



**ANNA UNIVERSITY CHENNAI
CHENNAI - 600 025**

UNIVERSITY DEPARTMENTS

REGULATIONS 2012

**CURRICULA AND SYLLABI FOR
I TO VIII SEMESTERS**

**B.TECH. LEATHER TECHNOLOGY
(FULL TIME)**

Attested

Sobhan
DIRECTOR

Centre For Academic Courses
Anna University, Chennai-600 025.

ANNA UNIVERSITY:: CHENNAI 600 025

UNIVERSITY DEPARTMENT

R – 2012

B.TECH. LEATHER TECHNOLOGY

I – VIII SEMESTERS CURRICULA AND SYLLABI

SEMESTER I

CODE	COURSE TITLE	L	T	P	C
THEORY					
HS8151	Technical English – I	3	1	0	4
MA8151	Mathematics – I	3	1	0	4
PH8151	Engineering Physics	3	0	0	3
CY8151	Engineering Chemistry	3	0	0	3
GE8151	Computing Techniques	3	0	0	3
GE8152	Engineering Graphics	2	0	3	4
PRACTICAL					
PH8161	Physics Laboratory	0	0	2	1
CY8161	Chemistry Laboratory	0	0	2	1
GE8161	Computer Practices Laboratory	0	0	3	2
GE8162	Engineering Practices Laboratory	0	0	3	2
Total		17	2	13	27

SEMESTER II

CODE	COURSE TITLE	L	T	P	C
THEORY					
HS8251	Technical English II	3	1	0	4
MA8251	Mathematics II	3	1	0	4
PH8255	Physics of Materials	3	0	0	3
CY8253	Chemistry for Technologists	3	0	0	3

GE8251	Engineering Mechanics	3	1	0	4
LT8201	Introduction to Leather Manufacture	3	0	0	3
PRACTICAL					
PH8261	Applied Physics Laboratory	0	0	2	1
CY8261	Applied Chemistry Laboratory	0	0	2	1
	TOTAL	18	3	4	23

SEMESTER III

CODE	COURSE TITLE	L	T	P	C
THEORY					
MA8355	Probability and Random Processes	3	1	0	4
CY8303	Instrumental Methods of Analysis for Leather Technologists	3	0	0	3
EE8252	Principles of Electrical and Electronics Engineering	3	0	0	3
LT8301	Basic Biochemistry and Microbiology	3	0	0	3
LT8302	Inorganic and Organic Chemistry	3	0	0	3
LT8303	Theory of Skin Proteins and Pre-tanning Processes	3	0	0	3
PRACTICAL					
EE8261	Electrical and Electronics Lab	0	0	3	2
LT8311	Tannery Practice – I	0	0	4	2
	TOTAL	18	1	7	23

SEMESTER IV

CODE	COURSE TITLE	L	T	P	C
THEORY					
MA8353	Numerical Methods	3	1	0	4
CY8402	Physical Chemistry for Leather Technologists	3	0	0	3

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LT8401	Technology of Heavy Leather Manufacture	3	0	0	3
LT8402	Theory and Practice of Chrome and Inorganic Tannages	3	0	0	3
LT8403	Theory and Practice of Vegetable and Organic Tannages	3	0	0	3
LT8404	Theory of Material Testing of Leathers – I	3	0	0	3
PRACTICAL					
LT8411	Material Testing Laboratory – I	0	0	4	2
LT8412	Tannery Practice – II	0	0	6	3
	TOTAL	18	1	10	24

SEMESTER V

CODE	COURSE TITLE	L	T	P	C
THEORY					
LT8501	Polymer Science	3	0	0	3
LT8502	Technology of Light Leather Manufacture	3	0	0	3
LT8503	Theory and Practice of Post Tanning Processes	3	0	0	3
LT8504	Theory of Material Testing of Leathers – II	3	0	0	3
LT8505	Principles of Unit Operations and Unit Processes in Leather and Leather Chemicals Manufacture	3	0	0	3
	Elective I	3	0	0	3
PRACTICAL					
HS8561	Employability Skills	0	0	2	1
LT8511	Material Testing Laboratory – II	0	0	4	2
LT8512	Tannery Practice – III	0	0	4	2
	TOTAL	18	0	10	23

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SEMESTER VI

CODE	COURSE TITLE	L	T	P	C
THEORY					
LT8601	Environmental Science and Engineering for Leather Sector	3	0	0	3
LT8602	Leather Goods and Garments Technology	3	0	0	3
LT8603	Leather Machineries	3	0	0	3
LT8604	Theory and Practice of Leather Finishing	3	0	0	3
	Elective II	3	0	0	3
PRACTICAL					
LT8611	Leather Goods and Garments – Design and Fabrication Laboratory	0	0	4	2
LT8612	Leather Machinery Laboratory	0	0	4	2
LT8613	Tannery Practice – IV	0	0	4	2
	TOTAL	15	0	12	21

SEMESTER VII

CODE	COURSE TITLE	L	T	P	C
THEORY					
LT8701	Leather Footwear Technology	3	0	0	3
LT8702	Process Economics and Industrial Management for Leather Sector	3	0	0	3
	Elective III	3	0	0	3
	Elective IV	3	0	0	3
	Elective V	3	0	0	3
PRACTICAL					
LT8711	Creative and Innovative Project	0	0	3	2

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LT8712	Industrial Training/Internship*	0	0	2	1
LT8713	Leather Footwear – Design and Fabrication laboratory	0	0	4	2
	TOTAL	15	0	9	20

**Minimum of two weeks industrial internship to be undertaken during the summer vacation after Semester VI*

SEMESTER VIII

CODE	COURSE TITLE	L	T	P	C
THEORY					
MG8654	Total Quality Management	3	0	0	3
PRACTICAL					
LT8811	Project Work	0	0	24	12
	TOTAL	3	0	24	15

LIST OF ELECTIVES FOR LEATHER TECHNOLOGY

CODE	COURSE TITLE	L	T	P	C
LT8001	Advanced Physics and Chemistry of Leather – I (APCL I)	3	0	0	3
LT8002	Advanced Physics and Chemistry of Leather II (APCL II)	3	0	0	3
LT8003	CAD/CAM for Leather Products Design and Manufacture	3	0	0	3
LT8004	Consumer Behavior and Business Orientation	3	0	0	3
LT8005	Eco-benign Options for Leather Processing	3	0	0	3
LT8006	Engineering Economics and Finance Management	3	0	0	3
LT8007	Enterprise Resource Planning for Leather Sector	3	0	0	3
LT8008	Entrepreneurship for Leather Sector	3	0	0	3
LT8009	Fashion Forecasting for Leather and Leather Products	3	0	0	3
LT8010	Human Resources Development	3	0	0	3

LT8011	International Marketing and Foreign Trade	3	0	0	3
LT8012	Leather and Leather Products Costing	3	0	0	3
LT8013	Leather and Product Merchandising	3	0	0	3
LT8014	Leather Products Machinery	3	0	0	3
LT8015	Organisation and Management of Leather Manufacture	3	0	0	3
LT8016	Safety in Leather Industries	3	0	0	3
LT8017	Science and Technology of Leather Auxiliaries	3	0	0	3
LT8018	Science and Technology of Leather Supplements and Synthetics	3	0	0	3
LT8019	Technology of Animal and Tannery By products Utilization	3	0	0	3
LT8020	Value Engineering in Leather Sector	3	0	0	3
LT8021	Leather Bio Technology and its Application in Leather	3	0	0	3
LT8022	Computer Applications for Leather and Leather Products	3	0	0	3
GE8072	Disaster Management	3	0	0	3
GE8073	Human Rights	3	0	0	3

TOTAL NO. OF CREDITS : 176

Attested

Sahar
DIRECTOR

Centre For Academic Courses
Anna University, Chennai-600 025.

OBJECTIVE

To impart basic communication skills and develop the habit of reading

OUTCOMES

- To enable all students of engineering and technology develop their basic communication skills in English.
- To give special emphasis to the development of speaking skills amongst the students of engineering and technology students.
- To ensure that students use the electronic media such as internet and supplement the learning materials used in the classroom.
- To inculcate the habit of reading for pleasure.

UNIT I

Listening - Introducing learners to GIE - Types of listening - Listening to audio (verbal & sounds); Speaking - Speaking about one's place, important festivals etc. – Introducing oneself, one's family / friend; Reading - Skimming a reading passage – Scanning for specific information - Note-making; Writing - Free writing on any given topic (My favourite place / Hobbies / School life, etc.) - Sentence completion - Autobiographical writing (writing about one's leisure time activities, hometown, etc.); Grammar - Prepositions - Reference words - Wh-questions - Tenses (Simple); Vocabulary - Word formation - Word expansion (root words / etymology); E-materials - Interactive exercises for Grammar & Vocabulary - Reading comprehension exercises - Listening to audio files and answering questions.

UNIT II

Listening - Listening and responding to video lectures / talks; Speaking - Describing a simple process (filling a form, etc.) - Asking & answering questions - Telephone skills – Telephone etiquette; Reading – Critical reading - Finding key information in a given text - Sifting facts from opinions; Writing - Biographical writing (place, people) - Lab descriptions (general/specific description of laboratory experiments) - Definitions - Recommendations; Grammar - Use of imperatives - Subject-verb agreement; Vocabulary - Compound words - Word Association; E-materials - Interactive exercises for Grammar and Vocabulary - Listening exercises with sample telephone conversations / lectures – Picture-based activities.

UNIT III

Listening - Listening to specific task - focused audio tracks; Speaking - Role-play – Simulation - Group interaction - Speaking in formal situations (teachers, officials, foreigners); Reading - Reading and interpreting visual material; Writing - Jumbled sentences - Coherence and cohesion in writing - Channel conversion (flowchart into process) - Types of paragraph (cause & effect / compare & contrast / narrative / analytical) - Informal writing (letter/e-mail/blogs) - Paraphrasing; Grammar - Tenses (Past) - Use of sequence words - Adjectives; Vocabulary - Different forms and uses of words, Cause and effect words; E-materials - Interactive exercises for Grammar and Vocabulary - Excerpts from films related to the theme and follow up exercises - Pictures of flow charts and tables for interpretations.

UNIT IV

Listening - Watching videos / documentaries and responding to questions based on them; Speaking - Responding to questions - Different forms of interviews - Speaking at different types of interviews; Reading - Making inference from the reading passage - Predicting the content of a reading passage; Writing - Interpreting visual materials (line graphs, pie charts etc.) - Essay writing – Different types of essays; Grammar - Adverbs – Tenses – future time reference; Vocabulary - Single word substitutes - Use of abbreviations & acronyms; E-materials - Interactive exercises for Grammar and Vocabulary - Sample interviews - film scenes - dialogue writing.

UNIT V

Listening - Listening to different accents, Listening to Speeches/Presentations, Listening to broadcast & telecast from Radio & TV; Speaking - Giving impromptu talks, Making presentations on given topics; Reading - Email communication - Reading the attachment files having a poem/joke/proverb - Sending their responses through email Writing - Creative writing, Poster making; Grammar - Direct and indirect speech; Vocabulary - Lexical items (fixed / semi fixed expressions); E-materials - Interactive exercises for Grammar & Vocabulary - Sending emails with attachment – Audio / video excerpts of different accents, - Interpreting posters.

TOTAL : 60 PERIODS

TEXT BOOKS

1. Mindscapes: English for Technologists and Engineers, Orient Black Swan, 2012 .
2. S.P. Dhanavel, English and Communication Skills for Students of Science and Engineering, Orient Black Swan, Chennai, 2011.

Attested

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REFERENCES

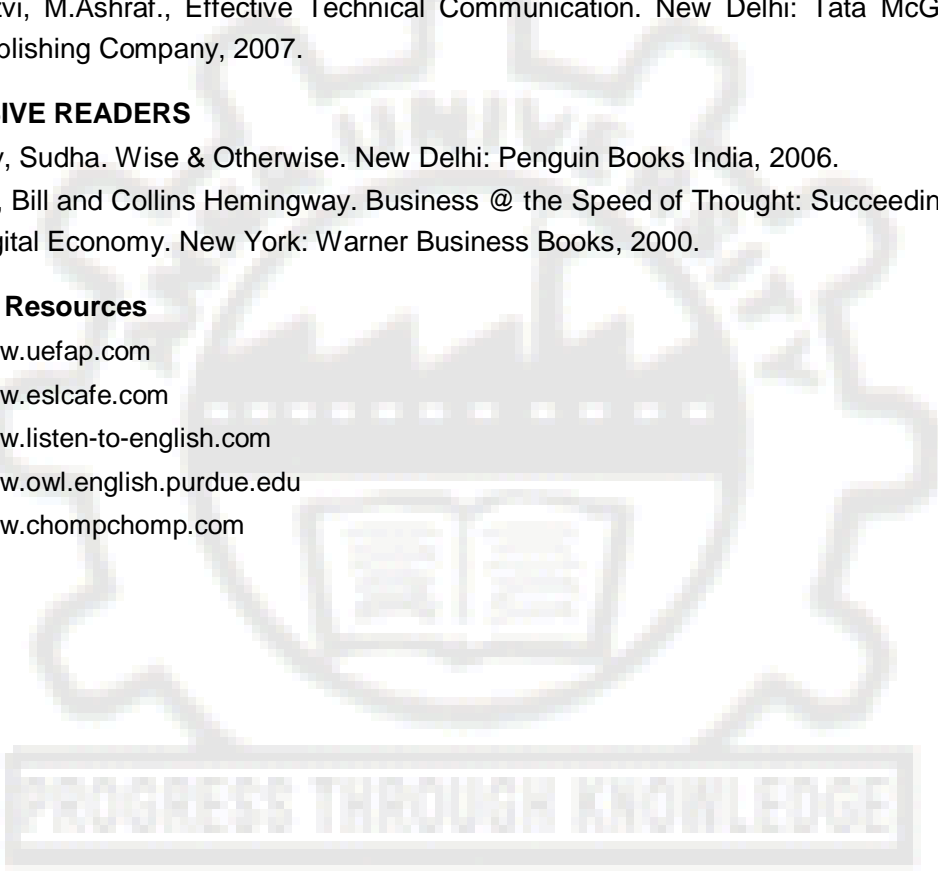
1. Pickett, Nell Ann, Ann A.Laster and Katherine E.Staples. Technical English: Writing, Reading and Speaking. New York: Longman, 2001.
2. Bailey, Stephen. Academic Writing: A practical guide for students. New York: Rutledge, 2011.
4. Morgan, David and Nicholas Regan. Take-Off: Technical English for Engineering. Reading: Garnet Publishing Limited, 2008. Thorn, Michael and Alan Badrick, An Introduction to Technical English, Harlow: Prentice Hall Europe, 1993.
5. Rizvi, M.Ashraf., Effective Technical Communication. New Delhi: Tata McGraw-Hill Publishing Company, 2007.

EXTENSIVE READERS

1. Murthy, Sudha. Wise & Otherwise. New Delhi: Penguin Books India, 2006.
2. Gates, Bill and Collins Hemingway. Business @ the Speed of Thought: Succeeding in the Digital Economy. New York: Warner Business Books, 2000.

Website Resources

1. www.uefap.com
2. www.eslcafe.com
3. www.listen-to-english.com
4. www.owl.english.purdue.edu
5. www.chompchomp.com



OBJECTIVE

To impart the fundamental knowledge about matrices, infinite series, partial derivatives, improper and multiple integrals

OUTCOMES

1. To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
2. To make the student knowledgeable in the area of infinite series and their convergence so that he/ she will be familiar with limitations of using infinite series approximations for solutions arising in mathematical modeling.
3. To familiarize the student with functions of several variables. This is needed in many branches of engineering.
4. To introduce the concepts of improper integrals, Gamma, Beta and Error functions which are needed in engineering applications.
5. To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I MATRICES**9+3**

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – 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 INFINITE SERIES**9+3**

Sequences – Convergence of series – General properties – Series of positive terms – Tests of convergence (Comparison test, Integral test, Comparison of ratios and D'Alembert's ratio test) – Alternating series – Series of positive and negative terms – Absolute and conditional convergence – Power Series – Convergence of exponential, logarithmic and Binomial Series.

UNIT III FUNCTIONS OF SEVERAL VARIABLES**9+3**

Limits and Continuity – 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 – Errors and approximations – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

9+3

UNIT IV IMPROPER INTEGRALS

Improper integrals of the first and second kind and their convergence – Evaluation of integrals involving a parameter by Leibnitz rule – Beta and Gamma functions – Properties – Evaluation of integrals using Beta and Gamma functions – Error functions

UNIT V MULTIPLE INTEGRALS

9+3

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of Solids – Change of variables in double and triple integrals – Area of a curved surface.

TOTAL : 60 PERIODS

TEXT BOOKS

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 40th Edition, 2007.
2. Ramana B.V., “Higher Engineering Mathematics”, Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.

REFERENCES

1. Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, 3rd Edition, 2007.
2. Bali N., Goyal M. and Watkins C., “Advanced Engineering Mathematics”, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
3. Greenberg M.D., “Advanced Engineering Mathematics”, Pearson Education, New Delhi, 2nd Edition, 5th Reprint, 2009.
4. Peter V.O’Neil, “Advanced Engineering Mathematics”, Cengage Learning India Pvt., Ltd, New Delhi, 2007.

OBJECTIVE

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

OUTCOME

On completion of the course the students are expected to have a thorough knowledge on the basic physics concepts relevant to different branches of Engineering and Technology.

UNIT I PROPERTIES OF MATTER**9**

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

UNIT II ACOUSTICS AND ULTRASONICS**9**

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

UNIT III THERMAL PHYSICS**9**

Thermal expansion - thermal stress - expansion joints - bimetallic strips - thermal conductivity - conduction in solids - Forbe's and Lees' disc methods - Rectilinear flow of heat through a rod - flow of heat through a compound materials - radial flow of heat through a spherical shell - thermal insulation of buildings – Laws of blackbody radiation: Kirchoffs law, Stephens law, Wiens law, Raleigh-Jean law and Planks law (derivation). Laws of thermodynamics - Otto and diesel engines and their efficiency - entropy - entropy of Carnot's cycle - reverse Carnot's cycle - refrigerator.

UNIT IV APPLIED OPTICS

9

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

UNIT V SOLID STATE PHYSICS

9

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

TOTAL : 45 PERIODS

TEXT BOOKS

1. Gaur R.K., and Gupta, S.L., Engineering Physics, Dhanpat Raj Publications, 2003.
2. Palanisamy, P.K., Engineering Physics, Scitech Publications (P) Ltd, 2006.
3. Arumugam, M., Engineering Physics, Anuradha Publications, 2000.

REFERENCE BOOKS

1. Sankar, B.N., Pillai.S.O., Engineering Physics, New Age International (P) Ltd., 2007.
2. Rajendran.V Engineering Physics, Tata McGraw-Hill, 2009.

CY8151

ENGINEERING CHEMISTRY

L T P C

(Common to All Branches of Engineering and Technology)

3 0 0 3

OBJECTIVE

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

OUTCOME

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

UNIT I CHEMICAL THERMODYNAMICS

9

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

UNIT II POLYMER CHEMISTRY

9

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

UNIT III KINETICS AND CATALYSIS

9

Introduction – reaction velocity, factors affecting reaction velocity, rate constant, order of reaction, molecularity, pseudo molecular reactions, zero, first, second and third order reactions, reactions of fractional orders, determination of order of reactions. Catalysis: Auto catalysis - Enzyme Catalysis: Michaelis-Menton equation; factors affecting enzyme catalysis. Heterogeneous Catalysis: Types of adsorption isotherms: Langmuir-Hinselwood and Rideal- Eley Mechanism.

