: 45 PERIODS

- UNIT I GENERAL TANNING PRACTICES & SOLE LEATHERS 9**
General practices in vegetable tanning. Manufacture of E.I. skins and kips - Pit tanning and drum tanning - Modern practices in E.I. tanning. General practices in chrome tanning. Manufacture of wet blue hides and skins. Vegetable tanned and Chrome tanned sole leathers ; Water proofing of sole leathers ; Bag tanning of cattle and buffalo hides.
- 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

1. Choichi Ogiwara, 'A practical guide to heavy leather processing', Fuel and Leather Research Centre, Karachi, 1980.
2. Tuck, D.H. 'The manufacture of upper leathers', Tropical Products Institute, London, 1981.
3. Jyotimay Dey, 'Practical aspects of the manufacture of upper Leather, Indian Leather Technologists Association, Calcutta, 1989.

**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/comboination 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**

1. Sarkar, P.K., 'Analytical Chemistry of Leather Manufacture', Indian Leather Technologists Association, Calcutta, 1982.
2. 'Official methods of Analysis', Society of Leather Technologists and Chemists, U.K., 1981.
3. 'Methods of Chemical testing of leathers', IS: 582 - 1970, Bureau of Indian Standards, New Delhi, 1977.
4. 'Methods of Physical testing of leathers, IS: 5914-1970, Bureau of Indian Standards, New Delhi, 1971

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

Database And Its Applications 10

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

1. Jerry, O., Parker, Gary, L., Breneman "Spreadsheet Chemistry" Prentice Hall, Englewood Cliffs, New Jersey-1991.
2. TAXALI, R.K., "dBase IV made simple" Tata McGraw Hill, NewDelhi 1991.
3. Reference Manuals for CAD systems for Footwear and Garments

PTLT 9353 THEORY AND MECHANISM OF LEATHER MACHINERY**L T P C
3 0 0 3****UNIT I****9**

General principles and mechanism involved in various tanning machined. 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**9**

Basic design, material selection and construction of pits, drums and paddle.

UNIT III**9**

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**9**

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**9**

Preventive maintenance and safety in the use of leather machinery

TOTAL: 45 PERIODS**REFERENCES**

1. Walter landman," The machines in the Tannery", World Leather Publication, 2003.
2. Sharpouse, J.H.," Leather Technicians Handbook", Leather Producers Association, Northampton NN3 1JD, Reprinted 1995.

PTLT9254 THEORY AND MECHANISM OF ORGANIC TANNAGES**L T P C
3 0 0 3****UNIT I****14**

Vegetable tannins - definition and classification, Occurrence, Biosynthesis

Chemistry of hydrolysable tannins - gallotann

ins, 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**9**

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

1. Howes, F.N. "Vegetable tanning materials", Butterworth. London, 1953.
2. Rodd, "Chemistry of carbon compounds", Vol. III-D, Chapter on "Hydrolysable tannins".
3. Haslam, E. "The biochemistry of Plants", Vol.7. Academic Press, 1981, Chapter 18, "Vegetable tannins".
4. "A survey of modern vegetable tannages". Tanning extracts Producers Federation, Switzerland, 1975.
5. Humphreys, G.H.W. and Jones, C.R. "The manufacture of sole and other heavy leathers". Pergamon Press, 1966. Chapter 5, "Vegetable tannin materials and syntans".
6. O'Flaherty and Roddy, T.W., Lollar, R.M. "The Chemistry and Technology of Leather", Vol. II. Krieger Publishing Corp., New York, 1977.
7. Gustavson, K.H. "Chemistry of Tanning Processes" Academic Press, New York, 1950.
8. Vegetable and Synthetic Tanning agents, Sundara Rao, V.S., et al – The Leather Industry, (ed. Bu Sadulla, S) Kothari Desk book series, H.C. Kothari Group (Publications Division), Madras, p.71, 1995.