PROGRESS THROUGH KNOWLEDGE

Attested

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UNIT IV PHOTOCHEMISTRY AND SPECTROSCOPY

9

Photochemistry: Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law. Photoprocesses - Internal Conversion, Inter-system crossing, Fluorescence, Phosphorescence, Chemiluminescence and Photo-sensitisation. Spectroscopy: Electromagnetic spectrum - Absorption of radiation – Electronic, Vibrational and rotational transitions. Width and intensities of spectral lines. Spectrophotometric estimation of iron. UV-visible and IR spectroscopy – principles, instrumentation (Block diagram) and applications.

UNIT V NANOCHEMISTRY

9

Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: Nanocluster, nanorod, nanotube and nanowire. Synthesis: Precipitation, thermolysis, hydrothermal, solvothermal, electrodeposition, chemical vapour deposition, laser ablation; Properties and Applications. Risk discussion and Future perspectives.

TOTAL : 45 PERIODS

TEXT BOOKS

1. P. Kannan and A. Ravikrishnan, "Engineering Chemistry", Sri Krishna Hitech Publishing Company Pvt. Ltd. Chennai, 2009.
2. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India, 2011

REFERENCES

1. P.W. Atkins and de Paula Julio, "Physical Chemistry", Oxford University Press, 8th Ed., (Indian Student Edition) (2009).
2. K. K. Rohatgi-Mukherjee, "Fundamental of Photochemistry" New Age International (P) Ltd., New Delhi, 1986.
3. G.A. Ozin and A.C. Arsenault, "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2005.
4. V.R.Gowariker, N.V.Viswanathan and Jayadev Sreedhar, "Polymer Science", New Age International P (Ltd.), Chennai, 2006

GE8151

COMPUTING TECHNIQUES

L T P C

3 0 0 3

OBJECTIVE

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

OUTCOME

On completion of the course the students are expected to have a

thorough knowledge on computers and C programming.

UNIT I INTRODUCTION

8

Generation and Classification of Computers- Basic Organization of a Computer –Number System – Binary – Decimal – Conversion – Problems. Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart.

UNIT II C PROGRAMMING BASICS

10

Problem formulation – Problem Solving - Introduction to ‘ C’ programming –fundamentals – structure of a ‘C’ program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in ‘C’ – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.

UNIT III ARRAYS AND STRINGS

9

Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String-String operations – String Arrays. Simple programs- sorting- searching – matrix operations.

UNIT IV FUNCTIONS AND POINTERS

9

Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays- Example Problems.

UNIT V STRUCTURES AND UNIONS

9

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

TOTAL : 45 PERIODS

TEXTBOOKS

1. Pradip Dey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, First Edition, Oxford University Press, 2009
2. Ashok N. Kamthane, “Computer programming”, Pearson Education, 2007.
3. Yashavant P. Kanetkar. “ Let Us C”, BPB Publications, 2011.

REFERENCES

1. Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006
2. Byron S Gottfried, “ Programming with C”, Schaum’s Outlines, Second Edition, Tata

McGraw-Hill, 2006.

3. R.G. Dromey, "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007

GE 8152

ENGINEERING GRAPHICS

**L T P C
2 0 3 4**

OBJECTIVE

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

OUTCOME

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

CONCEPTS AND CONVENTIONS (Not for Examination)

1

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HAND SKETCHING

5+9

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves, Scales: Construction of Diagonal and Vernier scales.

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES

5+9

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined

to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS

5 + 9

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

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES

5+9

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

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS

6 + 9

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

COMPUTER AIDED DRAFTING (Demonstration Only)

3

Introduction to drafting packages and demonstration of their use.

TOTAL : 75 PERIODS

TEXT BOOK

1. N.D.Bhatt and V.M.Panchal, "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010

REFERENCES

1. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
2. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
3. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2009.
4. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.
5. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.

6. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out 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, each of either or type covering all
2. units of the syllabus.
3. All questions will carry equal marks of 20 each making a total of 100.
4. Students will be permitted to use appropriate scale to fit solution within A3 size.
5. The examination will be conducted in appropriate sessions on the same day

PH 8161

PHYSICS LABORATORY
(Common to All Branches of B.E. / B.Tech. Programmes)

L T P C
0 0 2 1

OBJECTIVE

To make the students understand and get hands-on in the basic concepts of practical Physics.

OUTCOME

Familiarizes the basic concept in experiments and provide strong platform to apply hands-on experience gained here for experimenting higher level concepts.

- | | |
|------------------------|---------------------------------------------------------------------------|
| 1. Torsional pendulum | - Determination of rigidity modulus of wire and moment of inertia of disc |
| 2. Non-uniform bending | - Determination of young's modulus |
| 3. Lee's disc | - Determination of thermal conductivity of a bad conductor |
| 4. Potentiometer | - Determination of thermo e.m.f. of thermocouple |
| 5. Air wedge | - Determination of thickness of a thin sheet of paper |

- | | | |
|-----|----------------------|-------------------------------------------------------------------------------|
| 6. | i. Optical fibre | - Determination of Numerical Aperture and acceptance angle |
| | ii. Compact disc | - Determination of width of the groove using laser |
| 7. | Acoustic grating | - Determination of velocity of ultrasonic waves in liquids |
| 8. | Post office box | - Determination of Band gap of a semiconductor |
| 9. | Spectrometer | - Determination of wavelength using grating |
| 10. | Viscosity of liquids | - Determination of co-efficient of viscosity of a liquid by Poiseuille's flow |

TOTAL : 30 PERIODS

CY 8161

CHEMISTRY LABORATORY
(Common to All Branches of Engineering and Technology)

L T P C
0 0 2 1

OBJECTIVE

To provide hands-on experience in using PH meter, potentiometry, titration methods and estimating the strength of given solutions.

OUTCOME

Ability to perform all kinds of titrations and estimate the unknown chemical samples.

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of poly vinyl alcohol using Ostwald viscometer.
12. Pseudo first order kinetics – ester hydrolysis.

13. Corrosion experiment – weight loss method.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL : 30 PERIODS

REFERENCES

1. A text of quantitative inorganic analysis, A. L.Vogel, ELBS London, 1995.
2. Experiments in physical chemistry, D.P. Shoemaker and C.W. Gardad, McGraw Hill, London, 2001.
3. American Public Health Association.

GE8161

COMPUTER PRACTICES LABORATORY

L T P C

0 0 3 2

OBJECTIVE

- To enable the student to learn and use the major components of a computer system
- To make the students write programs and solve problems
- To learn to use office automation tools

OUTCOME

At the end of the lab session student will be able to use MS office and generate data, solve simple problems with C-Programming Language.

LIST OF EXPERIMENTS:

1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions
9. Program using Recursive Function and conversion from given program to flow chart.
10. Program using structures and unions.

TOTAL : 45 PERIODS

Attested

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Centre For Academic Courses
Anna University, Chennai-600 025.

OBJECTIVE

To provide exposure to the students with hands-on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

OUTCOME:

- ability to fabricate carpentry components and pipe connections including plumbing works.
- ability to use welding equipments to join the structures.
- ability to fabricate electrical and electronics circuits

GROUP – A (CIVIL & ELECTRICAL)

1. CIVIL ENGINEERING PRACTICE

12

Plumbing

Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.

Laying pipe connection to the suction side of a pump – inlet.

Laying pipe connection to the delivery side of a pump – out let.

Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.

Wood Work

Sawing, planning and making common joints: T-Joint, Mortise and Tennon joint, Dovetail joint. Study

Study of joints in door panels, wooden furniture

Study of common industrial trusses using models.

2. ELECTRICAL ENGINEERING PRACTICE

9

Basic household wiring using switches, fuse, indicator – lamp etc.,

Preparation of wiring diagrams

Stair case light wiring

Tube – light wiring

Study of iron-box, fan with regulator, emergency lamp

GROUP – B (MECHANICAL AND ELECTRONICS)

15

3. MECHANICAL ENGINEERING PRACTICE

Welding

Arc welding of butt joints, lap joints, tee joints

Gas welding Practice.

Basic Machining

Simple turning, drilling and tapping

operations. Machine assembly Practice.

Study and assembling the following:

Centrifugal pump, mixies and air conditioners. Demonstration on

(a) Smithy operations like the production of hexagonal bolt.

(b) Foundry operation like mould preparation for grooved pulley.

4. ELECTRONIC ENGINEERING PRACTICE

9

Soldering simple electronic circuits and checking continuity.

Assembling electronic components on a small PCB and testing.

Study of Telephone, FM radio, low-voltage power supplies.

TOTAL : 45 PERIODS

HS 8251

TECHNICAL ENGLISH - II

L T P C

(For All Branches of B.E / B.Tech programmes)

3 1 0 4

OBJECTIVE

- To make the students acquire listening and speaking skills meant for both formal and informal contexts
- To help them develop their reading skills by exposing them to different types of reading strategies

- To equip them with writing skills needed for academic as well as workplace situations
- To make them acquire language skills at their own pace by using e-materials and language lab component

OUTCOME

On completion of the course the students are expected to acquire various linguistic skills required for academic and work place situations.

UNIT I

9 + 3

Listening - Listening to informal conversations and participating; Speaking - Opening a conversation (greetings, comments on something, weather) - Turn taking - Closing a conversation (excuses, general wish, positive comment, thanks); Reading - Developing analytical skills, Deductive and inductive reasoning - Extensive reading; Writing - Effective use of SMS for sending short notes and messages - Using 'emojicons' as symbols in email messages; Grammar - Regular & irregular verbs - Active and passive voice; Vocabulary - Homonyms (e.g. 'can') - Homophones (e.g. 'some', 'sum'); E-materials - Interactive exercise on Grammar and vocabulary – blogging; Language Lab - Listening to different types of conversation and answering questions.

UNIT II

9 + 3

Listening - Listening to situation based dialogues; Speaking - Conversation practice in real life situations, asking for directions (using polite expressions), giving directions (using imperative sentences), Purchasing goods from a shop, Discussing various aspects of a film (they have already seen) or a book (they have already read); Reading - Reading a short story or an article from newspaper, Critical reading, Comprehension skills; Writing - Writing a review / summary of a story / article, Personal letter (Inviting your friend to a function, congratulating someone for his success, thanking one's friend / relatives); Grammar - modal verbs, Purpose expressions; Vocabulary - Phrasal verbs and their meanings, Using phrasal verbs in sentences; E-materials - Interactive exercise on Grammar and vocabulary, Extensive reading activity (reading stories / novels from links), Posting reviews in blogs - Language Lab - Dialogues (Fill up exercises), Recording students' dialogues.

UNIT III

9 + 3

Listening - Listening to the conversation - Understanding the structure of conversations; Speaking - Conversation skills with a sense of stress, intonation, pronunciation and meaning - Seeking information – expressing feelings (affection, anger, regret etc.); Reading - Speed reading – reading passages with the time limit - Skimming; Writing - Minutes of meeting – format and practice in the preparation of minutes - Writing summary after reading the articles from the journals - Format for the journal articles – elements of technical articles (abstract, introduction,

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methodology, results, discussion, conclusion, appendices, references) - Writing strategies; Grammar - Conditional clauses - Cause and effect expressions; Vocabulary - Words used as nouns and verbs without any change in the spelling (e.g. 'rock', 'train', 'ring'); E-materials - Interactive exercise on Grammar & vocabulary - Speed Reading practice exercises; Language Lab - Intonation practice using EFLU materials – Attending a meeting and writing minutes.

UNIT IV

9 + 3

Listening - Listening to a telephone conversation, Viewing a model interview (face-to-face, telephonic and video conferencing) and observing the practices; Speaking - Role play practice in telephone skills - listening and responding, -asking questions, -note taking – passing on messages, Role play and mock interview for grasping the interview skills; Reading - Reading the job advertisements and the profile of the company concerned – scanning; Writing - Applying for a job – cover letter - résumé preparation – vision, mission and goals of the candidate; Grammar - Numerical expressions - Connectives (discourse markers); Vocabulary - Idioms and their meanings – using idioms in sentences; E-materials - Interactive exercises on Grammar & Vocabulary - Different forms of résumés- Filling up a résumé / cover letter; Language Lab - Telephonic interview – recording the responses - e-résumé writing.

UNIT V

9 + 3

Listening - Viewing a model group discussion and reviewing the performance of each participant - Identifying the characteristics of a good listener; Speaking - Group discussion skills – initiating the discussion – exchanging suggestions and proposals – expressing dissent/ agreement – assertiveness in expressing opinions – mind mapping technique; Reading - Note making skills – making notes from books, or any form of written materials - Intensive reading Writing - Types of reports – Feasibility / Project report – report format – recommendations / suggestions – interpretation of data (using charts for effective presentation); Grammar - Use of clauses; Vocabulary – Collocation; E-materials - Interactive grammar and vocabulary exercises - Sample GD - Pictures for discussion, Interactive grammar and vocabulary exercises - Pictures for discussion; Language Lab - Different models of group discussion.

TOTAL : 60 PERIODS

TEXT BOOKS

1. Mindscapes: English for Technologists and Engineers, Orient Black Swan, 2012, 2012 .
2. S.P. Dhanavel, English and Communication Skills for Students of Science and Engineering, Orient Black Swan, Chennai, 2011.

REFERENCES

1. Laws, Anne. Presentations. Hyderabad: Orient BlackSwan, 2000.
2. Lewis, Hedwig. Body Language: A Guide for Professionals. New Delhi: Sage Publications, 1998.
3. Naterop, Jean B. and Rod Revell. Telephoning in English. Cambridge: Cambridge University Press, 1987.
4. Rutherford, Andrea J. Basic Communication Skills for Technology. New Delhi: Pearson Education, 2001.
5. Ur, Penny. Teaching Listening Comprehension. Cambridge: Cambridge University Press, 1984.

EXTENSIVE READERS

1. Abdul Kalam, A P J. Ignited Minds: Unleashing the Power within India. New Delhi: Penguin Books India, 2002.
2. Parameswaran, Uma. C.V.Raman: A Biography. New Delhi: Penguin Books India, 2011.

WEB RESOURCES

1. www.esl-lab.com
2. www.englishgrammar.org
3. www.englishclub.com
4. www.mindtools.com
5. www.esl.about.com

MA8251

MATHEMATICS II

L T P C

(Common to All Branches of B.E. / B.Tech. Programmes in II Semester) 3 1 0 4

OBJECTIVE

To impart the fundamental knowledge about differential equations, vector calculus, analytic functions, complex integration and Laplace transforms.

OUTCOME

- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I DIFFERENTIAL EQUATIONS

9+3

Method of variation of parameters – Method of undetermined coefficients – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

UNIT II VECTOR CALCULUS

9+3

Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral and volume integral – Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTION

9+3

Analytic functions – Necessary and sufficient conditions for analyticity – Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – Mapping by functions $w = z + c, az, 1/z, z^2$ - Bilinear transformation.

PROGRESS THROUGH KNOWLEDGE

Attested

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UNIT IV COMPLEX INTEGRATION

9+3

Line integral – Cauchy's integral theorem – Cauchy's 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 VLAPLACE TRANSFORMS

9+3

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems – 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 : 60 PERIODS

TEXT BOOKS

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40th Edition, 2007.
2. Ramana, B.V. "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi, 2010.

REFERENCES

1. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, New Delhi, 2007.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, Delhi, 3rd Edition, 2007.
3. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
4. Peter V.O'Neil, Advanced Engineering Mathematics, Cengage Learning India Pvt., Ltd, New Delhi, 2007.

OBJECTIVE

To introduce the physics of various materials relevant to different branches of technology.

OUTCOME

On completion of the course the students are expected to have a thorough knowledge on the various materials and their physical properties.

UNIT I PREPARATION AND PROCESSING OF MATERIALS

9

Phases – Phase rule – binary systems – tie line rule – lever rule – phase diagram – invariant reactions – diffusion Fick's law – Nucleation – homogeneous and heterogeneous nucleation – Free energy of formation of a critical nucleus – crystal growth – Czochralski, Bridgman, Solution methods - Thin films – preparation: PVD method – Sol-gel method – heat treatment and hardening processes..

UNIT II PROPERTIES OF CONDUCTING AND SUPERCONDUCTING MATERIALS

9

Classical free electron theory of metals –Fermi function - Schrödinger wave equation – Time independent and time dependent equations. Physical significance of wave function, particle in a box (in one dimension) – electrons in a metal - Density of energy states – effect of temperature on Fermi energy – carrier concentration in metals - Superconducting Phenomena, Properties of superconductors – Meissner effect and Isotope effect. Type I and Type II superconductors, High T_c superconductors – Magnetic levitation and SQUIDS.

UNIT III ELECTRONIC MATERIALS

9

Elemental and compound semiconductors – Origin of band gap in solids (qualitative) - Concept of effective mass of electron and hole – carrier concentration in an intrinsic semiconductor (derivation) – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – carrier concentration in n-type and p-type semiconductors (derivation) – variation of Fermi level with temperature and impurity concentration – Compound semiconductors – Hall effect – Determination of Hall coefficient – LED and Solar cells.

UNIT IV INSULATING AND MAGNETIC MATERIALS

9

Dielectric, paraelectric and ferroelectric materials – Electronic, Ionic, Orientational and space charge polarization – Internal field and deduction of Clausius Mosotti equation – dielectric loss – different types of dielectric breakdown – classification of insulating materials and their

applications – Introduction to magnetic materials - Domain theory of ferromagnetism, Hysteresis, Soft and Hard magnetic materials – Anti-ferromagnetic materials – Ferrites, Giant Magneto Resistance materials. Magnetic bubbles.

UNIT VCERAMIC AND NEW MATERIALS

9

Introduction to Ceramics and its applications - Ceramic Fibres - Fibre reinforced Plastics – Fibre reinforced Metal – Metallic glasses – Shape memory alloys – Copper base alloys – Nickel – Titanium alloys – Relaxor- Ferroelectric materials – Electro and magneto rheological fluids – Sensors and Actuators – polymer semiconductors – photoconducting polymers – liquid crystals – Bio-sensors – Scintillation detectors (Position sensitive) –Bio materials – hydroxyapatite – PMMA – Silicone.

TOTAL : 45 PERIODS

REFERENCES

1. Raghavan. V. Materials Science and Engineering, Prentice Hall of India, 2002.
2. Kumar.J, Moorthy Babu. S and Vasudevan. S., Engineering Physics, Vijay Nicole Imprints, 2006
3. Palanisamy.. P.K., Materials Science, Scitech., 2003.
4. Calister, W.D., Materials Science and Engineering an Introduction, John Wiley, 2003.
5. Raghavan, V., Physical Metallurgy, Prentice Hall of India, 2002.

CY8253

CHEMISTRY FOR TECHNOLOGISTS

L T P C

3 0 0 3

OBJECTIVE

To introduce the chemistry involved in various technology.

OUTCOME

On completion of the course the students are expected to have a thorough knowledge on the chemistry of water, interfaces, oils, fats, chemicals and colorants.