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 **9**
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 **9**
Speciality leathers - exotic leathers and furs Morocco, pleated leathers, book binding and chamois leathers; reptiles: crocodiles, lizards, etc: Dressing of fur skins

TOTAL: 45 PERIODS

REFERENCES

1. Briggs, P.S. 'Gloving, clothing and special leathers', Tropical Products Institute, London, 1981.
2. Kartheiz, Fuchs, H.P. 'The Chemistry and technology of Novelty Leathers' FAO, United Nations, Rome.
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 **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, Mc Clandish 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 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, chromium induced structural changes in collagen.

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

TOTAL: 45 PERIODS

REFERENCES

1. Fred O Flaherty, Roddy, T.W. and Lollar, R.M. 'The Chemistry and Technology of Leather', Vol.II, Type of tannages, Rober E.Krieger Publishing Co.,New York, 1977.
2. Gustavson, K.H. 'Chemistry of Tanning Processes' Academic Press, New York, 1956.
3. Bienkiewicz 'Physical Chemistry of Leather Manufacture' Krieger, Florida 1982.

**PTLT9352 THEORY AND MECHANISM OF POST TANNING AND FINISHING L T P C
3 0 0 3**

UNIT I DYES AND DYEING OF LEATHER 12

Classification of dyes based on their chemical nature and also according to their application, their 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, wetting agents, dispersing agents and dye fixatives. Theory of colours, chromphoric groups and their optical absorption, structural features of dyes, factors affecting hue and colour, intensity; acid, basic and reactive dye classification, Introduction to the chemistry and technology of dye manufacture .

UNIT II FATLIQUORS AND FATLIQUORING 11

Theory of leather lubrication, 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 funclisation of oils, sulphochlorination, sulphoamidation, transesterification, maleinisation, phosphorylation reactions for fatliquor preparation. Stability of emulsions, grain and particle sizes of emulsions, factors controlling grain sizes of emulsions. Introduction to fatliquor manufacturing technology.

UNIT III RETANNING AGENTS 10

Chemical classification of syntans, sulphonation of naphthalene phenols, Naphthols, Phenol-formaldehyde condensation reactions and Navalac, characterisation and photo oxidation mechanisms of phenolic terms, chemistry of light fast syntans, chemistry of amino resins and PU, Unit operations in syntan manufacture.

UNIT IV PIGMENTS, BINDERS, TOP COATING AGENTS 8

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. Different types of top coat formulations, choice of polymers for surface protection.

UNIT V FINISHING AUXILIARIES**4**

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.

TOTAL: 45 PERIODS**REFERENCES**

1. Fred O Flaherty, Roddy, T.W. and Lollar, R.M. 'The Chemistry and Technology of Leather', Vol.III, Rober E. Krieger Publishing Co., New York, 1977.
2. Venkataraman , K. 'Chemistry of Synthetic Dyes', Academic Press, New York and Lond, 1971.
3. Myers, R.R., and Lond, J.S. 'Treatise on Coatings', Marcel Dekker, New York, 1975.

PTLT9378**DESIGN AND MANUFACTURE OF LEATHER GOODS AND GARMENT****LT P C
3 0 0 3****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
- oraganisation and management of a leather goods and garments manufacturing unit

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 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**12**

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

Hand & machine cutting, Knives & tools – Preparation and handling. Pattern interlocking/nesting for material optimization. Factors influencing cutting value.

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 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 9

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 7

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.

TOTAL: 45 PERIODS

RERERENCES

1. Pattern Making Manual - Womens Garments, ESMOD, Paris, 1991.
2. Fashion Drawing Method, ESMOD, Paris, 1992.
3. Metric Pattern cutting for Menswear, Winifred Aldrich, BSP Professional Books, London, 1990.
4. Grading Manual, ESMOD, Paris, 1994.
5. Training in Tanning Techniques and Leather Goods Manufacture - Course material,
6. CLRI, Madras, 1990.
7. Skiving Manual, First Edition, 1994 CLRI, Madras.

**PTLT9326 ENTREPRENEURSHIP IN LEATHER SECTOR L T P C
3 0 0 3**

UNIT I INDUSTRIAL ENTERPRISE 6

Concepts and Fundamental Principles - Factors influencing business environment, Opportunity assessment, Business forecasting and prospectives - Leather as an economic and export opportunity sector - Influence of socio-economic environment on the sustainability of the leather sector.