UNIT I WATER

9

Water quality parameters- determination of hardness (EDTA method), TDS, BOD, COD and iron and their significance. Softening – Zeolite and demineralization processes. Boiler troubles and remedies – removal of oils and silica, internal conditioning. Desalination by electro-dialysis and reverse osmosis. Water quality parameters and standards for textile wet processing.

Attested

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UNIT II CHEMISTRY OF INTERFACES

9

Interface region-curved interfaces-thermodynamics of surfaces - Surface film on liquids- Adsorption of gases on Solids-adsorption isotherms. Applications of adsorption studies- detergency, wetting, foaming, defoaming, spreading, water repellency.

UNIT III OILS, FATS, SOAPS & LUBRICANTS

9

Chemical constitution, Chemical analysis of oils and fats – acid, saponification and iodine values, Definitions, determinations and significance. Definition, mechanism of lubrication, preparation of petrolubes, desirable characteristics – viscosity, viscosity index, carbon residue, oxidation stability, flash and fire points, cloud and pour points, aniline point.

Semisolid lubricant – greases, preparation of sodium, lithium, calcium and axle greases and uses, consistency test and drop point test. Solid lubricants – graphite and molybdenum disulphide

UNIT IV CHEMICALS AND AUXILIARIES

9

Surfactant Chemistry, bleaching powder, sodium hypochlorite, hydrogen peroxide, chlorine dioxide, preparation, estimation of available chlorine in hypochlorite bleach liquor. determination of strength of hydrogen peroxide.

UNIT V COLORANTS

9

Theory of color and constitution: chromophore and auxochrome, classification of dyes based on application. Chemistry and synthesis of, azo dye.

TOTAL : 45 PERIODS

REFERENCES

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
3. Puri B. R., Sharma L. R. and Madhan S. Pathania, "Principles of Physical Chemistry", Shoban Lal Nagin Chand & Co., Jalandar, 2000
4. Shore J., "Colourants and Auxiliaries: Volume I Colorants", Wood head Publishing Ltd., 2002, ISBN 0 901956 77 5
5. Shore J., "Colourants and Auxiliaries: Volume II Auxiliaries", Wood head Publishing Ltd., 2002, ISBN 0 901956 78 3
6. Trotman E. R., "Dyeing and Chemical Technology of Textile Fibres", B.I Publishing Pvt. Ltd., New Delhi, 1994

7. Shenai V. A., "Chemistry of Dyes and Principles of Dyeing", Sevak Publications, Mumbai, 1995

GE8251

ENGINEERING MECHANICS

L T P C

3 1 0 4

OBJECTIVE

- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering

OUTCOME

On completion of the course the students are expected to study the effect of force and motion in various design functions of engineering.

UNIT I BASICS AND STATICS OF PARTICLES

9+3

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces — Vectorial representation of forces – Vector operations of forces –additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility.

UNIT II EQUILIBRIUM OF RIGID BODIES

9+3

Free body diagram – Types of supports –Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force –Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III PROPERTIES OF SURFACES AND SOLIDS

9+3

Centroids and centre of mass– Centroids of lines and areas – Rectangular, circular, triangular areas by integration – T section, I section, - Angle section, Hollow section by using standard formula –Theorems of Pappus – Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem –Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia –mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.

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UNIT IV DYNAMICS OF PARTICLES

9+3

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's laws of motion – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies.

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS

9+3

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction –wedge friction-. Rolling resistance –Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/ wheel and sphere.

TOTAL: 60 PERIODS (L:45 + T:15)

TEXT BOOKS

1. Beer, F.P and Johnson Jr. E.R. "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004)
2. Vela Murali, "Engineering Mechanics", Oxford University Press (2010)

REFERENCES

1. Hibbeler, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education (2010).
2. Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and Dynamics", 4th Edition, Pearson Education (2006)
3. J.L.Meriam and L.G.Kraige, " Engineering Mechanics- Statics – Volume 1, Dynamics- Volume 2, Third Edition, John Wiley & Sons,(1993)
4. Rajasekaran, S and Sankarasubramanian, G., "Engineering Mechanics Statics and Dynamics", 3rd Edition, Vikas Publishing House Pvt. Ltd., (2005).
5. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, (1998).
6. Kumar, K.L., "Engineering Mechanics", 3rd Revised Edition, Tata McGraw - Hill Publishing Company, New Delhi (2008).

LT8201

INTRODUCTION TO LEATHER MANUFACTURE

L T P C

3 0 0 3

AIM

This course aims at introducing the fundamentals of chemistry and technology of leather manufacture.

OBJECTIVES

This course objective is to introduce the fundamentals of chemistry and technology of leather manufacture.

OUTCOMES

Through this course the student gains an appreciation of the underpinning science and technology involved in manufacturing of leathers.

UNIT I HIDES/SKINS AND PRESERVATION 10

Functions and properties of skins and hides; Histological characteristics of hides and skins - Cow, Ox, Buff, Cow Calf, buff calf, Goat and Sheep; Chemical constituents of hides and skins; Brief study of various fibrous and non-fibrous proteins;

Standard flaying techniques; Hide/skin putrefaction and factors involved; Various preservation techniques and their principles; Defects in hides and skins; Raw material grading – Size, weight and surface defects as criteria.

UNIT II PRETANNING PROCESSES 12

Principles and objectives of pretanning processes viz., soaking, liming, deliming, bating, pickling, depickling, degreasing and depickling.

UNIT III TANNING PROCESSES 10

Various types of tanning materials; Organic and mineral tanning agents; Principles involved in vegetable and chrome tanning and their mechanism in brief; Combination tannages.

UNIT IV POST TANNING PROCESSES 7

Principles and objectives of post tanning processes viz., rechroming, neutralisation, retanning, dyeing and fatliquoring; Various mechanical operations involved; Methods of drying.

PROGRESS THROUGH KNOWLEDGE

Attested

Sobhan
DIRECTOR

Centre For Academic Courses
Anna University, Chennai-600 025.

UNIT V FINISHING TECHNIQUES

6

Principles and objectives of leather finishing; Classification of leather finishing; Types of auxiliaries and finishes used; General machinery employed in leather finishing

TOTAL : 45 PERIODS

TEXT BOOKS

1. Sarkar, K.T., Theory and Practice of Leather Manufacture Ajoy Sorcor, Madras, 1981.
2. Dutta, S.S., Introduction to the Principles of Leather Manufacture, Indian Leather Technologists Association, Calcutta, 1980.
3. Sharpouse, J.H., "Leather Technicians Handbook", Leather Producers Association, Northampton NN3 1JD, Reprinted 1995. Fred O Flaherty, Roddy, T.W. and Lollar, R.M. 'The Chemistry and Technology of Leather', Vol.I & II, Type of tannages, Rober E. Krieger Publishing Co., New York, 1977.
4. Beinkiewicz, K. 'Physical Chemistry of Leather Making', Robert E. Krieger Publishing Co., Florida, 1983.

PH8261

APPLIED PHYSICS LABORATORY
(In common with Textile Technology)

L T P C
0 0 2 1

OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

OUTCOMES

- The students will have the ability to test materials by using their knowledge of applied physics principles in optics and properties of matter.

LIST OF EXPERIMENTS

1. X-ray powder method
2. Study of crystal lattices
3. Torsion test
4. Density measurements of fibres
5. Electrical resistance measurement
6. Optical absorption –Spectrometer
7. FTIR study
8. pH measurement

9. Thermal conductivity
10. Di-electric constant
11. Viscosity of liquid
12. Strain gauge meter – Young's modulus
13. Instrumentation amplifier
14. Electrical conductivity
15. Creep characterization
16. Melt flow index of polymers

TOTAL : 30 PERIODS

CY8261

APPLIED CHEMISTRY LABORATORY
(In common with Textile Technology)

L T P C
0 0 2 1

OBJECTIVE

- To make the student acquire practical skills in the wet chemical and instrumental methods for quantitative estimation of hardness, alkalinity, metal ion content, corrosion in metals and cement analysis.

OUTCOMES

- The students will be conversant with hands-on knowledge in the quantitative chemical analysis of water quality related parameters, corrosion measurement and cement analysis.

LIST OF EXPERIMENTS

1. Preparation of solutions with various normality and molarity.
2. Determination of Redwood / Saybolt numbers, kinematic viscosity and viscosity index of lubricating oils
3. Determination of flash point, fire point, cloud and pour point of oils
4. Determination of acid value, saponification number and iodine value of oils
5. Determination of total, temporary, permanent, calcium and magnesium hardness of water samples
6. Determination of chloride, sulphate, and COD of water samples
7. Determination of purity of washing soda and strength of a commercial acid
8. Estimation of available chlorine in hypochlorite solution
9. Estimation of strength of hydrogen peroxide
10. Synthesis of a dye, preparation of soap and a defoamer

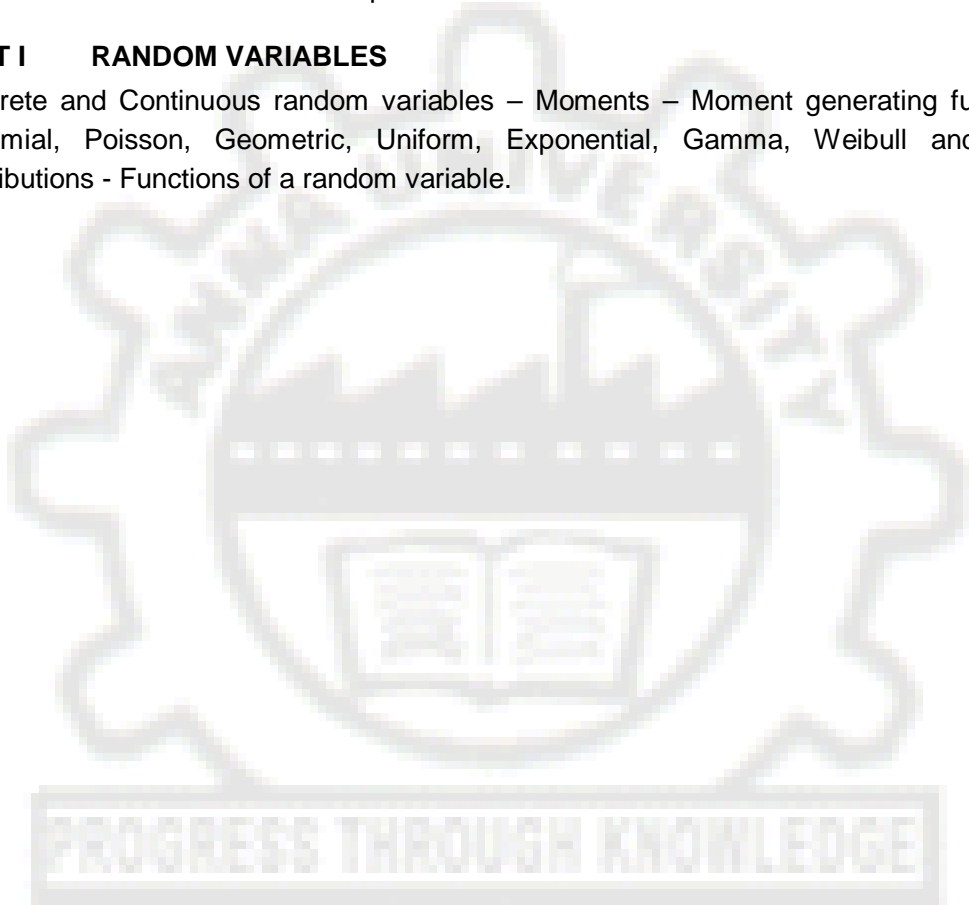
TOTAL : 30 PERIODS

OBJECTIVES

- To provide the necessary basic concepts in probability and random processes and apply them in random signals, linear systems etc. in communications engineering.
- The students will have an exposure of various distributions.

UNIT I RANDOM VARIABLES**9+3**

Discrete and Continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.



UNIT II TWO-DIMENSIONAL RANDOM VARIABLES

9+3

Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III RANDOM PROCESSES

9+3

Classification – Stationary process – Markov process - Poisson process – Random telegraph process.

UNIT IV CORRELATION AND SPECTRAL DENSITIES

9+3

Auto-correlation functions – Cross-correlation functions – Properties – Power spectral density – Cross-spectral density – Properties.

UNIT V LINEAR SYSTEMS WITH RANDOM INPUTS 9+3

Linear time invariant system – System transfer function – Linear systems with random inputs – Auto-correlation and Cross-correlation functions of input and output - White noise.

TOTAL : 60 PERIODS

TEXT BOOKS

1. Ibe, O.C. “Fundamentals of Applied Probability and Random Processes”, Elsevier, U.P., 1st Indian Reprint, 2007.
2. Peebles, P.Z., “Probability, Random Variables and Random Signal Principles”, Tata McGraw Hill, New Delhi, 4th Edition, 2002.

REFERENCES

1. Yates, R.D. and Goodman, D.J., “Probability and Stochastic Processes”, John Wiley and Sons, 2nd Edition, 2005.
2. Miller, S. L. and Childers, D. G., “Probability and Random Processes with Applications to Signal Processing and Communications”, Academic Press, 2004.
3. Hwei Hsu, “Schaum’s Outline of Theory and Problems of Probability, Random Variables and Random Processes”, Tata McGraw Hill, New Delhi, 9th Reprint, 2010.

Attested

Sobhan
DIRECTOR

AIM

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

OBJECTIVES

To have thorough understanding on the theory of instrumentation and applications of analytical equipment used for testing of various products with special reference to leather technology. To know the importance of analytical instrumentation during the purification, compounding and formulating the finished product

OUTCOMES

Students can understand the principle and importance of various analytical instruments used for the characterization of various materials

UNIT I INTRODUCTION TO SPECTROSCOPICAL METHODS OF ANALYSIS 3

Electromagnetic Radiation; Various ranges, Dual properties, Various energy levels, Interaction of photons with matter, absorbance, and transmittance and their relationship, Permitted energy levels for the electrons of an atom and simple molecules, classification of instrumental methods based on physical properties.

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

UNIT II MOLECULAR SPECTROSCOPY 13

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

UNIT III ATOMIC SPECTROSCOPY 5

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

*Attested**Sobhan*
DIRECTOR

POLARIMETRY AND REFRACTOMETRY

3

Polarimetry and refractometry Principle, instrumentation and Applications.



UNIT IV THERMAL ANALYSIS

5

Thermogravimetry: Instrumentation, factors affecting the shapes of thermograms, applications, thermograms of some important compounds ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, $\text{CaC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ etc; Differential thermal analysis: principle, Instrumentation and applications, differences between DSC and DTA, Applications of DSC (Inorganic and Polymer samples)

UNIT V CHROMATOGRAPHIC METHODS

6

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

TOTAL : 45 PERIODS

Text Book

1. Willard, H.H., Merritt.L.L., Dean J.A., and Settle, F.A., Instrumental methods of analysis, Sixth edition, CBS publishers, 1986.

REFERENCES

1. Parikh V .M. Absorption spectroscopy of organic molecules Addison –Wesley Publishing company, 1994.
2. Skoog D.A. and West D.M.M., Fundamentals of Analytical Chemistry, Saunders – college Publishing, 1982.
3. Banwell, G.C., Fundamentals of molecular spectroscopy TMH, 1992.

EE8252 PRINCIPLES OF ELECTRICAL AND ELECTRONICS ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

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

OUTCOMES:

- ability to identify the electrical components explain the characteristics of electrical machines.
- ability to identify electronics components and use of them to design circuits.

UNIT I ELECTRICAL CIRCUITS

Basic principles involved in power generation, transmission and use – Ohms Law Kirchoff's Law – steady state solution of DC circuits – Theorem: Thevinin's, Norton's and Superposition Theorems.\

UNIT II AC CIRCUITS

9

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

UNIT III ELECTRICAL MACHINES

9

Principles of operation and characteristics of DC machines. Transformers (single and three-phase) – synchronous machines – three-phase and single-phase induction motors – (op. Principles).

UNIT IV ELECTRONIC DEVICES & CIRCUITS

9

Types of Materials –Silicon & Germanium- N type and P type materials – PN Junction – Forward and Reverse Bias –Semiconductor Diodes –Rectification – Bipolar Junction Transistor – Characteristics – transistor as an Amplifier –Introduction to operational Amplifier –Inverting Amplifier –Non Inverting Amplifier –DAC – ADC .

UNIT V MEASUREMENTS & INSTRUMENTATION

9

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

TOTAL : 45 PERIODS

REFERENCES

1. Del Toro, "Electrical Engineering Fundamentals", Pearson Education, New Delhi, 2007
2. John Bird, "Electrical Circuit Theory and Technology", Elsevier, First Indian Edition, 2006

3. Allan S Moris, "Measurement and Instrumentation Principles", Elseveir, First Indian Edition, 2006
4. Rajendra Prasad, "Fundamentals of Electrical Engineering", Prentice Hall of India, 2006
5. Thereja .B.L., "Fundamentals of Electrical Engineering and Electronics", S. Chand & Co. Ltd., 2008
6. Sanjeev Sharma, "Basics of Electrical Engineering", S.K International Publishers, New Delhi, 2007
7. V.K Mehta and Rohit Mehta, "Principle of Electrical Engineering", S. Chand & Company, 2008.

LT8301

BASIC BIOCHEMISTRY AND MICROBIOLOGY

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

OBJECTIVE

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

OUTCOMES

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

UNIT I

3

Introduction

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

UNIT II

12

Nucleic Acids

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

Proteins

Amino acids: classification and structures of standard amino acids. Classification of proteins based on solubility, shape, composition and functions. Protein structure : levels of structure and protein architecture, primary structure of proteins, secondary structure of proteins- helix and pleated sheets, tertiary structure of proteins, forces stabilizing the tertiary structure and

Attested

Sobhan
DIRECTOR

quarternary structure of proteins, denaturation and renaturation of proteins, behavior of proteins in solutions, salting in and salting out of proteins. Structure and biological functions of fibrous proteins, (keratin, collagen and elastin), globular proteins (hemoglobin and myoglobin), lipoproteins, metalloproteins, glycoproteins and nucleoproteins; Enzymes and their industrial applications.