UNIT II VENTURE PLANNING AND DEVELOPMENT 12

Resource planning, Product and process selection criteria - Market segmentation and selection - Investment strategies, Business financing systems, Financial analysis for investment decision - Policy issues and legal clearances - Venture planning in tanneries, shoe units, chemical units and leather garments and goods units - Return on investments in leather sector - Financial sensitivity analysis for investments in the leather sector.

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**9**

Man and environment, types of pollution, industrial pollution, pollution monitoring, analysis of pollutants, hazardous due to pollutants on the eco-system, public awareness, need of environmental Engineering— pollution controls aspects, Indian pollution regulations. Environmental legislation. Pollution control boards- central –state board- Bureau of Indian standard, tolerance limits and specifications.

UNIT II**9**

Water pollution- source of water pollution- characterization of industrial wastewater, sampling techniques, preservation of effluent, treatment techniques for industrial effluent. Physical, chemical, Physiochemical method of effluent treatment, primary-secondary-tertiary treatment methods.

UNIT III**9**

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

UNIT IV**9**

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**9**

Waste minimization, Mass exchanger networks-introduction, Health hazard, Environmental awareness, Environmental impact assessment, and methodology of Impact Assessment, Safety and Risk analysis.

TOTAL: 45 PERIODS**TEXT BOOKS:**

1. Gilbert M.Masters, Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., Second edition, ISBN 81-297-0277-0, 2004.
2. J.Jeffrey Peirce etl,'Environmental pollution and control' Butterworth-Heinemann; 4th edition, 1997.
3. S.P.Mahajan, 'Pollution control in Process Industries', Tata Mc.Graw Hill, 1990.
4. 'Environmental Pollution Control Engineering', C.S.Rao, New Age International Ltd., 1992.

REFERENCES:

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India,
2. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, vol. I and II, Enviro Media.

3. Cunningham, W.P.Cooper, T.H.Gorhani, Environmental Encyclopedia, Jaico Publ., House, Mumbai, 2001.
4. Wager K.D., Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998.

PTLT 9261

TANNERY WASTE MANAGEMENT

**L T P C
3 0 0 3**

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.
2. Emil T. Chanleu, "Environmental Protection", McGraw Hill. Publishing Co. Ltd., New Delhi.
3. Arceivala, S.J. "Waste Water Treatment and disposal", Marcel Dekkar Inc., New York.
4. Metcalf and Eddy, 'Waste water engineering, treatment, disposal and reuse', 2nd end. Tata McGraw Hill Publishing Co., Ltd., New Delhi 1979.
5. Besselievie, B. Edmund and Max Schwartz. 'The Treatment of Industrial wastes, Second Edition' McGraw Hill. Publishing Co., Ltd., New Delhi.
6. Sawyer, C.M. and Maccarty, P.L. 'Chemistry for Environmental Engineering, 3rd Edition, Mc Graw Hill, Kogakusha, Tokyo, 1978.
7. Campbell, M.E. and Glenn, W.M., 'Profit from pollution prevention : A guide to industrial waste reduction and recycling' Pollution problem foundation, Ontario.
8. Carre, M.C. Vulliermet, A and Vulliermet, B. 'Environment and tannery', Centre Technique due Cuir, Lyon, France, 1983.
9. UNDP and UNDO - 'Tanneries and the Environment - A Technical guide, 1991.

UNIT I TRENDS IN LIVESTOCK POPULATION**5**

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**10**

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**10**

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**5**

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**5**

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**5**

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**5**

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
4. Report of the Nation wide Survey on Leather Product Units in India , CLRI, 1997.
5. Thyagarajan, G, Srinivasan, A.V. and Amudeswari, A., "Indian Leather 2010, A technology, Industry and Trade Forecast', CLRI, Madras 1994.
6. Bulletins of India's Foreign Trade in Leather and Leather Products , CLRI
7. Sadulla, S. The Leather Industry Kothari's Deskbook Series, H.C. Kothari Group (Publications Division), Madras 1995.