UNIT III

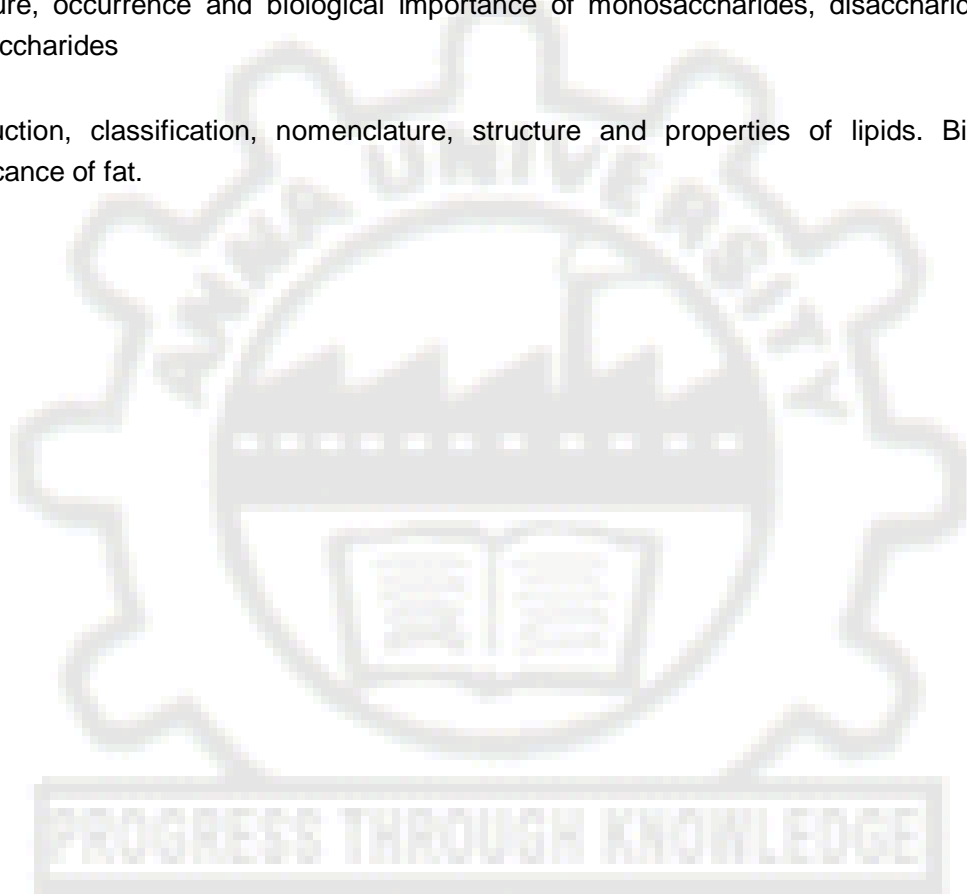
12

Carbohydrates

Structure, occurrence and biological importance of monosaccharides, disaccharides and polysaccharides

Lipids

Introduction, classification, nomenclature, structure and properties of lipids. Biological significance of fat.



UNIT IV MICROBES- STRUCTURE AND MULTIPLICATION

10

Basics of microbial existence; History of microbiology, classification and nomenclature of microorganisms, microscopic examination of microorganisms, light and electron microscopy; principles of different staining techniques like gram staining, acid fast, capsular staining, flagellar staining. Structural organization and multiplication of bacteria, viruses, algae and fungi, with special mention of life history of actinomycetes, yeast, mycoplasma and bacteriophages.

UNIT V MICROBIAL NUTRITION AND GROWTH

8

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

TOTAL : 45 PERIODS

REFERENCE BOOKS

1. Lehninger's Principle of Biochemistry: (3rd ed. 2002), Nelson, L. D. and M. M Cox, Macmillan, Worth Publication Inc.
2. Biochemistry: (4th ed. 1992) Stryer, L., W.H. Freeman & Co. NY
3. Biochemistry with Clinical Correlation: (5th ed., 2002) Thomas M. Devlin, Wiley- Liss Publication.
4. Biochemistry: (2nd ed.1995) Voet&Voet, John Wiley and Sons.
5. Biochemistry: (3rd ed. Vol.1, 2, 3, 1993) JeoffreryZubay, Wm C. Brown Publ
6. Principle of Microbiology: (2nd ed.1997) R.M. Atlas, Wm.C Brown., IOWA.
7. Microbial Physiology: (3rded.) Albert G. Moat and John W. Foster A. Johnewiley& Sons. Inc. Publication.
8. Microbiology: (5th ed. 2003) Pelczar& Chan, Tata McGraw Hill Publishing Co. Ltd.
9. General Microbiology: (2nd ed. vol-1, 2, 1989) Power &Daginawala, Himalaya Publishing House.
10. Biochemistry of Bacterial Growth: (4th ed.) Joet Mandelstam, Kenneth McQuillen, lanDawed. Blackwell Scientific Publication.

OBJECTIVE

To impart fundamental knowledge on inorganic and organic chemistry that is essential for leather technologists

OUTCOME

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

UNIT I INTRODUCTION TO INORGANIC COMPOUNDS 10

A brief survey of the 's' block - binary compounds, complexes, alkalides and electrides. Features of the 'p' block and its elements - expansion of the octet, Lewis structures; 'd' orbitals and transition metals; Coordination compounds –nomenclature, Theories - Coordination theory, Werner's theory; Stereo chemistry

UNIT II MOLECULAR BONDING 10

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

UNIT III OILS, FATS AND WAXES 10

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

UNIT IV HETEROCYCLIC AND ANTIMICROBIAL COMPOUNDS 6

Definition and reactions of Pyrrole, Furan, Thiophene, Pyridine - Reactions of furfural- Synthesis of Isoriazid; Antibacterial drugs-Synthesis of Sulphanilamide and sulphapyridine.

UNIT V DYES AND DYEING 9

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

Text Books

1. J W Huheey, E A Keiter and R L Keiter, 'Inorganic Chemistry' 4th edn, Harper Collins
2. M J Winter, 'Chemical Bonding' Oxford Primer Series, Oxford University Press, 1994
3. N C Norman, 'Periodicity and the p-block Elements' Oxford Primer Series, Oxford University Press, 1994
4. R.T. Morrison and R.N.Boyd "Organic Chemistry" VI Edition Prentice Hall Inc (1996) USA
5. K.S.Tiwari, N.K.Vishnoi and S.N.Malhotra "A text book of Organic Chemistry" Second Edition, Vikas Publishing House Pvt. Ltd. (1998) New Delhi.

REFERENCES

1. Chemistry in Engineering and Technology, Vol.2, TMH Publishing Co Ltd., New Delhi, 1994
2. I L Finar "Organic Chemistry" ELBS (1994).

LT8303 THEORY OF SKIN PROTEINS AND PRE-TANNING PROCESSES

L T P C
3 0 0 3

AIM

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

OBJECTIVES

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

OUTCOMES

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

UNIT I COMPONENTS , FUNCTIONS AND COMPOSITION OF SKIN 9

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

UNIT II STRUCTURE, FUNCTION, THERMAL TRANSITION AND DEGRADATION OF COLLAGEN 12

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

UNIT III PRETANNING PROCESSES 10

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

UNIT IV CLEANER PROCESSING IN BEAMHOUSE PRACTICES 7

Salt-free curing options, sulphide free unhairing systems, ammonia-free deliming, salt free pickling systems, solvent and eco friendly degreasing systems. Strategies to bring down BOD, COD and TDS standards of tannery effluents.

UNIT V PRACTICE AND QUALITY CONTROL 7

Different methods of pretanning processes as applied to light, heavy and industrial leathers. Process control in pretanning operations.

TOTAL : 45 PERIODS

Text Books

1. Lehninger A.L., Nelson D.L., Cox M.M., "Principles of Biochemistry", CBS Publications,1993.

2. Gustavson, K.H., 'The Chemistry & Reactivity of Collagen', Academic Press, New York.
3. Flaherty, O., William Roddy, T. Robert, M. Lollar, 'The Chemistry and Technology of Leather', Vol.1 Preparation for Tannage, E Robert Krieger Publishing Company, New York, 1978.
4. Bienkiewicz, "Physical Chemistry of Leather Manufacture", Krieger, Florida, 1982.

REFERENCES

1. Voet D., Voet G., "Biochemistry ", Second Edition, John Wiley and Sons, 1994.
2. Stryer L., "Biochemistry ", Fourth Edition, 1994.
3. Darnell J., Lodish H., Baltimore D., "Molecular Cell Biology ", Freeman W.H., 1990.

EE8261

ELECTRICAL AND ELECTRONICS LAB

L T P C

0 0 3 2

OBJECTIVE:

To impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics and simulation of time response. To expose the students to the basic operation of electrical machines and help them to develop experimental skills.

OUTCOME:

Ability to understand and analyze Instrumentation systems and their applications to various industries

LIST OF EXPERIMENTS

1. Study of DC & AC Starters
2. Wheatstone Bridge and Schering Bridge
3. Speed Control of DC Shunt Motor
4. Load Test on DC Shunt Motor
5. OCC & Load Characteristics of DC Shunt Generator
6. Load Test on Single-Phase Transformer
7. Load Test on Three-Phase Induction Motor
8. Load Test on Single-Phase Induction Motor
9. Study of Transducers
10. ADC and DAC Converters

TOTAL : 45 PERIODS

50

Attested

Sobhan
DIRECTOR

Centre For Academic Courses
Anna University, Chennai-600 025.

AIM

To provide an introduction to the production of chrome and vegetable tanned leathers from raw hides and skins.

OBJECTIVES

To provide practical knowledge on the production of chrome and vegetable tanned leathers from raw hides and skins.

OUTCOMES

Students will have practical skill to make chrome and vegetable tanned leathers from raw hides and skins

1. Assortment of hides and skins
2. Various methods of Curing
3. Manufacture of wet-blue from hides and skins
4. Manufacture of E.I and vegetable tanned leathers
5. Introduction to various post tanning and finishing processes for the manufacture of upper and garment leathers
6. Introduction to various mechanical operations/processing equipments/devices

TOTAL : 60 PERIODS

PROGRESS THROUGH KNOWLEDGE

Attested

Sobhan
DIRECTOR

Centre For Academic Courses
Anna University, Chennai-600 025.

OBJECTIVES

To provide the mathematical foundations of numerical techniques for solving linear system, eigen value problems, interpolation, numerical differentiation and integration and the errors associated with them;

OUTCOMES

To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.

UNIT I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 9+3

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss Elimination method – Pivoting - Gauss-Jordan methods – Iterative methods of Gauss-Jacobi and Gauss-Seidel - Matrix Inversion by Gauss-Jordan method - Eigenvalues of a matrix by Power method and by Jacobi's method.

UNIT II INTERPOLATION AND APPROXIMATION 9+3

Interpolation with unequal intervals - Lagrange interpolation – Newton's divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton's forward and backward difference formulae – Least square method - Linear curve fitting.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9+3

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 and Simpson's 3/8 rules – Romberg's method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9+3

Single step-methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first and second order equations - Multi-step methods - Milne's and Adams-Bashforth predictor-corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

9+3

Finite difference methods for solving two-point linear boundary value problems. Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL : 60 PERIODS

TEXT BOOKS

1. Grewal, B.S. and Grewal, J.S., "Numerical methods in Engineering and Science", Khanna Publishers, New Delhi, 9th Edition, 2007.
2. Sankara Rao, K. "Numerical methods for Scientists and Engineers", Prentice Hall of India Private Ltd., New Delhi, 3rd Edition, 2007.

REFERENCES

1. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education Asia, New Delhi, 1st Edition, 2007.
2. Gerald, C.F. and Wheatley, P.O., "Applied Numerical Analysis", Pearson Education Asia, New Delhi, 6th Edition, 2006.
3. Laurene V. Fausett, "Applied Numerical Analysis using MATLAB", Pearson Education, New Delhi, 1st print, 2nd Edition, 2009.

CY8402

PHYSICAL CHEMISTRY FOR LEATHER TECHNOLOGIST

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

OBJECTIVE

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

OUTCOMES

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

UNIT I PHASE RULE

9

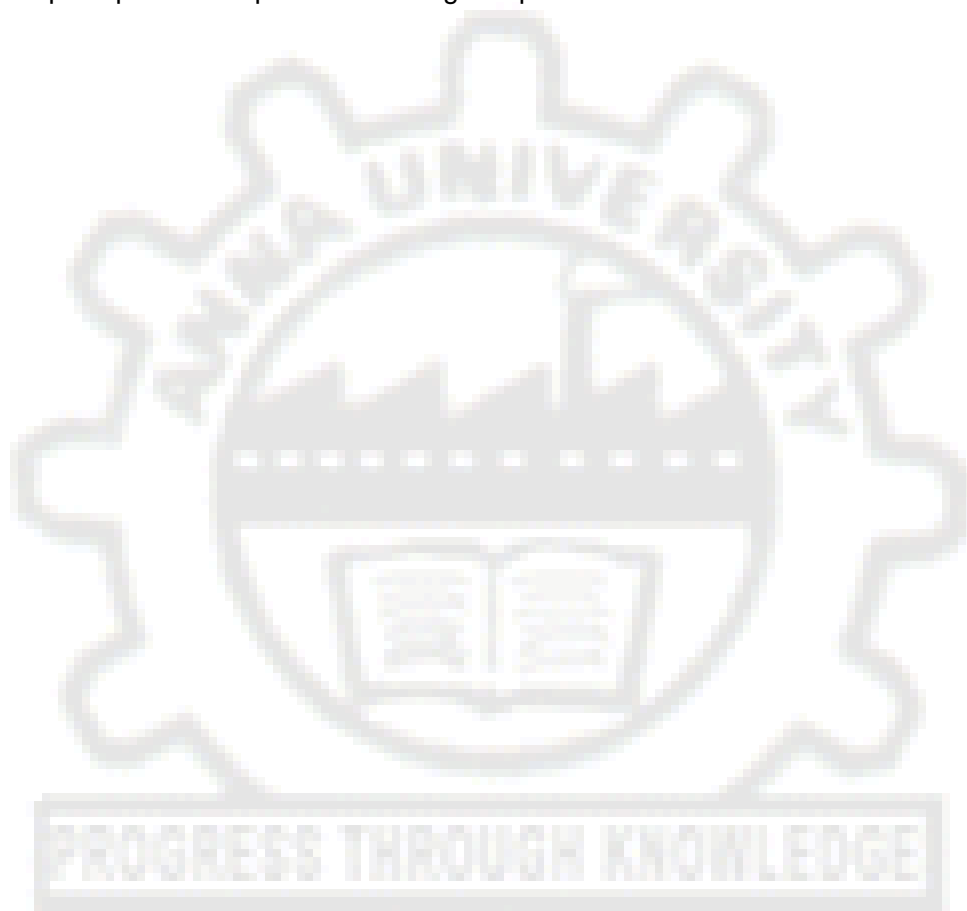
Definition – Application of phase rule to water system – Thermal Analysis – Cooling curves – Two component system – Eutectic and compound formation-Liquid –liquid equilibria-

Distillation of binary liquid mixture- Azeotropic distillation-Fractional distillation-partially miscible liquid-CST-Immiscible liquid-Steam distillation

UNIT II IONIC EQUILIBRIA

9

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 III 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

UNIT IV SURFACTANTS

9

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

UNIT V APPLICATION TO LEATHER TECHNOLOGY

9

Wetting, Cohesion & Adhesion, Contact Angle, Foams, detergency, Emulsions, stability, Surface properties and Membrane technology.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Puri B.H. Sharma L.R and M.S.Prathama, Principles of Physical Chemistry, S. Chand and Company, Delhi (2001).
2. Gordon M. Barrow, Physical Chemistry, Sixth edition, Tata McGraw Hill (1998).
3. Bienkiewicz, "Physical chemistry of leather making", Krieger Publishing Co., Florida, 1983.
4. Introduction to Colloid and Surface Chemistry, Duncan J. Shaw, Butterworth, Hewemann, (1992).

LT8401 TECHNOLOGY OF HEAVY LEATHER MANUFACTURE

L T P C

AIM

3 0 0 3

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

Attested

Sobhan
DIRECTOR

Centre For Academic Courses
Anna University, Chennai-600 025.

OBJECTIVES

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

OUTCOMES

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

UNIT I SOLE, HARNESS AND SADDLERY LEATHERS 9

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

UNIT II INDUSTRIAL LEATHERS 9

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

UNIT III SPORTS GOODS LEATHERS 9

Different types of raw materials used, physical and chemical properties required and process details to achieve the specifications for the following sports goods leathers: Leathers for football, rugby ball, volley ball, hockey ball and cricket ball. Glove leathers for wicket keepers and boxing. .

UNIT IV FINISHED LEATHERS FROM HIDES 9

Different types of raw materials used, physical and chemical properties required and process details to achieve the specifications for the following leathers: Full chrome, Semi chrome and Chrome retan - uppers, suedes, nubuck, lining, nappa, shrunken grain, upholstery, Dressing of E.I. kips into upper, lining and leathers for leathergoods, burnishable, printed leathers, Case hides.-Kattai and banwar from buff calf; Bag tanned leather and their use in traditional products

UNIT V UPGRADATION AND QUALITY CONTROL 9

Attested

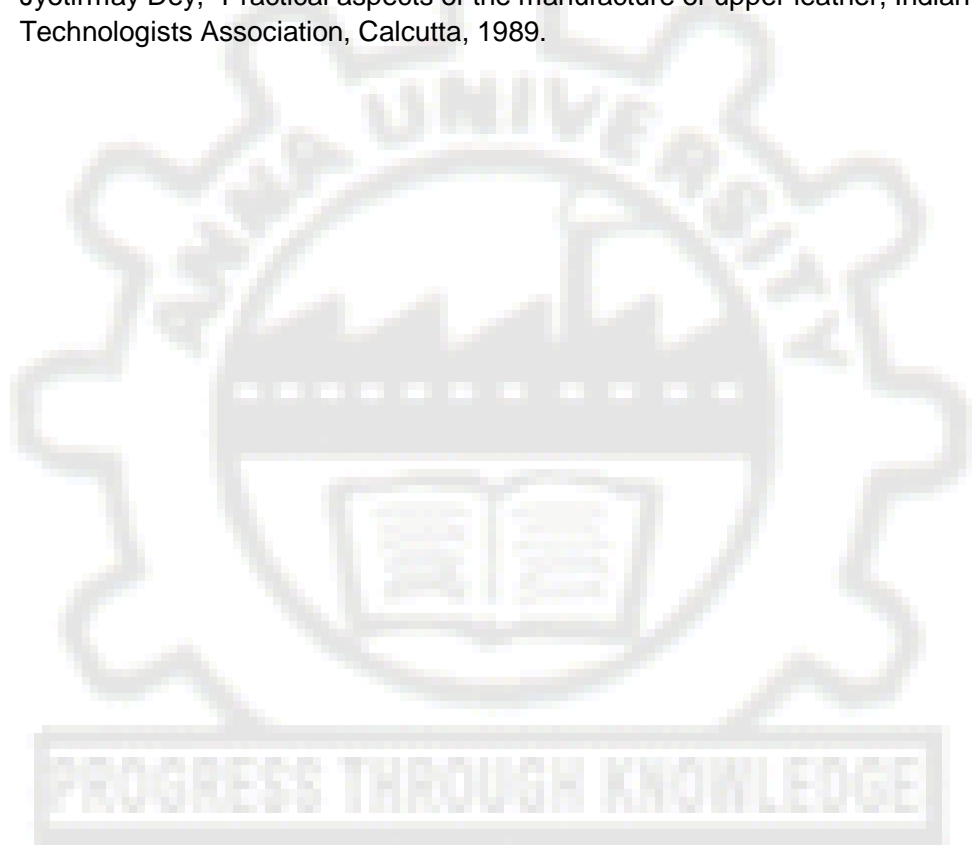
Sobhan
DIRECTOR

Upgradation technologies; Rectification of defects in hides; Control of area, yield, color and finish of leathers; Quality control in heavy leather manufacture.

TOTAL : 45 PERIODS

TEXT BOOKS

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. Jyotirmay Dey, 'Practical aspects of the manufacture of upper leather, Indian Leather Technologists Association, Calcutta, 1989.



AIM

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

OBJECTIVES

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

OUTCOMES

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

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, McCandish precipitation point.