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
Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – 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

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics Concepts and Cases", Thompson Learning, (2000).

REFERENCES

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999).
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, (2003)
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, (2001)
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, (2004)
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003)

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

1. Peters, M. S. and Timmerhaus, C. D., " Plant Design and Economics for Chemical Engineers ", 5th Edn., McGraw Hill, 2002.
2. Holand, F.A., Watson, F.A. and Wilkinson, J.K., " Introduction to process Economics ", 2nd Edn., John Wiley, 1983.
3. Narang, G.B.S. and Kumar, V., " Production and Costing ", Khanna Publishers, New Delhi, 1988.
4. Narang, G.B.S. and Kumar, V., " Production and Costing ", Khanna Publishers, New Delhi, 1988.
5. 1988.

REFERENCES

1. Allen, L.A., " Management and Organization", McGraw Hill.
2. Perry, R. H. and Green, D., " Chemical Engineer's Handbook ", 7th Edn., McGraw Hill.

UNIT I UPPERS & LINING**15**

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.

ii. Coated Fabrics & Poromerics : Types of yarn, thread manufacturing, twist, coated fabric, method of weaving - brading, knitting, coating of fabric, synthetic leather and poromerics, method of evaluation.

UNIT II SOLING MATERIALS**10**

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**13**

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**4**

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

UNIT V DRESSING MATERIALS**3**

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

TOTAL: 45 PERIODS**REFERENCES**

1. Acceptable quality standards in the leather and footwear industry, United Nations Industrial Development Organization 1996.
2. Ganga Radhakrishnan, Polymers in Footwear Manufacture, Publication of Indian Leather, India, 1993.
3. Glibert, R. and Love lock, D.W., Microbial aspects of the deterioration of materials, Society for applied Bacteriology Technical Series, 4, Academic Press, London, 1975.
4. Harvey,A.J., Manual of tests methods and performance requirements for leather, materials and components in the manufacture of footwear, LASRA Publications, New Zealand.
5. Juran, J.M., Gryna, F.M. Jr. Quality Control Handbook, 4th Edition, McGraw Hill Book Co., New York, 1988.
6. Modern Shoemaking Series, SATRA, UK Publications
7. Quality manual for leather manufacture, LTM-CLRI Publication.
8. Venkatapaiah, B., Adhesives in Shoe Manufacture, India, 1994.
9. Venkatapaiah, B., Introduction to Modern Footwear Technology, India, 1997.
10. Thornton, J.H. `Textbook of Footwear Materials, `Heywood, London, 1995.

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

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDCA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

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

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept, Requirements and Benefits.

TOTAL: 45 PERIODS**TEXT BOOK**

1. Besterfield, D. H., et al., “ Total Quality Management “, Pearson Education Asia, 1999. (Indian reprint 2002).

REFERENCES

1. Evans, J. R. and Lindsay, W, M., “ The Management and Control of Quality “, (5th Edn.), South-Western (Thomson Learning), 2002
2. Narayana V. and Sreenivasan, N.S., “ Quality Management – Concepts and Tasks “, New Age International 1996.

PTLT9451

PROJECT WORK

L T P C
0 0 12 6

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.

PTLT9022 SCIENCE OF LEATHER SUPPLEMENTS AND SYNTHETICS

L T P C
3 0 0 3

UNIT I **5**
Chemistry of the most common polymeric materials used in leather industry as supplements.

UNIT II POLYMERISATION FUNDAMENTALS **10**
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 **5**
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 **15**
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 **10**
Polymers for leather processing, syntans, filling agents, base coats, top coats and adhesives.

TOTAL: 45 PERIODS

REFERENCES

1. Williams, D.H. 'Polymer Science and Engineering', Prentice Hall, New York, 1971.
2. Rodriguez, F. 'Principles of Polymer System', McGraw-Hill, NY, 1970.
3. Miles, D.C. & Briston, J.H. 'Polymer Technology', Temple Press, London, 1965.
4. Moncrieff, R.W. 'Man-made fibres', 5th Edn., Heywood Books, London, 1970.