UNIT III FACTORS CONTROLLING CHROME TANNING**8**

Single and double bath chrome tannages and their relative merits and demerits, preparation of basic chromium sulphate (BCS) salt, reaction parameters influencing composition of BCS, kinetics of chrome tanning, diffusion and complexation, effects of float volume, pH, basicity, masking, temperature, drum speed, ageing chrome tanned substrates.

UNIT IV MECHANISM OF CHROME TANNAGE

9

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

UNIT V OTHER INORGANIC TANNAGES

10

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

Total : 45 Periods

REFERENCES

1. Fred O Flaherty, Roddy, T.W. and Lollar, R.M. 'The Chemistry and Technology of Leather', Vol.III, 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.
4. Covington A D, 'Tanning Chemistry' RSC Publishing, Cambridge, UK, 2009.

LT8403

**THEORY AND PRACTICE OF VEGETABLE AND
ORGANIC TANNAGES**

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

AIM

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

OBJECTIVES

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

OUTCOMES

The students will gain a thorough understanding on vegetable tannins and their application in vegetable tanning process. This subject also provide a glimpse of other organic tannages

UNIT I VEGETABLE TANNINS

14

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

UNIT II CONSTITUENTS OF VEGETABLE TANNING MATERIALS

7

Tannins as well as non-tannins, polyphenolic constituents present in popular tanning materials like avaram, konnam, wattle, cutch, babul, myrobalan, etc., and their physico-chemical properties and their effect on the physical properties of leathers.

PROGRESS THROUGH KNOWLEDGE

Attested

Sobhan
DIRECTOR

UNIT III MECHANISM AND PRACTICE OF VEGETABLE TANNING 10

Mechanism of reaction of vegetable tannins with collagen. Electrolytic equilibria, diffusion equilibria, fixation and absorption equilibria. General practices in vegetable tanning. Pit tanning and drum tanning. Manufacture of E.I. leathers - Modern practices in E.I. tanning.

UNIT IV OTHER ORGANIC TANNAGES 8

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

UNIT V PREPARATION OF VEGETABLE TANNIN EXTRACTS AND SYNTHETIC TANNING AGENTS 6

Methods of preparation of vegetable tannin extracts, spray dried vegetable tannins, synthetic and other organic tannages.

TOTAL : 45 PERIODS

TEXT BOOKS

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". "A survey of modern vegetable tannages". Tanning extracts Producers Federation, Switzerland, 1975.
4. Humphreyes, 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".
5. O'Flaherty and Roddy,T.W. , Lollar, R.M. "The Chemistry and Technology of Leather", Vol. II. Krieger Publishing Corpn., New York, 1977.
6. Gustavson, K.H. "Chemistry of Tanning Processes" Academic Press, New York, 1950.
7. 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.

Attested

Sobhan
DIRECTOR

AIM

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

OBJECTIVES

At the end of the course, the student would understand

- The analytical chemistry behind testing of leather chemicals and leathers
- The principle used in instrumental techniques
- Various methods of analyses of leather chemicals, spent process liquors and pelts/leathers
- Quality Standards of various leather chemicals and leather end products

OUTCOMES

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

UNIT I ANALYSIS OF PRETANNING & TANNING AGENTS/CHEMICALS 15

Principles of analytical methods employed in analysis of pretanning chemicals – Water, Common salt, lime, unhairing, deliming and bating agents; Vegetable tanning materials and extracts; Aldehydes; Chrome extracts and liquors; Zirconium, Titanium, Aluminium, Iron and THPS tanning agents; Specifications recommended by standards organizations.

UNIT II ANALYSIS OF POST TANNING AND FINISHING CHEMICALS 8

Principles of analytical and instrumental methods employed in analysis of neutralising agents, syntans, dyes, oils and fats, fatliquors, post tanning auxiliaries, pigments, resin binders, wax emulsions, fillers, lacquers and lacquer emulsions and finishing auxiliaries; Specifications recommended by standards organizations.

UNIT III ANALYSIS OF PROCESS LIQUORS AND EMISSIONS 8

Principles of analytical and instrumental methods employed in analysis of exhaustion liquors

of pretanning, tanning and post tanning processes. Analysis of emissions - air pollutants from leather processing; Specifications recommended by standards organizations.

UNIT IV ANALYSIS OF TANNED LEATHERS 8

Principles of analytical and instrumental methods employed in analysis of various chrome leathers, vegetable tanned leathers; Specifications recommended by standards organizations.

UNIT V ANALYSIS OF ECO-SENSITIVE SUBSTANCES IN LEATHER 6

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

TOTAL : 45 PERIODS

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 (Reaffirmed 2003) Bureau of Indian Standards, New Delhi.
4. Fred O Flaherty, Roddy, T.W. and Lollar, R.M. 'The Chemistry and Technology of Leather', Vol.IV, Evaluation of leather, Rober E. Krieger Publishing Co., New York, 1977.

LT8411

MATERIAL TESTING LABORATORY – I

L T P C

0 0 4 2

AIM

To provide practical knowledge and the skill on chemical analyses of various leather chemicals, process liquors, effluent and pelts/leathers at various stages of processing and eco-sensitive chemicals present in leather.

OBJECTIVES

To impart practical knowledge on chemical analysis of various leather chemicals, process liquors, effluent and pelts/leathers at various stages of processing and eco-sensitive chemicals present in leather

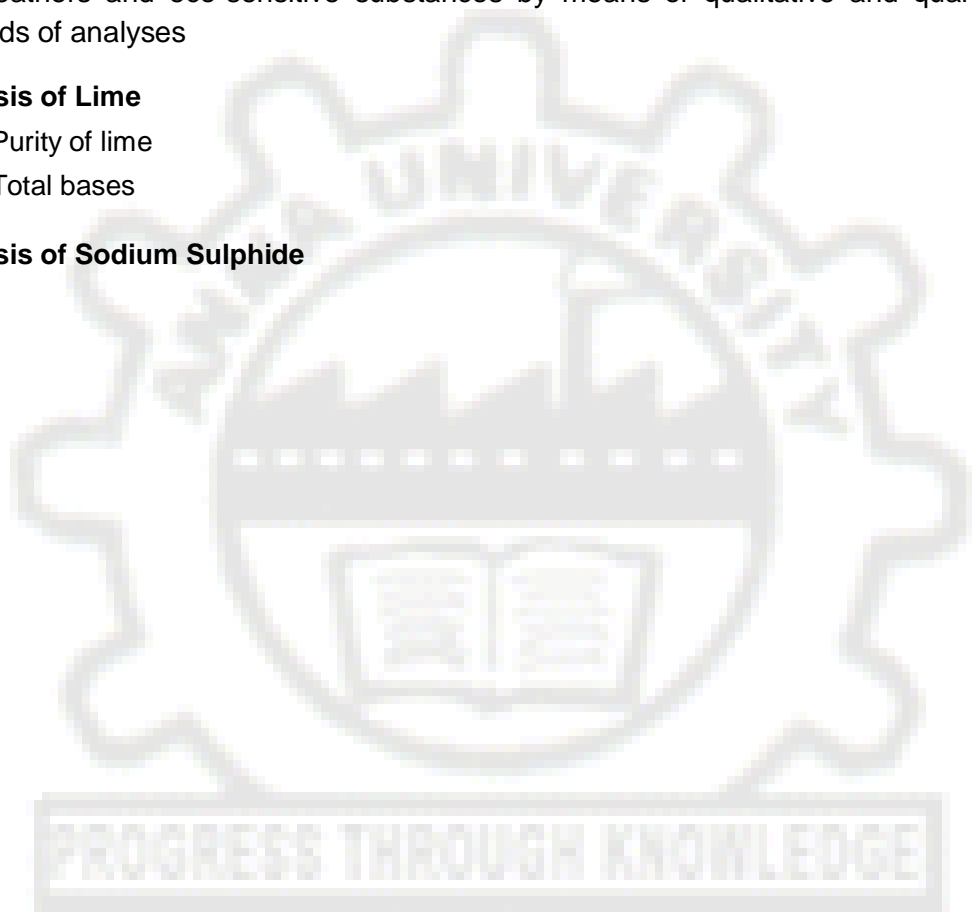
OUTCOMES

Students will have practical experience on the analysis of various leather chemicals, pelts/leathers and eco-sensitive substances by means of qualitative and quantitative methods of analyses

Analysis of Lime

- a. Purity of lime
- b. Total bases

Analysis of Sodium Sulphide



Analysis of Deliming Agents

- a. Analysis of ammonium salts
- b. Analysis of boric acid

Analysis of Bate

Analysis of Vegetable Tanning Materials

- a. Qualitative analysis
- b. Quantitative analysis
- c. Acids and Salts in Vegetable Tannin Extracts by Different Methods

Analysis of Chrome tanning agents

- a. Moisture
- b. Cr_2O_3 content
- c. Acid combined with chromium
- d. Basicity: Proctor and Lehigh basicities
- e. Degree ofolation

Analysis of Syntans

Quantification of phenolic content & free formaldehyde

Analysis of Oils and fatliquors

- a. Moisture
- b. Acid value
- c. Saponification value
- d. Iodine value
- e. Free fatty acids
- f. Unsaponifiables
- g. Total alkalinity

Analysis of pretanned pelts and tanned leathers

Analysis of process liquors

Soak, Lime, Pickle Liquor, Chrome and Vegetable tan liquors; BOD, COD, TOC, TDS, TS in composite liquors/waste waters.

AIM

To carry out the practical leather processing of heavy and finished leathers from raw hides.

OBJECTIVES

At the end of the course students will gain confidence in manufacturing

- Heavy leathers like sole, saddle, belting etc., from hides
- Finished leathers from different bovine hides and calf skins

OUTCOMES

Students will gain the skill set to make heavy and finished leathers from raw hides and calf skin

Manufacture of vegetable tanned and chrome sole leathers;

Waterproofing of sole leathers;

Processing of Industrial leathers like belting, hydraulic and pneumatic leathers;

Processing of harness and saddle leathers;

Manufacture of sports goods leathers – football leathers, cricket and hockey ball leathers, sports glove from hides

Manufacture of following leathers (minimum three) from different raw materials and tannages:

- Picking band leathers and stropping leathers
- Upholstery leathers
- Upper leathers
- Zug grain upper leathers
- Nappa leathers
- Patent leathers
- Shrunken grain leathers
- Suede upper leathers
- Burnishable upper leathers
- Oil-pull up leather

- Inorganic and organic tannages other than chromium and vegetable respectively.
- Eco friendly options for different unit operations.
- Water and energy saving during leather processing.

TOTAL : 90 PERIODS



Attested

Sahjan
DIRECTOR

Centre For Academic Courses
Anna University, Chennai-600 025.

OBJECTIVE

To impart knowledge on the synthesis and characterization of polymers

OUTCOMES

This subject will provide the students a basic understanding on polymers which will be useful for them to connect their role in leather and synthetics manufacture

UNIT I**9**

Introduction to natural and synthetic polymers; Terms and fundamental concepts; Step-growth polymerization, Carother's equation, Functionality, Crosslinking; PET manufacturing; Chain growth polymerization, Free radical polymerization, Kinetics of free-radical initiation, termination, chain transfer, Mayo's equation, cage effect, autoacceleration, inhibition and retardation;

UNIT II**9**

Polypropylene manufacturing; Acrylic manufacturing; Atom transfer radical polymerization, ionic polymerization, ring opening polymerization; Nylon-6 manufacturing; Co-polymerization and its importance. Copolymer equation, reactivity ratio, tailor making of copolymer properties; Techniques of chain polymerization; Bulk, solution, emulsion, microemulsion and suspension polymerization; chemical modification of fibres; Polymer solution, Flory's theory; Interaction parameter.

UNIT III**9**

Molecular weight and its distribution by: End group analysis, osmometry, light scattering, ultra centrifugation, gel permeation chromatography, intrinsic viscosity; Spectroscopic methods of polymer characterization such as, FTIR. UV, NMR and others.

UNIT IV**9**

Compounding of polymers - fillers, plasticizers, antioxidants, UV stabilizers, colouring agents and flame retardants. Polymer processing - compression, moulding, injection, extrusion, calendaring and film casting; Preparation and properties of polyesters, polyamides, epoxy and silicone polymers; Conductive polymers, super absorbent polymers.

Recycling, remoulding, depolymerisation, incineration, biodegradable polymers.

TOTAL : 45 PERIODS

REFERENCES

1. Joel R., "Fried Polymer Science and Technology", Journal of Chemical Association, ACS Publications, 2004.
2. Fred W Billmeyer, "Textbook Of Polymer Science", John Wiley & Sons, 1984-03
3. Hearle, J.W.S, "Polymers and their Properties", E. Horwood, New York, 1982
4. Lenz RW , "*Organic Chemistry of Synthetic High Polymers*", Interscience Publishers, New York, 1967
5. Anil Kumar, Rakesh K Gupta, "Fundamentals of Polymers", McGraw-Hill, New York, 1998
6. Stephen Z. D. Cheng and Bernhard Wunderlich, "*Polymer Science*", Polymer Physics Ed., 1986
7. Mishra G. S., "*Introductory Polymer Chemistry*", John Wiley & Sons, Dhanpat Rai & Co. Pvt. Ltd., 2003
8. Gowariker V. R., Viswanathan N. V., and Jayadev Sreedhar, "Polymer Science", New Age International (P) Limited publishers, Bangalore, 2001
9. William D. Callister, Jr, "Materials Science and Engineering – An Introduction", Sixth Edition, John Wiley & Sons, Inc., 2004

LT8502

TECHNOLOGY OF LIGHT LEATHER MANUFACTURE

L T P C

3 0 0 3

AIM

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

OBJECTIVES

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

OUTCOMES

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

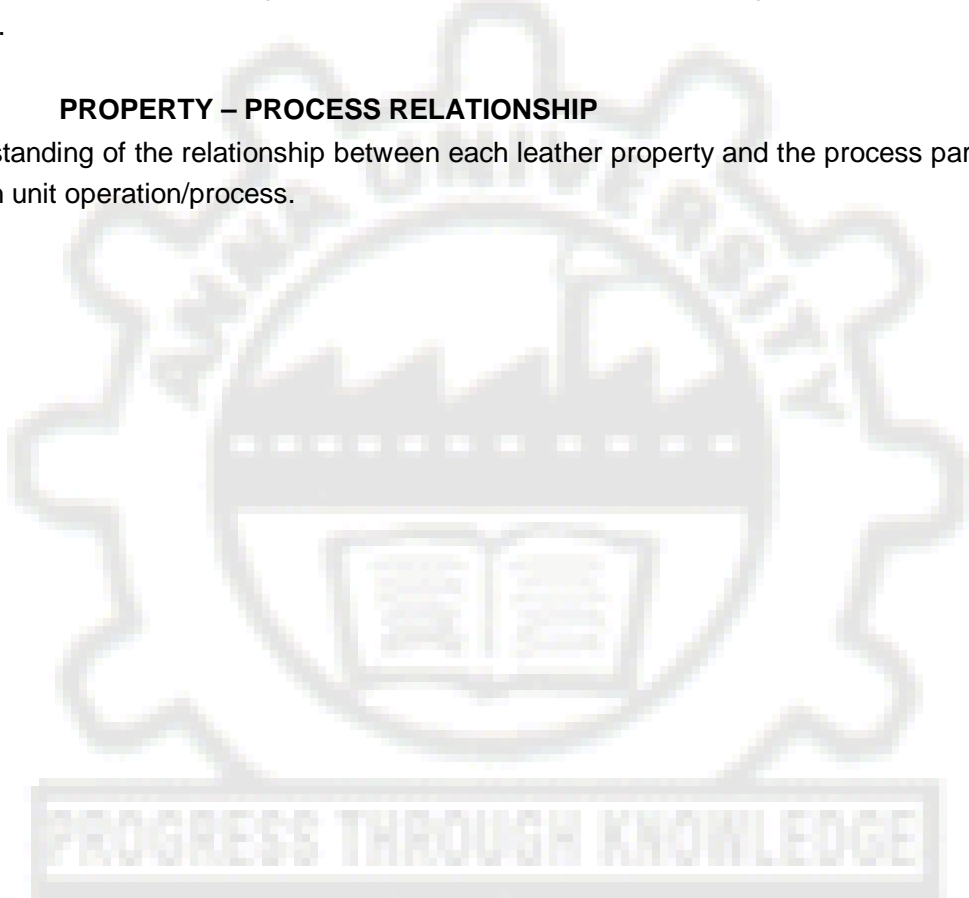
UNIT I PROPERTIES OF LEATHER 9

Definition and understanding of various physical, chemical and organo-leptic properties of leather.

UNIT II PROPERTY – PROCESS RELATIONSHIP

8

Understanding of the relationship between each leather property and the process parameter of each unit operation/process.



UNIT III PRODUCT BRIEF OF LIGHT LEATHERS**8**

Product brief i.e, property requirements w.r.t. product manufacture and use of different light leathers

UNIT IV PROCESS DESIGN**8**

Concept of designing the process of manufacture of light leathers of different product briefs.

UNIT V LIGHT LEATHER MANUFACTURE**12**

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

TOTAL : 45 PERIODS**TEXT BOOKS**

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.

LT8503 THEORY AND PRACTICE OF POST TANNING PROCESSES**L T P C****3 0 0 3****AIM**

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

OBJECTIVES

To impart knowledge on

- Chemistry of post tanning auxiliaries.
- Mechanism of dyeing, fatliquoring and retanning
- Practice of Post tanning processes

OUTCOMES

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

UNIT I DYES AND DYEING OF LEATHER**10**

Theory of colours, chromophoric groups and their optical absorption, structural features of dyes, factors affecting hue and colour, intensity; Classification of dyes based on their chemical

nature, application and colour index, properties; blending of dyes, theory and practice of colour matching, theory and mechanism of dyeing, chemistry and application of dyeing auxiliaries such as leveling agents, dispersing agents and dye fixatives.

UNIT II FATLIQUORS AND FATLIQUORING OF LEATHER 10

Fatliquors – chemical classification, natural and synthetic oils. Unit operations: Sulphation, sulphonation, sulphitation reactions of oils, role of double bonds and iodine value in oils. Stability of emulsions, grain and particle sizes of emulsions, factors controlling grain sizes of emulsions. Mechanism of fatliquoring process and softening of leathers.

UNIT III SYNTANS AND RETANNING OF LEATHER 10

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

UNIT IV PRACTICE OF POST TANNING PROCESSES AND OPERATIONS 10

Practice of post tanning processes viz., neutralization, retanning, dyeing, fatliquoring and Post tanning process technologies for products from different types of leathers.

UNIT V POST TANNING MECHANICAL OPERATIONS 5

Sammying, splitting and shaving, drying, staking, toggling, buffing etc operations – understanding and judicious application of these operations to meet the end product parameters.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Venkataraman, K. 'Chemistry of Synthetic Dyes', Academic Press, New York and Lond, 1971.
2. 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.
3. Billmeyer and Saltzman's, 'Principles of Color Technology', - Wiley – Inter Sciences Publication.
4. Dutta, S.S., Introduction to the Principles of Leather Manufacture, Indian Leather Technologists Association, Calcutta, 1980.
5. Gustavson, K.H. 'Chemistry of Tanning Processes' Academic Press, New York, 1956.

Attested

Sobhan
DIRECTOR

AIM

To impart knowledge on analytical methods for physical testing of leathers and related microscopical and bacteriological tests of leather and leather chemicals

OBJECTIVES

To impart knowledge on

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

OUTCOMES

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

UNIT I MICROSCOPY**10**

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

UNIT II BACTERIOLOGY**8**

Structure of bacterial cell, nutritional requirements, culture media, sterilization, staining of bacterial cells. Effect of environmental factors on bacterial growth, enzymes of bacteria, biochemical properties of bacteria, control of bacterial growth. Testing of bacterial action on raw hides and skins and in the different stages of Leather Manufacture.

UNIT III MOULD & PEST CONTROL**10**

Structure of moulds associated during different stages of leather manufacture. Effect of environmental factors on mould growth. Effect of mould growth during processing of skins/hides, finished leathers, leather goods and during transportation. Testing and prevention of mould growth during processing, storage of finished goods and transportation. Parasitic

OUTCOMES

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



Attested

Sobhan
DIRECTOR

Centre For Academic Courses
Anna University, Chennai-600 025.

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 stagewise contact.

Distillation: Principle of distillation, Application of distillation in leather chemicals and auxiliaries processing.

Extraction: Extraction principles, Leaching and Extraction equipment and their application in manufacture of leather chemicals

Drying: Drying characteristics, Theory and mechanism of drying, estimation of drying rate, design and performance of industrial dryers for leather.

Humidification: Humidity charts, methods of humidification and dehumidification; Equipments and their design aspects; Humidity control in leather processing.

UNIT III MECHANICAL SEPARATIONS

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 principles of unit operations and unit processes in leather & leather chemicals processing: General concepts of unit operations and unit processes in leather & leather chemicals processing. Development of process flow sheets with reference to leather and leather chemical industries design, control safety pollution abatement. Principles of halogenation, esterification, hydrolysis, oxidation, hydrogenation. Polymerization, sulphation and sulphonation, diazotization and coupling.

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Tanning agents: Vegetable tannins and Vegetable tannin extracts, Basic Chromium Sulphate, Aluminium, and Zirconium, salts for leather processing.

Oils, fats and detergents: Oils and fats; their nature and products derived from oils and fats, Fatty Acids and Alcohols, waxes and fatliquors.

Synthetic binders: Binders on acrylics, polyamides, polyesters, polyurethanes, polypropylene

Dyes and intermediates & surface coating agents: Raw materials; important unit processes; Types of dye intermediates and dyes; pigments, lacquers

Recent developments in chemicals for leather manufacture: Recent developments like REACH and its implications on leather chemicals; Alternate eco-benign leather chemicals and auxiliaries for leather manufacture.

UNIT V WATER AND INORGANIC CHEMICALS

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.
6. Shreve, R.N., Austin, G.T., Shreve's Chemical Process Industries, McGraw-Hill Book company, 1984.
7. Groggins, P.H., Unit Processes in Organic synthesis, McGraw-Hill Book company, 5th Edition, 2004.
8. Dutta, S.S., An introduction to the principles of leather manufacture, ILTA.
9. Thorstensen, T.C., Practical Leather Technology, Krieger Publications, 1993

(Common to all branches of Fifth or Sixth Semester B.E / B.Tech programmes)

OBJECTIVES

- To enhance the employability skills of students with a special focus on Presentation skills, Group discussion skills and Interview skills
- To help them improve their soft skills, including report writing, necessary for the workplace situations
 1. Making presentations – introducing oneself – introducing a topic – answering questions – individual presentation practice
 2. Creating effective PPTs – presenting the visuals effectively
 3. Using body language with awareness – gestures, facial expressions, etc.
 4. Preparing job applications – writing covering letter and résumé
 5. Applying for jobs online – email etiquette
 6. Participating in group discussions – understanding group dynamics – brainstorming the topic
 7. Training in soft skills – persuasive skills – sociability skills – questioning and clarifying skills – mock GD
 8. Writing reports – collecting, analyzing and interpreting data – drafting the report
 9. Attending job interviews – answering questions confidently
 10. Interview etiquette – dress code – body language – mock interview

TOTAL 30: PERIODS

Requirements for a class of 30 students

1. A PC or a lap top with one or two speakers
2. A Collar mike and a speaker
3. An LCD projector and a screen
4. CD's and DVD's on relevant topics
5. Individual chairs for conducting group discussions

REFERENCE BOOKS

1. Dhanavel, S.P. 2010. English and Soft Skills. Hyderabad: Orient BlackSwan Ltd.

2. Corneilssen, Joep. How to Prepare for Group Discussion and Interview. New Delhi: Tata-McGraw-Hill, 2009.
3. D'Abreo, Desmond A. Group Discussion and Team Building. Mumbai: Better Yourself Books, 2004.
4. Ramesh, Gopalswamy, and Mahadevan Ramesh. The ACE of Soft Skills. New Delhi: Pearson, 2010.
5. Gulati, Sarvesh. Corporate Soft Skills. New Delhi: Rupa and Co. 2006.
6. Van Emden, Joan, and Lucinda Becker. Presentation Skills for Students. New York: Palgrave Macmillan, 2004.

EXTENSIVE READERS

1. Covey, Stephen R. The 7 Habits of Highly Effective People. New York: Free Press, 1989.
2. Bagchi, Subroto. The Professional. New Delhi: Penguin Books India, 2009.

WEB RESOURCES

1. www.humanresources.about.com
2. www.careerride.com

LT8511

MATERIAL TESTING LABORATORY - II

**L T P C
0 0 6 3**

AIM

To provide practical knowledge on microscopical and microbiological testing of leathers physical testing of leathers.

OBJECTIVES

To provide practical knowledge microbiological testing and physical testing of leathers

OUTCOMES

At the end of the course, the students would have practical experience and understanding in

- Microscopical analysis/identification of leathers

- Microbiological testing of raw skins/hides, pelts and leathers and various process liquors
- Physical testing of leathers

MICROSCOPY LAB

- Setting up of a compound microscope
- Preparation of microscopical slides by paraffin embedding method and by freezing method
- Identification of hides and skins from their histological structures and from their grain pattern- Buffalo, Cow, Sheep and Goat
- Microscopical assessment of fibre structure during the process - Soaking, liming, pickling and tanning and different finished leathers.

MICROBIOLOGY LAB

- Preparation of various culture media
- Staining of bacteria
- Enumeration of bacteria in hides and skins and in tan liquors
- Isolation and identification of fungi/mold/yeast in raw hides/skins, leathers and tan liquors
- Mildew resistance test for leathers
- Identification of insect and parasitic damages in skins/hides/leathers (Entomology demo only)

PHYSICAL TESTING LAB

Strength Properties

- Tensile Strength and Elongation at break
- Tongue tear strength
- Stitch tear and slit tear strengths
- Grain crack and bursting strengths

Wear and Comfort Properties

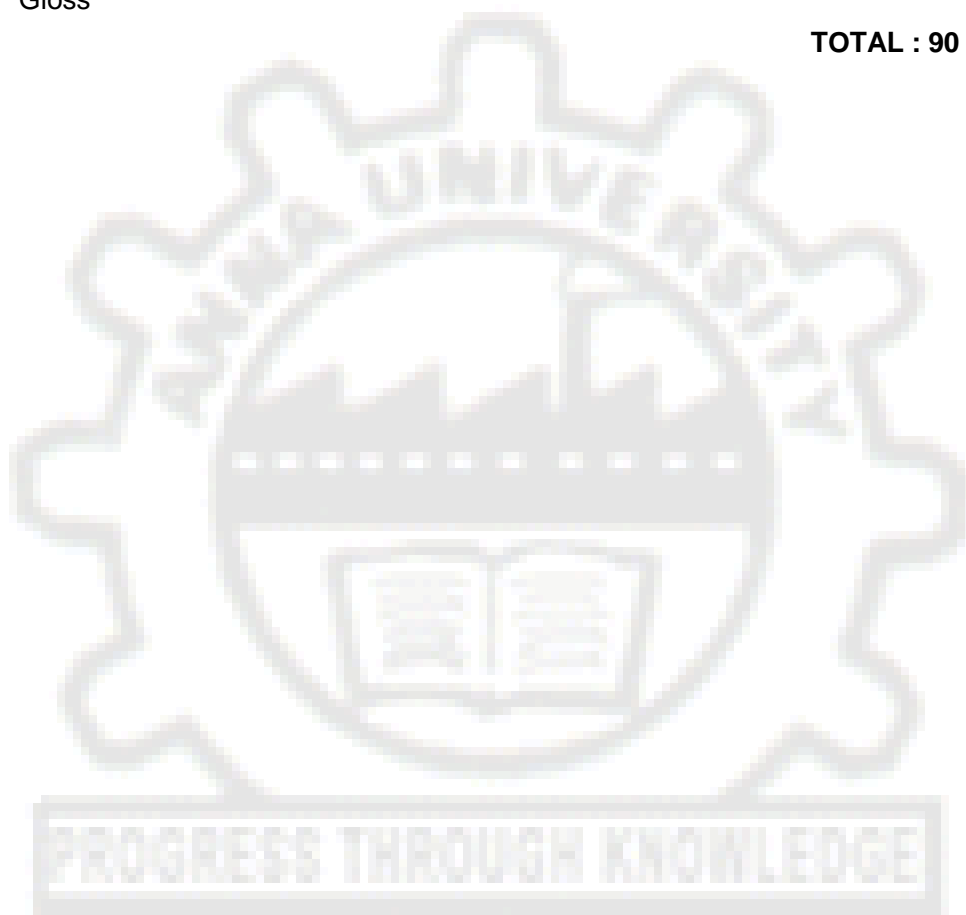
- Static/dynamic water absorption
- Water vapour permeability
- Abrasion resistance

d. Perspiration resistance

Fastness Properties

- a. Rub fastness
- b. Water fastness
- c. Heat fastness
- d. Light fastness
- e. Gloss

TOTAL : 90 PERIODS



AIM

To carry out the practicals for manufacture of light leathers from raw goat, sheep and calf skins.

OBJECTIVES

To provide practical knowledge on light leathers from raw and intermediate processed materials from goat, sheep and calf skins.

OUTCOMES

At the end of the course students will gain confidence in processing

- Upper, Lining, Nappa, Suede, Nubuck, Glove leathers from different skins
- Specialty leathers from different skins

Practical training (minimum 6 leathers) on the manufacture of

White Leather from wet white tanning (compulsory)

Resin and protein upper leathers

Nappa leathers

Glazed kid leathers

Nubuck leathers

Dress glove

Utility glove leathers

Crushed kid leathers

Suede upper leathers

Suede garment leathers

Mesh leathers

Hair-on/Fur-on leathers

Chamois leathers

TOTAL : 60 PERIODS

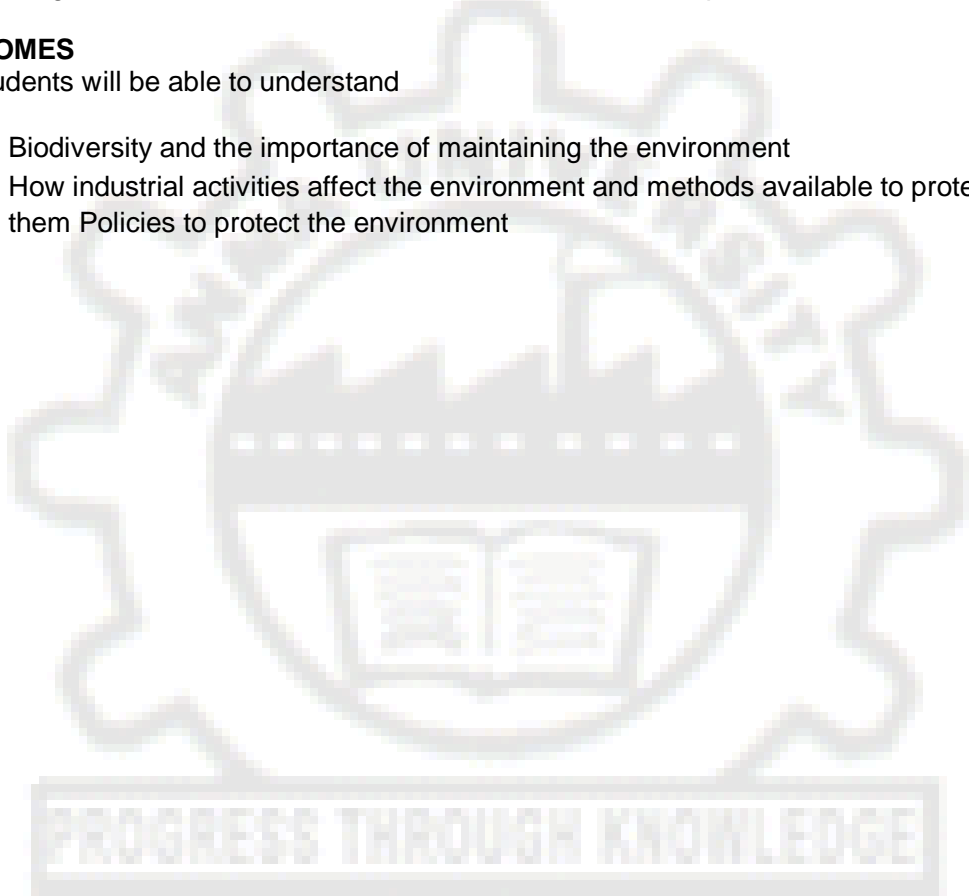
OBJECTIVE

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

OUTCOMES

The students will be able to understand

- Biodiversity and the importance of maintaining the environment
- How industrial activities affect the environment and methods available to protect them Policies to protect the environment



UNIT I ENVIRONMENT, ECOSYSTEMS, BIODIVERSITY AND SUSTAINABLE DEVELOPMENT 8

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

UNIT II ENVIRONMENTAL POLLUTION AND CHEMISTRY 14

Definition of pollution- different types of environmental pollution- classification of pollutants in water and wastewater – characterization of pollutants in water and wastewater – environmental significance - types of sampling, significance of sampling, precautions to be taken while sampling and preservation of samples.

Atmospheric structure and composition - definition of air pollution – sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- ambient air quality and emission standards –photochemical smog, ozone layer depletion, greenhouse gases, global warming, acid rain and their effect on environment.

Definition, types and sources of solid and hazardous wastes - need for solid and hazardous waste management – elements of integrated waste management and role of stakeholders – definition, types and sources of nuclear and radioactive wastes – waste management and disposal.

UNIT III WASTEWATER TREATMENT AND DISPOSAL 10

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

UNIT IV ENVIRONMENTAL IMPACT & RISK ASSESSMENT 9

Definition and over view of Environmental Impact Assessment (EIA), key issues in EIA, legal and regulatory aspects in India – types and limitations of EIA –public participation in EIA- EIA process: screening, scope, setting, analysis – risk analysis - sources of environmental risks – risk management - risk communication and risk perception- emergency preparedness.

UNIT V ENVIRONMENTAL POLICIES AND LEGISLATION 4

Environmental legislations in India- environment protection act – air (prevention and control of pollution) act – water (prevention and control of pollution) act – wildlife protection act – forest

conservation act – solid and hazardous waste management rules - biomedical waste rules – responsibilities of generators- role and responsibility of pollution control boards.

TOTAL : 45 PERIODS

REFERENCES

1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).
2. Sawyer,C.N., MacCarty, P.L. and Parkin, G.F., Chemistry for Environmental Engineering and Science, Tata McGraw – Hill, Fifth edition, New Delhi 2003.
3. Metcalf and Eddy, Wastewater Engineering, Treatment and Reuse, Tata McGraw Hill, New Delhi, 2003.
4. Peavy HS, Rowe DR, Tchobanoglous G (1985) Environmental Engineering. (Eds: McGraw-Hill International Editions), Civil Engineering Series, 577.
5. Petts, J., Handbook of Environmental Impact Assessment, Vol., I and II, Blackwell Science, London, 1999.

LT8602

LEATHER GOODS AND GARMENTS TECHNOLOGY

LT P C

3 0 0 3

AIM

To impart knowledge on making leather goods and garments

OBJECTIVES

To impart knowledge on making leather goods and garments

OUTCOMES

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 goods 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 other materials; Accessories for Leather goods & garments - Various types of fasteners, fittings and other

Attested

Sobhan
DIRECTOR

accessories. Alternative materials and their adaptability for goods and garments.
Operational sequences in leather goods and garments production.

UNIT II

12

- i) Production planning - Nomenclature used for component identification in various leather garments skirts, jackets, trouters etc and various leather goods – Wallet, hand bags, Executive bags etc. Process scheduling and line balancing.
- ii) Cutting and clicking - Hand & machine cutting, Knives & tools – Preparation and handling. Pattern interlocking/nesting for material optimization. Factors influencing cutting value.
- iii) Assembling- Pre assembly and assembly operations – skiving, splitting, folding, sewing etc. Various types of assembly techniques for leather goods and garments.
- iv) Quality - Quality control measures in leather products manufacture.

UNIT III MACHINERY

9

Machinery needs for leather goods and garments manufacture. Various types of sewing machines – flat bed, cylinder bed, post bed and other special sewing machines – different feed mechanisms.

Clicking, splitting, skiving, folding, embossing, creasing machines – their working principles operation and maintenance.

UNIT IV DESIGN & DEVELOPMENT

9

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

UNIT V ORGANISATION & MANAGEMENT

7

Project Feasibility reports, 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

REFERENCES

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. Skiving Manual, First Edition, 1994 CLRI, Madras.
6. A course manual on leather garment pattern designing.
7. Leather garments making, NIMI publication, 2012.
8. Leather and sports goods – Pattern and Template marker, NIMI Publications, 2011

LT8603

LEATHER MACHINERIES

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

AIM

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

OBJECTIVES

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

OUTCOMES

At the end of the course, the students would understand the

- General principles involved in various machineries used in leather manufacture.
- Salient features and purpose of the various machinery used
- Preventive maintenance and safety in the use of leather machinery
- Adjustment of machinery parts for proper functioning of different machines used in leather processing
- Design of optimal machinery layout of tannery

UNIT I GENERAL PRINCIPLES AND MECHANISM OF LEATHER MACHINERY 12

involved in various tannery machines. Mechanism of cutting and shearing action of helical blade systems. Bush, ball, roller and ring oil bearing, cam springs and their application and function in tannery machinery.

UNIT II DESIGN, MATERIAL SELECTION AND CONSTRUCTION OF EQUIPMENT 12

Basic design, material selection and construction of pits, drums and paddles. Pneumatic

steering mechanism and control as applied to dust control equipment, air compressor, auto spray, etc. Hydraulic steering mechanism in case of shaving, staking, embossing machines, etc.



UNIT III MECHANICAL FEATURES OF LEATHER MACHINERY **12**

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

UNIT IV TANNERY LAYOUT **5**

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

UNIT V PREVENTIVE MAINTENANCE AND SAFETY **4**

Preventive maintenance and safety in the use of leather machinery

TOTAL : 45 PERIODS

REFERENCES

1. Walter Landmann, The Machines in the Tannery – A Review of Leather Producing Machinery and Equipment in current use, World Trades Publishing, UK, 2003
2. Thomas C.Thorstensen, Practical Leather Technology- Robert E.krieger Publishing Company, Huntington, New york, 1976.