UNIT I INTRODUCTION.**9**

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**9**

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

UNIT III ANIMAL BLOOD, ITS PRODUCTS AND THEIR UTILISATION**9**

Alimentary tract and its processing into various products. Present status of the industry in the country. Pet foods methods of preparation in brief.

UNIT IV COLLECTION AND CONSERVATION OF ORGANS AND GLANDS FROM SLAUGHTERED ANIMALS : POSSIBLE SCOPE OF THEIR UTILISATION**9**

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**9**

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

TOTAL = 45 PERIODS**REFERENCES**

1. Burnham, F. 'Rendering - the invisible industry', Aero Publishers, inc., Fallbrook, CA 92028, 1978.
2. Mann, I. 'Processing and Utilisation of animal by-products', Food and Agriculture organisation, Rome, 1962.
3. Scaria, K.J., Mahendrakumar and Divakaran, S. 'Animal by-Products - processing and utilisation', Central Leather Research Institute, Madras, 1981.
4. Taiganides, E.P. 'Animal Wastes', Applied Science, Publishers Ltd., Essex, 1977.
5. Mahendrakumar, 'Hand Book of rural technology for the processing of animal by-products'. FAO Agricultural Services Bulletin 79, Food and Agriculture Organisation.
6. Divakaran, S. Animal Blood - Processing and utilisation, Food and Agriculture Organisation, Rome, 1978.

- UNIT I CLEANER PRESERVATION TECHNOLOGIES 9**
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 12**
Desalting Procedures for TDS reduction, Use of enzymes in beam house for pollution reduction, Soaking enzyme, Unhairing enzyme, Degreasing enzyme. Recycling of soak liquors - sulfide-free and Less- sulfide unhairing methods based on enzymes and other chemical alternatives-lime splitting - Recycling of liming floats - Lime-free processing, Ammonium - free deliming agents - Carbon di-oxide and other alternatives - salt-less pickling - pickle-less chrome tanning - Recycling of pickle floats.
- UNIT III CLEANER TANNING TECHNOLOGIES 10**
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 6**
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 8**
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
3. Proceedings of the Workshop on "Cleaner Production Technology "organised by CLRI for commonwealth countries held in CLRI Chennai 1998.

UNIT I**6**

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

UNIT II**15**

Manufacture of industrially important polymers for plastics, fibres and lastomer Polyethylene, polypylene, polyvinyl chloride, polyvinyl alcohol, polyacrylonitrile, polystyrene, polyurethane, fluoro-carbon polymers, epoxy resins, polyamides, polyesters, alkyd resins, silicone polymers, cellulose.

UNIT III**6**

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

UNIT IV**8**

Testing of polymers. Mechanical and Thermal testing.

UNIT V**10**

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

TOTAL: 45 PERIODS**REFERENCE :**

1. Williams, D.J., 'Polymer Science & Engineering', Prentice Hall, New York, 1971.
2. Austin, G.T., Shreer's 'Chemical Process Industries', 5th ed., McGraw Hill International Book Co., Singapore, 1984.
3. Elrich. F.R., 'Science & Technology of Rubber', Academic Press, New York, 1978.
4. Lubin, 'Handbook of composites', Van Nostrand Reinhold Co., New York.

AIM

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

UNIT I**9**

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**9**

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**13**

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 fatliquor preparation. Stability of emulsions, grain and particle sizes of emulsions, factors controlling grain sizes of emulsions. Fatliquor manufacturing technology. Theory of colors, chromophoric groups, structural features of dyes; acid, basic and reactive dye classification. Chemistry and technology of dye manufacture.

UNIT IV**9**

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**5**

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**

1. Fred O Flaherty, Roddy, T.W. and Lollar, R.M. 'The Chemistry and Technology of Leather', Vol.II, Type of tannages, Rober E. Krieger Publishing Co., New York, 1977.
2. Gustavson, K.H. 'Chemistry of Tanning Processes' Academic Press, New York, 1956.
3. Venkataraman, K. 'Chemistry of Synthetic Dyes', Academic Press, New York and Lond, 1971.
4. Myers, R.R., and Lond, J.S. 'Treatise on Coatings', Marcel Dekker, New York, 1975.

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

1. Panneer Selvam, R, "Engineering Economics", Prentice Hall of India Ltd, New Delhi, 2001.

REFERENCES

1. Chan S.Park, "Contemporary Engineering Economics", Prentice Hall of India, 2002.
2. Donald.G. Newman, Jerome.P.Lavelle, "Engineering Economics and analysis" Engg. Press, Texas, 2002
3. Degarmo, E.P., Sullivan, W.G and Canada, J.R, "Engineering Economy", Macmillan, New York, 1984
4. Grant.E.L., Ireson.W.G., and Leavenworth, R.S, "Principles of Engineering Economy", Ronald Press, New York, 1976.
5. Smith, G.W., "Engineering Economy", Iowa State Press, Iowa, 1973.

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.

Manpower planning :Importance, Assessing current human resources - assessing future requirement - matching demand and supply. Objectives - Sequencing - Scheduling - Production - Planning and Control. Materials management Micro and macro level - systems approach - Materials planning - SQC - Incoming material control. Demand analysis and forecasting. Meaning of Demand - Types of Demand - Demand forecasting - forecasting methods

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**

1. Arun Monappa, Mirzas Saiyadain, Personnel Management, 2nd Edition, 3rd reprint, Tata Mc Graw Hill, New Delhi 1997.
2. Baker .K.R. Introduction to sequencing & scheduling John wiley & sons 1974.
3. Barnes .R.M. Motion and time study John Wiley - 1984.
4. Datta .A.K - Materials management, Prentice Hall 1998
5. Edwin .B Flippo, Personnel Management 6th edition Mc Graw Hill Singapore 1984.
6. Francis R.L. and White J.A. Facilities lay-out and location, Prentice Hall 1998.
7. Introduction to Workstudy ILO, 3rd revised edition 1983.
8. James Apple Material handling system design Ronald Press.
9. Joseph M Putti - Management, a functional approach - Mc Graw Hill 1997.
10. Kenneth .C Lauden MIS : Organisation & Technology, Prentice Hall 1995
11. King J.R - Production Planning and Control , Pergamon International Library 1975.
12. Metcalf and Eddy Inc. Waste water Engineering, Treatment and Disposal, Second edition Mc Graw Hill New York 1979.
13. Mote .V.L, Samuel Paul & Gupta .G.S - Managerial economics - Concept and cases - Tata Mc Graw Hill Publishing Co., Ltd., New Delhi 1981.
14. Niebel .B.W - Motion and Time study Tarapore vala & Sons, India 1982.

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, International Labour Office, Geneva 1999.
2. J. Buljan, A Sahasranaman, J Hannak, Occupational Safety and Health Aspects of Leather Manufacture, 1st edition, United Nations Industrial Development Organization, Chennai, 1998.
3. CLRI, Safety Manual on Leather Processing, 1st edition, Central Leather Research Institute, Chennai, 1999.

PTLT9028 PRINCIPLES OF PLANT DESIGN FOR LEATHER AND PROCESS CONTROL SYSTEMS

**L T P C
3 0 0 3**

UNIT I INTRODUCTION	4
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	8
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	9
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	8
Qualities of measurement. Measurement of temperature, flow, pressure and vacuum, level and pH. Methods of composition analysis. Process instrumentation.	
UNIT V PROCESS CONTROL	16
Introduction to the concept of automatic control. Types of control. Controller combinations, Pneumatic control circuits. Hydraulic control circuits. Electronic control circuits applications. Case studies in wet operation, Utility - Requirements	

TOTAL: 45 PERIODS

REFERENCES

1. Eckman, D.P. Industrial Instrumentation.
2. Millard H. Lajoy, Industrial Automatic Control
3. Brunnel, L.E. & Yound, E.H. "Process Equipment Design", Willey Eastern Limited, New Delhi.
4. Max, S. Peters and Timmerhaus, K.D. 'Plant Design and Economics for Chemical Engineering', McGraw-Hill - International Book Company, New York, 1989.