LT8604 **THEORY AND PRACTICE OF LEATHER FINISHING** **L T P C**
3 0 0 3

OBJECTIVES

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

OUTCOMES

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

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

UNIT I COATING SCIENCE 9

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

UNIT II PIGMENTS 9

Classification of pigments; Inorganic, organic, nacreous (pearlescent) and interference pigments - their representation code in the colour index. Different forms of pigments - powders and pastes. Evaluation and control of their brilliance, opacity, particle size, resistance to solvent, heat and light and colour matching.

UNIT III POLYMERIC MATERIALS AND THEIR DISPERSION FORMS 9

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

UNIT IV PRINCIPLES OF FINISHING, FINISH FORMULATIONS AND THEIR APPLICATION 9

Resistance to heat, light and solvent. Pigment volume concentration, plasticizer, wetting agents, role in dispersion and stability - requirements in multiple coat technique – such as clearing coat, sealer coat, base coat, top and feel coat. Single coat composition methods like spraying, curtain coating, roller coating etc. Cationic finishes and their relative merits. Foam finish; Eco- friendly finishing - Volatile Organic Compounds (VOC) reductions. Finish formulation for various types of leathers.

UNIT V COATING METHODS AND NOVEL FINISHING SYSTEMS 9

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

TOTAL : 45 PERIODS

REFERENCES

1. Pattern. T.E., Pigment Hand Book, vol.3 ed. W.J., New York, 1973.
2. Patterson, P., Pigments - An Introduction to Theory of Physical Chemistry, Elsevier Publishing Co. Ltd., Amsterdam, 1967.
3. Treatise on coating, Misers and Long Ed., Marcel Dekker, New York (5 Vol.)
4. Sharphouse, J.H., "Leather Technicians Handbook", Leather Producers Association, Northampton NN3 1JD, Reprinted 1995.

LT8611

LEATHER GOODS AND GARMENTS – DESIGN AND FABRICATION LABORATORY

**L T P C
0 0 4 2**

OBJECTIVE

To impart practical knowledge on making leather goods and garments.

OUTCOMES

At the end of this course students will be able understand the practical intricacies involved in design and fabrication of leather goods and garments

Leather Assortment

Pattern preparation/nesting

Cutting of leather and other materials

Table work / pre assembly operations

Assembling and stitching operation

Pattern design for leather goods and garments.

Pattern grading and practice in CAD/CAM.

Practice in leather goods and garments making

TOTAL : 60 PERIODS

LT8612

LEATHER MACHINERY LABORATORY

**L T P C
0 0 4 2**

OBJECTIVES

To impart practical knowledge on the working principles and maintenance of machineries used in leather manufacture.

OUTCOMES

This course will provide practical exposure on the functioning and maintenance of different machine used in leather manufacture



- Adjusting the position of different rollers in a splitting machine to get the required thickness while splitting.
- Adjusting the grinding stones to achieve the required level profile in a splitting band knife.
- Adjusting the position of rollers in a shaving machine to achieve proper thickness
- Replacing the worn-out helical blades in a shaving machine
- Procedure to be followed in removing the worn-out knife
- Replacing the rubber beading in a drum door.
- Changing the main ball bearing in a drum
- Tightening the V-belts in a drum
- Adjusting the worn-out staking blades in a slocomb staking machine for proper staking
- Increasing the staking pressure
- Selection and fixing of the emery paper in a buffing machine
- Adjusting the lateral oscillation of a buffing cylinder
- Adjusting the feed roll position for proper buffing
- Fixing the felt in a buffing machine
- Fixing the glass roll in a glazing machine
- Fixing the leather strap to the cast iron bed of a glazing machine
- Increasing the glazing bed
- Adjusting the various knobs in a spray gun to achieve proper spraying over leather
- Adjusting the air compressor pressure for proper spraying

TOTAL : 60 PERIODS

PROGRESS THROUGH KNOWLEDGE

LT8613

TANNERY PRACTICE - IV

L T P C
0 0 4 2

OBJECTIVES

To provide practical training in various methods of finishing of leathers.

OUTCOMES

At the end of this course the students will have skill set to handle process/operations in finishing various leathers

- Modern methods of finishing
- Use of cross linkers ,Feel modifiers
- Water repellent finish formulations.
- Finishing using Roller coaters, Transfer coating m/c
- Cationic and foam finishing technologies.
- Patent finishing using Roller Coaters
- Trouble shooting in finishing.
- Finishing of various types of leathers – chrome-free, exotic, upholstery and water-repellant leathers

TOTAL : 60 PERIODS

LT8701

LEATHER FOOTWEAR TECHNOLOGY

L T P C
3 0 0 3

OBJECTIVE

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

OUTCOMES

At the end of this course students will be able know about

- various components used for the manufacture of footwear
- processing steps involved in the making of leather footwear
- different machineries involved in the footwear manufacture
- techniques to design and develop leather footwear

UNIT I FOOTWEAR MATERIALS AND COMPONENTS**9**

Different types of upper and lining leathers; Different types of soling materials; Different types of adhesives used in footwear industry; Kinds of insole boards, Grinders; Fasteners; Shoe dressing materials etc.

UNIT II DESIGN AND PATTERN DEVELOPMENT**9**

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

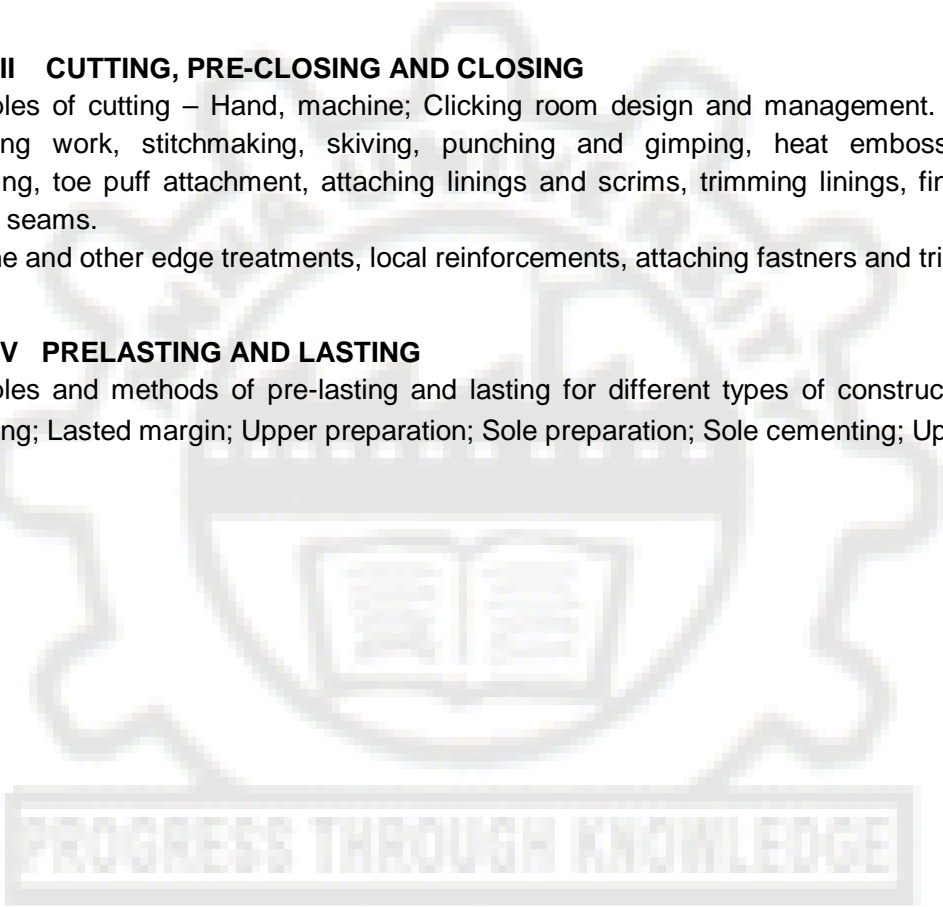
UNIT III CUTTING, PRE-CLOSING AND CLOSING**13**

Principles of cutting – Hand, machine; Clicking room design and management. Checking incoming work, stitchmaking, skiving, punching and gimping, heat embossing, flow moulding, toe puff attachment, attaching linings and scrim, trimming linings, finishing off closed seams.

Top line and other edge treatments, local reinforcements, attaching fasteners and trims.

UNIT IV PRELASTING AND LASTING**10**

Principles and methods of pre-lasting and lasting for different types of construction; Sole attaching; Lasted margin; Upper preparation; Sole preparation; Sole cementing; Upper



cementing; Bottom fillers and shanks; Adhesive drying, Heat activation, Spotting, Pressing, Last slipping, Health and safety, Quality control and fault finding problems- solving.

UNIT VMETHODS OF SHOE CONSTRUCTION

4

Various methods of shoe construction; shoe room techniques.

TOTAL : 45 PERIODS

REFERENCES

1. Cott, N.F., "American Shoe Making", Shoe Trades Publishing Co., Cambridge.1993.
2. "Apparel International" Published by P.F collier and sons, U.K, 1961.
3. "Shoes and Leather News",Published by bureau of foreign and domestic commerce, Dept of commerce, US, 1940.

LT8702

**PROCESS ECONOMICS AND INDUSTRIAL
MANAGEMENT FOR LEATHER SECTOR**

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

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.

OUTCOMES

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

UNIT I PRINCIPLES OF PRODUCTION MANAGEMENT AND ORGANISATION 15

Planning, organization, staffing, coordination, directing, controlling, communicating, organization as a process and a structure; types of organizations

Method study; work measurement techniques; basic procedure; motion study; motion economy; principles of time study; elements of production control; forecasting; planning; routing; scheduling; dispatching; costs and costs control, inventory and inventory control.

UNIT II ENGINEERING ECONOMICS FOR TECHNOLOGISTS-INTEREST, INVESTMENT COSTS AND COST ESTIMATION 10

Time Value of money; capital costs and depreciation, estimation of capital cost, manufacturing costs and working capital, invested capital and profitability.

UNIT III PROFITABILITY, INVESTMENT ALTERNATIVE AND REPLACEMENT 8

Estimation of project profitability, sensitivity analysis; investment alternatives; replacement policy; forecasting sales; inflation and its impact.

UNIT IV ANNUAL REPORTS AND ANALYSIS OF PERFORMANCE 4

Principles of accounting; balance sheet; income statement; financial ratios; analysis of performance and growth.

UNIT V ECONOMIC BALANCE AND QUALITY CONTROL 8

Essentials of economic balance – Economic balance approach, economic balance for leather and product industries. 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.

REFERENCE

1. Allen, L.A., “ Management and Organization”, McGraw Hill.

OBJECTIVE

The goal of this course is to help students to identify innovative projects that promotes creativity.

OUTCOMES

At the end of the project period, students should be familiar with current thinking in their field, and able to apply the concepts to relevant research problems or practical applications.

The aim of the this course is to develop students to take intellectual risks, to think creatively, and to create new knowledge through structured, systematic initiatives that encourage the development of creative and innovative skills. The course will help students to identify innovative projects that promote and inculcate creativity by applying concepts relevant to research applications and practical applications related to leather science and technology. Several novel *learning concepts, models, frameworks and tools that are applicative to learning and applying leather science and technology will be carried out.* Each student will be allowed to choose projects that are creative and innovative in nature, which lead to budding these skills to meet the challenges of the leather sector world-wide.

TOTAL: 30 PERIODS**OBJECTIVE**

To impart practical exposure on the industrial practices of leather or leather chemicals manufacture

OUTCOMES

The industrial internship is expected to provide practical exposure on industrial practices and instill confidence to students

Each student is required to undergo a practical training in leather processing unit/ leather chemical manufacturing unit and submit an industrial training report on practical internship

undertaken by/assigned to him by the Department. The report should be based on the practical experience gained at the industry duly certified by the issuing authority at the training centre of leather industry. The objective of the training is to make use of the practical knowledge gained on site by the student at various stages of the leather and leather chemical processing. This helps to judge the level of proficiency, originality and capacity for application of the practical knowledge attained by the student during the training period.

Student should undertake this industrial internship/training for a minimum of two weeks during the summer vacation after sixth semester. However evaluation for this course will be done in seventh semester.

TOTAL DURATION: Min 2 WEEKS

LT8713	LEATHER FOOTWEAR – DESIGN AND FABRICATION LABORATORY	L T P C 0 0 4 2
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OBJECTIVE

To impart practical knowledge on making leather footwear.

OUTCOMES

At the end of this course students will be able understand the practical intricacies involved in design and fabrication of leather footwear.

Leather Assortment

Layout preparation

Preparation and cutting

Upper preparation

Pre Assemble operation

Closing Operation

Bottom Stock Preparation

Lasting and Finishing

Practice in CAD/CAM and pattern grading using machine.

Practice in classic shoe making; moccasin construction; practice in shoe finishing

TOTAL : 60 PERIODS

MG8654

TOTAL QUALITY MANAGEMENT

L T P C

3 0 0 3

AIM

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

OBJECTIVES

The objective of this course is to introduce the students about various concepts involved in Total Quality Management system

OUTCOMES

At the end of this course the students will be to

- understand the TQM concept and principles and the various tools available to achieve total quality management.
- understand the statistical approach for quality control
- have awareness about the ISO and QS certification process and its need for the industries.

UNIT I INTRODUCTION

9

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality - Basic concepts of TQM – TQM Framework - Contributions of Quality Gurus – Barriers to TQM – Cost of Quality.

UNIT II TQM PRINCIPLES

9

Quality statements - Customer focus –Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement – PDCA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I

9

The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

9

UNIT IV TQM TOOLS & TECHNIQUES II

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM
– Concepts, improvement needs – Performance measures - BPR.



UNIT V QUALITY SYSTEMS FOR LEATHER AND LEATHER PRODUCTS 9

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits –Quality Council – Leadership, Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward.

TOTAL : 45 PERIODS

TEXT BOOK

1. Dale H.Besterfield, et al., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint , 2006.

REFERENCE BOOKS

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", (6th Edition), South-Western (Thomson Learning), 2005.
2. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, Third Edition , 2003.
3. Suganthi,L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006 .
4. Janakiraman,B and Gopal, R.K, "Total Quality Management – Text and Cases",Prentice Hall (India) Pvt. Ltd., 2006.

LT8811

PROJECT WORK

**L T P C
0 0 24 12**

OBJECTIVE

The objective of the project is to make use of the knowledge gained by the student at various stages of the degree programme. This helps to judge the level of proficiency, originality and capacity for application of the knowledge attained by the student at the end of the programme.

OUTCOMES

The project work is expected to shape the student to think originally, plan/execute work properly, analytical abilities and reporting/communication skills

Each student is required to submit a report on the project undertaken by and assigned to him by the Department. The report should be based on the information available in the

literature or data determined in the laboratory/industry. The objective of the project is to make use of the knowledge gained by the student at various stages of the degree programme. This helps to judge the level of proficiency, originality and capacity for application of the knowledge attained by the student at the end of the programme.

VIVA VOCE

The object of the viva-voce examination is to determine whether the objectives of the Project work have been met by the student as well as to assess the originality and initiative of the student as demonstrated in the Project Work.

Total : 240 PERIODS

LT8001

**ADVANCED PHYSICS AND CHEMISTRY OF
LEATHER – I (APCL – I)**

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

AIM

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

OBJECTIVES

This subject is to impart advanced physical and chemical concepts associated with the structure of collagen and their dimensional changes associated during the leather manufacture

OUTCOMES

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

UNIT I

10

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

UNIT II

10

Molecular architecture of collagen. Inter and intra-change forces in the stabilisation and

aggregation of collagen molecules. Three dimensional network of collagen fibres in skins and leather matrix.

UNIT III **7**

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

UNIT IV **9**

Molecular mechanisms in relaxation and folding with special reference to native collagen and tanned collagen. Helix to coil transition and effects of thermo-mechanical stress on connective tissue fibres.

UNIT V **9**

Shrinkage and cross linking phenomena in native, chrome tanned and vegetable tanned collagen. Influence of electromagnetic and high energy radiation on native collagen.

TOTAL : 45 PERIODS

TEXT BOOKS AND REFERENCES

1. Flaherty, O. Roddy, T.W., Lollar, R.M., 'The Chemistry & Technology of Leather', Vol.1, E. Robert Krieger Publishing Co., New York 1978.
2. Gustavson, K.H., 'The Chemistry & Reactivity of Collagen', Academic Press, New York.
3. Ramachandran, G.N., 'Treatise on the Biology of Collagen, Academic Press, New York.
4. Krishnan, V, Ed. 'Trends in Collagen', Proceedings of the Indian Academy of Sciences (Chemical Sciences), Vol. 111, No. 1, Indian Academy of Sciences, Bangalore, 1999.

PROGRESS THROUGH KNOWLEDGE

Attested

Sahin
DIRECTOR

AIM

To attempt micro-level understanding of leather making

OBJECTIVES

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

OUTCOMES

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

UNIT I**6**

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

UNIT II**9**

Types of transport of fluids into solid matrices. Diffusion and transport phenomena in collagenous matrices. Kinetics and diffusion of tannery materials, dyes; forced diffusion into collagenous matrices.

UNIT III**15**

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

UNIT IV

6

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

UNIT V

9

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

TOTAL : 45 PERIODS

TEXT BOOKS AND REFERENCES

1. Fred O, Flaherty, Roddy, T.W Roddy and Robert M. Lollar Ed., 'The Chemistry of Technology of Leather', Robert E. Krieger Publishing Co., New York 1977.
2. Bienkiewicz, 'Physical Chemistry of Leather Manufacture' Krieger, Florida, 1982.
3. Gustavson, K.H., 'Chemistry of Tanning Processes', Academic Press, New York, 1956.
4. Krishnan, V, Ed. 'Trends in Collagen', Proceedings of the Indian Academy of Sciences (Chemical Sciences), Vol. 111, No. 1, Indian Academy of Sciences, Bangalore, 1999.

LT8003

**CAD/CAM FOR LEATHER PRODUCTS DESIGN
AND MANUFACTURE**

L T P C

3 0 0 3

AIM

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

OBJECTIVES

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

OUTCOMES

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

UNIT I COMPUTER APPLICATIONS IN LEATHER AND PRODUCT SECTOR 12

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



UNIT II HARDWARE IN CAD

12

Introduction, Principles, Capabilities and operation of graphical workstations, central processing units, graphic terminals, input/output devices, interface and storage devices, networking concepts of LAN and WAN.

Digitization: 2D & 3D Coordinate extracting, principles of digital and analog conversion, digital input/output processing systems.

Output devices: Prints, plotter and cutter. Various types, their working principles and applications.

UNIT III PATTERN ENGINEERING

8

Computerized techniques for pattern generation, grading and assessment of leather products patterns, consumption calculations, pattern nesting and costing, stitching etc. through computerized techniques.

UNIT IV LAST AND SOLE MODELLING FOR FOOTWEAR

7

Digitization with Microscribe; manipulation and optimization of digitized last; use of macros; last comparison; grading wizard; flattening; 3D visualization of last and styles; concept of e-last; introduction to sole and sole mould design.