5. Vibrandit, C. and Dryden, C.E. 'Chemical Engineering Plant Design', McGraw-Hill book Company Inc., New York.
6. Lloyd, E. Brownell and Young, E.H. 'Process Equipment Design', Wiley Eastern Limited, New Delhi.
7. Walas, 'Chemical Process Equipment Selection and Design', McGraw-Hill Book Company Inc., New York.
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 9

Introduction, Definition, Importance and Scope of Marketing, Philosophies of Marketing Management, Elements of Marketing - Needs, Wants, Demands, Customer, Consumer, Markets and Marketers; Marketing Vs Selling, Consumer Markets and Industrial Markets. Concept of Marketing Management, Marketing – Mix, Functions of Marketing Management, Marketing Organisations, Qualities of Marketing Manager.

Marketing Environment, Factors Affecting Marketing Environment, Marketing Information System and Marketing Research, Strategic Marketing Planning.

UNIT II PURCHASING PRINCIPLES AND MANAGEMENT 8

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 9

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 9

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 9

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
2. Integrated Retail Management by James R. Ogden & Denise T.Ogden, 2007, Biztantra Retail Management – Levy & Weitz-TMH 5th Edition 2002
3. Charles W L Hill. And Arun Kumar Jain. International Business:competing in the global market place, Mc Graw-Hill, 2007.
4. John D. Daniels Lee H Radebaugh, International Business: Environments and Operations Addison Wesley, 2007.
5. Justin Paul – International Business – Prentice Hall of India, 2007Oded Shenkar Yadong Luo : International Business – John Wiley & Co., 2006
6. Wild J. John, Wild L. Keneth and Han C. Y. Jerry, International Business: An integrated approach, Prentice Hall International
7. Alan M. Rugman and Richard M.Hodgetts – International Business by Pearson Education,, 2007.

PTLT9047 HUMAN RESOURCES MANAGEMENT

**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, 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 15

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 6

Equal employment opportunity, recruitment, selection, career planning, organizational exit.

UNIT III HUMAN RESOURCE DEVELOPMENT 7

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

1. Mathis, R. L. & Jackson, J. H. (2003). Human Resource Management, (10th ed.), Mason, Ohio: Thomson-Southwestern.
2. Rao, T.V., (1996) "Human Resources Development: Experiences. Interventions. Strategies", Sage Publications, New Delhi.

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

UNIT I 9
 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 11
 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
 Imported Goods and Goods in Transit-Warehousing of Goods, Import into India.
 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 11
 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 5
 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**9**

Marketing Management in the Indian context Introduction-concept-process functions-Role of Marketing in modern Organization- Marketing environment-Socio economic forces- Marketing Planning-Understanding Buyer-Organizational Buyer behavior Product Management - pricing decisions-Promotion Decisions.

TOTAL: 45 PERIODS**TEXT BOOKS**

1. Wagdre, H. International Marketing Management, Adhyayan Publisher, 2007
2. Datey, V. S. Foreign Trade Policy, Taxmann Publishers, 2008.
3. Bhat, M. K. international marketing management with special reference to India, king publishers, 2001

PTLT 9050**ENTERPRISE PLANNING FOR LEATHER SECTOR****L T P C
3 0 0 3****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 6
Post implementation review of ERP Packages in Manufacturing, Services, and other Organizations

TOTAL: 45 PERIODS

REFERENCES

1. Leon, A. Enterprise Resource Planning, Tata Mcgraw-hill, 1999.
2. Garg, V.K. and Venkitakrishnan, N.K. ERP Ware: ERP Implementation Framework, Prentice Hall, 1999
3. Garg, V.K. and Venkitakrishnan, N.K. Enterprise Resource Planning Concepts and Practice, PHI Learning Pvt. Ltd., 2004.

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UNIT I INTRODUCTION 5
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UNIT III COMMUNICATION TECHNOLOGY 5
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UNIT V IT MANAGEMENT 12
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BUSINESS APPLICATIONS IN E-COMMERCE
Retailing in E-commerce – market research on internet customers – e- commerce for service sector – Advertising in e-commerce – B2B e-commerce.

TOTAL: 45 PERIODS

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