UNIT V ADVANCED COMPUTATIONAL TECHNIQUES IN CAD, RAPID PROTOTYPING

6

Principles and practice; simulation – concepts and applications.

TOTAL : 45 PERIODS

REFERENCES

1. MP Groover and EW Zinimers, "CAD/CAM, Computer Aided Design and Manufacturing", Prentice Hall of India, 1984.
2. Newman & S P Sul., "Introduction to Computer Graphics", Published by Morgan Kaufmann, 1995
3. S.Harrington, "Computer Graphics : A programming approach", Edition 2, Published by Elsevier, 1997.
4. Zandi, "Computer Aided Design and drafting", Published by Delmer, 1985.
5. William Pratt., "Digital Image Processing", 1978.
6. Desai and Abel, "Introduction to FEM". "Step by Step guide to CAD for footwear": CAD Centre, SDDC, CLRI.

7. Rapid prototyping ; AU – FRG publications, 1984.
8. Jorg BuchnerSimulation : “QUEST” manual : EDS Technologies, Published by Springer, 2003.

LT8004

CONSUMER BEHAVIOUR AND BUSINESS ORIENTATION

L T P C

3 0 0 3

AIM

To impart consumer behaviour and business orientation skills to students.

OBJECTIVE

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

OUTCOMES

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

UNIT I CONSUMER DECISION-MAKING AND MARKETING IMPLICATIONS 6

Introduction to the study of consumer behaviour- Stages in Consumer Decision- Making- Types of Consumer decision-making -Consumers shopping styles and Trends-Information search and consumers decision-making-Information search and marketing strategies- Dimensions of information search - Impulse Buying of Consumer- an emerging trend.

UNIT II CONSUMER DECISION-MAKING AND BEYOND 7

Models of consumers- Four views of consumer decision-making - Economic, Passive, Cognitive, Emotional-A simple view of consumer decision-making- Howard sheth Model- Engel, Kollat and BlackWell Model- Case studies with reference to India.

UNIT III DETERMINANTS OF CONSUMER BEHAVIOUR 10

- a) Motivation-Abraham Maslow’s need Herz-berg’s two factor theory, Sigmund Freud’s Psycho- analytical model of Motivation.
- b) Perception - Selective attention, Exposure and Subliminal Perception Process- Factors for perceptual distortion.

- c) Learning -Pavlovian & Skinner's approaches in Stimulus Response Theories-- Leon festinger's Cognitive Dissonance Theory.
- d) Beliefs and Attitudes- Cognitive , Affective and Action oriented Attitude.

UNIT IV BUSINESS ORIENTATION 8

Management roles and functions in a business. Designing and re-designing business process, location, layout, operations planning and control. Basic awareness on the issues impinging on quality, productivity and environment. Principles of double-entry book-keeping: journal entries, cash-book, pass book, and Bank Reconciliation Statement, ledger accounts, trail balance and preparation of final accounts: Trading and Profit and Loss Account; Balance-sheet. Brief introduction to Single-Entry system of record keeping. Sources of risk/venture capital, fixed capital, working capital and a basic awareness of financial services such as leasing and factoring. Managing business growth. The pros and cons of alternative growth options, internal expansion, acquisitions and mergers, integration and diversification. Crisis in business growth.

UNIT V ISSUES IN BUSINESS MARKETING 14

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

TOTAL : 45 PERIODS

REFERENCES

1. Consumer Behavior 9th Edition Leon and Schiffman and Leslie Lazar Knuk, Pearson Education Blackwell: Consumer Behaviour, 10e, Thomson 2007
2. Consumer Behaviour- Suja Nair - Himalaya Publishers. Assael: Consumer Behaviour, 6e Thomson 2006
3. Research for Marketing decisions- Paul, Donald, Herald- Prentice Hall (India) Zikmund: Exploring Marketing Research, 8e, Thomson 2006
4. Naresh K.Malhotra, Marketing Research, An applied Orientation, Pearson Education

- Asia. Panda, Shiba Charan, Entrepreneurship Development, New Delhi, Anmol Publications.
5. Patel, V.G., The Seven Business Crises and How to Beat Them, Tata-Mcgraw, New Delhi, 1995.
 6. Verma, J.C., and Gурpal Singh, Small Business and Industry-A Handbook for Entrepreneurs, Sage, New Delhi, 2002



AIM

To impart knowledge on eco friendly options for leather processing.

OBJECTIVE

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

OUTCOMES

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

UNIT I CLEANER PROCESSING - BEAMHOUSE 9

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

UNIT II CLEANER PROCESSING: TANNING 9

Less chorme and chrome-free tanning systems. Latest concepts and trends in leather processing. Eco-labelling. Integrated strategies to achieve permissible BOD, COD and TDS standards of tannery effluents.

UNIT III CLEANER PROCESSING: POST TANNING 9

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

UNIT IV CLEANER PROCESSING: FINISHING 9

Cleaner processing and solvent free finishing systems; Eco-labelling. integrated strategies to achieve permissible BOD, COD and TDS standards of tannery effluents.

**UNIT V ADVANCED FINISHING, SPLIT PROCESSING AND
UPGRADATION TECHNIQUES – CLEANER TECHNOLOGIES**

9

Role of following finishing equipment like autospray, roller coats, embossing machines, finiflex, auto togglers, stacking machines etc. Techniques such as oil pull-up, waxy, burnishable, crazy horse, antique finish, screen printing, roller printing, tie and dye finishing. metallic effects, patent finishing, cationic finishing, other novel finishing techniques like electrostatic finishing.



Shoe suede, garment suede, grain finished effect and specialty finishes at split leather - processing technologies and finishing techniques specially suited for the purpose. Upgradation of lower ends for better utilisation. Transfer foil, lamination techniques, etc in split finishing. Latest trends.

TOTAL : 45 PERIODS

REFERENCES

1. P.S.Briggs, "Gloving, Clothing and special leathers" products Institute, London, 1981.
2. J.H.Sharphouse, "Leather Technicians Hand Book", Leather Producers Association, Northampton NN3 1JD, Reprinted 1995.

LT8006 ENGINEERING ECONOMICS AND FINANCE MANAGEMENT L T P C
3 0 0 3

AIM

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

OBJECTIVE

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

OUTCOMES

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

UNIT I FINANCIAL ACCOUNTING 13

Accounting principles – basic records depreciation – depreciation methods – preparation and interpretation of profit and loss statement – balance sheet – fixed assets – current assets.

UNIT II PROFIT VALUE ANALYSIS 10

Cost valume profit relationship – relevant costs in decision making profit management analysis – break even analysis – margin of safety Angle of incident & multi product break even analysis – Effect of changes in volume selling price fixed cost and variable cost on profit.

UNIT III WORKING CAPITAL MANAGEMENT

8

Current assets and liability decisions – estimation of working capital requirements – Management of accounts receivable – Inventory – cash – inventory valuation methods.

UNIT IV CAPITAL BUDGETING

8

Significance of capital budgeting – payback period – present value method – Accounting rate of return method.



UNIT V ENGINEERING ECONOMICS

7

Economics – Engineering economics – Demand analysis Laws of demand – Production and cost – Pricing methods

TOTAL : 45 PERIODS

TEXT BOOKS

1. R. Kesavan, C.Elanchezhian and T.Sundar Selwyn – Engineering Economics and Financial Accounting, Laxmi Publications 2005

REFERENCES

1. C.James, Vanhorn, Fundamentals of Financial management PHI 1996
2. Charles T.Homgren, Cost Accounting, PHI 1985
3. S.N.Maheswaran, Management Accounting and Financial Control, Sultan Chand, 1992.

LT8007 ENTERPRISE RESOURCE PLANNING FOR LEATHER SECTOR

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

AIM

To introduce enterprise resource planning principles to leather technologists.

OBJECTIVE

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

OUTCOMES

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

UNIT I INTRODUCTION

6

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

UNIT II ERP AND RELATED TECHNOLOGIES

13

1. Business process Reengineering (BPR)
2. Management Information System (MIS)
3. Decision Support Systems (DSS)



4. Executive Support Systems (ESS)
5. Data Warehousing, Data Mining
6. Online Analytical Processing (OLTP)
7. Supply Chain Management (SCM)
8. Customer Relationship Management (CRM)

UNIT III ERP MODULES & VENDORS

10

1. Finance
2. Production planning, control & maintenance
3. Sales & Distribution
4. Human Resource Management (HRM)
5. Inventory Control System
6. Quality Management
7. ERP Market

UNIT IV ERP IMPLEMENTATION LIFE CYCLES

10

1. Evaluation and selection of ERP package
2. Project planning
3. Implementation team training & testing
4. End user training & Going Live
5. Post Evaluation & Maintenance

UNIT V ERP CASE STUDIES

6

Post implementation review of ERP Packages in Manufacturing, Services, and other Organizations

TOTAL : 45 PERIODS

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

AIM

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

OBJECTIVE

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

OUTCOMES

This course would enable the students to explore their feasibilities of turning into efficient entrepreneurs.

UNIT I GLOBAL LEATHER AND ALLIED INDUSTRIES 6

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

UNIT II VENTURE PLANNING AND DEVELOPMENT AS APPLIED TO LEATHER AND ALLIED SECTOR 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 as applied in industrial leather sector.

UNIT III TECHNO - ECONOMIC FEASIBILITY REPORTS (TEFR) FOR LEATHER AND ALLIED SECTOR 5

Components of TEFR - size of projects, Project costing - Selection and means of finance - cash-flow projections - Costing and pricing - Implementation schedules - PERT and related project scheduling charts - TEFR for tannery, shoe plants, leather chemical, leather garments and leather goods units.

UNIT IV RESOURCE MANAGEMENT AND PRODUCTION PLANNING FOR LEATHER AND ALLIED SECTOR

10

Material and money flow - Labour management - Principles of production management - TQM concepts - ISO and related certification methods - Purchase management in leather sector - Credit financing and labour issues in leather sector - Productivity bottlenecks in tanneries and shoe plants and debottlenecking strategies - Inventory control measures for leather sector.

Operations research - time-motion studies - Principles of time management - Management information system - Intranet and Internet communication and its relevance in managing enterprises - Factors concerning system productivity in leather sector.

UNIT V MANAGING GLOBAL LEATHER MARKETS

12

Market demand assessment techniques - Taxation and internal revenue issues - Market forecasting tools and techniques - Brand building - Export - import guidelines and trade issues - Market sensitivity analysis - Global trade in leather - inter-country comparison of strengths and weaknesses at market place - WTO and related issues influencing leather - Eco-criteria and its influence in leather market - Forecasting domestic market for leather products and market driven planning of an enterprise in leather sector.

TOTAL : 45 PERIODS

REFERENCES

1. Brandt, Steven C., The 10 Commandments for Building a Growth Company, Third Edition, Macmillan Business Books, Delhi, 1977
2. Bhide, Amar V., The Origin and Evolution of New Businesses, Oxford University Press, New York, 2000.
3. Desai, Vasant, Small Scale Enterprises Vols. 1-12, Mumbai, Himalaya Publishing House. (Latest edition).
4. Dollinger, Mare J., Entrepreneurship: Strategies and Resources, Illinois, Irwin, 1955.
5. Holt, David H., Entrepreneurship: New Venture Creation, Prentice-Hall of India, New Delhi, latest Edition.
6. Panda, Shiba Charan, Entrepreneurship Development, New Delhi, Anmol Publications. (Latest Editions)
7. Patel, V. G., The Seven Business Crises and How to Beat Them, Tata-McGraw, New Delhi, 1995.
8. SIDBI Report on Small Scale Industries Sector (Latest Editions)

Attested

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9. Taneja, Satish and Gupta, S.L. Entrepreneurship Development-New Venture Creating, Galgotia Publishing House, New Delhi, Latest Edition
10. Verma, J.C., and Gural Singh, Small Business and Industry-A Handbook for Entrepreneurs, New Delhi, Sage, 2002
11. Vesper, Karlsh, New Venture Strategies, (Revised Edition), New Jersey, Prentice-Hall, 1990.



AIM

To impart knowledge on fashion forecasting for leather and leather products.

OBJECTIVES

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

OUTCOMES

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

UNIT I HISTORICAL EVALUATION & INTERNATIONAL TRENDS 10

Historical evaluation of leather and leather products styling. Seasonal influences on fashion, cultural and geographical instances on leather and products fashion. Market research and track record.

UNIT II FASHION CONSIDERATIONS 9

Design Criteria through effect of shape, colour, pattern, texture and decorative materials. Life cycle of fashion

UNIT III PRODUCT DEVELOPMENT 9

Market Strategy - Prototype Development - Field test and evaluation - Standard preparation - Second prototype - Final run. Costing

UNIT IV PRESENTATION TECHNIQUES 9

Organisation of shows and preparation of art portfolios; advertising; effect of foreign languages in the presentation and promotional activities.

UNIT V FASHION FORECAST 8

Direction of fashion trends in leather and leather products production and marketing.

TOTAL : 45 PERIODS

REFERENCES

- Cott, N.F., "American Shoe Making", Shoe Trades Publishing Co., Cambridge.1993.
- "Apparel International" Published by P.F Collier and sons, U.K, 1961.

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

LT8010

HUMAN RESOURCE DEVELOPMENT

L T P C

3 0 0 3

AIM

To impart human resource management skills to the students.

OBJECTIVES

The purpose of this course is to provide an overview of human resource management, with particular emphasis in human resource planning and strategy, personnel selection, equal employment opportunity, training, performance appraisal, compensation, and contemporary issues.

OUTCOMES

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

UNIT I MANAGEMENT AND GENERAL EMPLOYMENT PRACTICES 15

Human resource planning, Organizational design, HR budgeting, Motivation, Leadership, Employee involvement, Ethics, International issues ,Job design: Job analysis-Job description, Performance management: Performance appraisals, Workplace behaviour problems

UNIT II STAFFING 6

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

UNIT II HUMAN RESOURCE DEVELOPMENT 7

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

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Competency development: Technical competence, Managerial competence, Process competence, Helping Competence and Coping Competencies; Training and Development; Organizational Development, Career Development;
Comtemporary issues: Knowledge management and learning organizations, BPR, TQM and Intellectual capital management.



UNIT IV COMPENSATION AND BENEFITS**5**

Job evaluation, Pay structures, Benefit programs, Pay delivery administration.

UNIT V HEALTH, SAFETY, SECURITY AND LABOUR RELATIONS**12**

Employee assistance programs, safety programs, theft, fraud, investigations, corrections; Labour laws, unfair labour practices, collective bargaining

TOTAL : 45 PERIODS**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.

LT8011**INTERNATIONAL MARKETING AND FOREIGN TRADE****L T P C****3 0 0 3****AIM**

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

OBJECTIVE

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

OUTCOMES

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

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 international 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- Products, Sales forecasting and sales Management-pricing, Promotion, Branding and Advertising.

Retail Management - Introduction to Logistics - Parameters of Supply Chain Management - Management of logistics and Supply Chain - -Consumer Supply Chain Relationship.

UNIT IV

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 BuyerandOrganizational behavior- -Product Management -ricing 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

OBJECTIVES

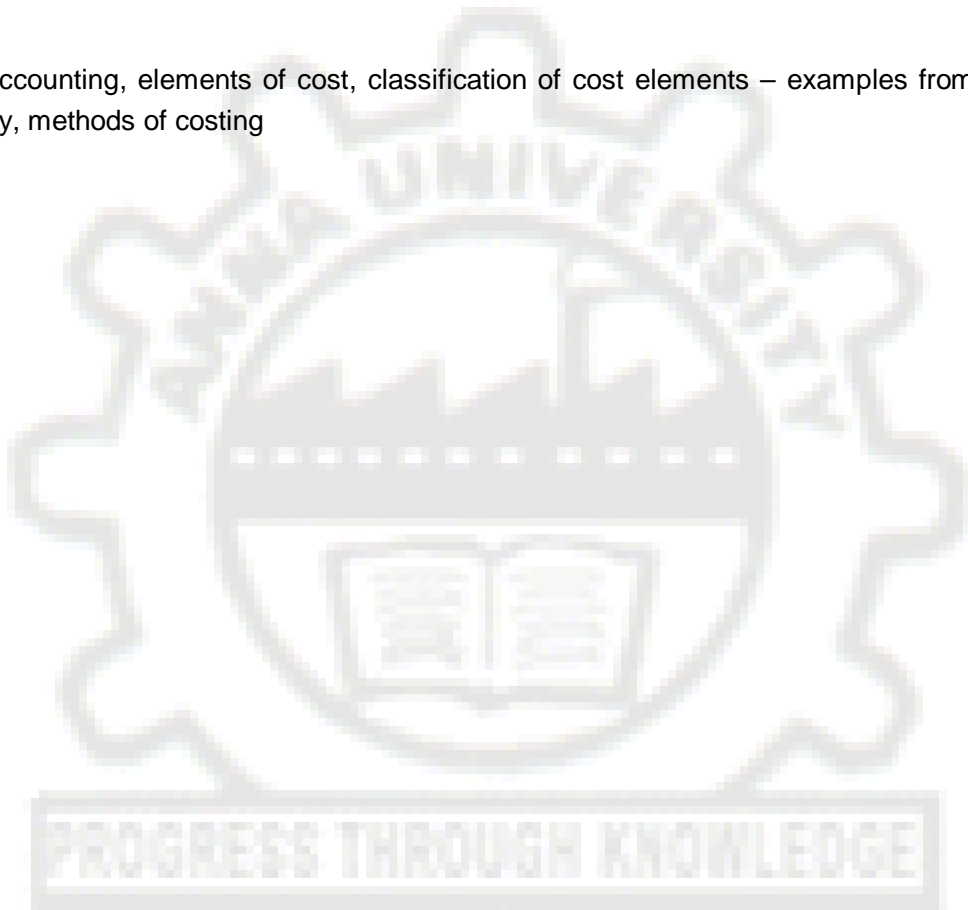
The sorting, assessment and valuation of various leather and leather products will be learnt.

OUTCOMES

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

UNIT I**9**

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



UNIT II	5
Cost profit volume analysis, breakeven analysis; standard costing, analysis of variance	
UNIT III	17
Costing of leather and leather products – material, labour, power and overhead expenses	
UNIT IV	9
Foreign exchange mechanisms, exchange rates; foreign exchange exposure management – risks, strategies to reduce risk	
UNIT V	5
Budget, types of budgets, budgeting and control in tanneries and leather products industry	

TOTAL : 45 PERIODS

REFERENCES

1. “Cost accounting for textile mills”, ATIRA, Ahmadabad, 1974
2. Kantwala, D.N., “Costing and Cost Control – A Marginal Approach for Textile Industry”, Texcons, Bombay, 1974
3. James C., Van Home., “Financial Management and Policy”, Prentice Hall of India Pvt. Ltd, New Delhi, 1980
4. Bhav P.V. and Srinivasan V., “Costing Accounting to Textile Mills”, ATIRA, Ahmadabad, 1976
5. Thukaram Rao M.E., “Cost and Management Accounting” New Age International, Bangalore, 2004
6. Thukaram Rao M.E., “Cost Accounting and Financial Management” New Age International, Bangalore, 2004.

LT8013

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

The objective of the course is to provide

- Fundamentals of purchasing
- Retail sector
Global Market

OUTCOMES

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

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 9

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 -

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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, 2007 Oded Shenkar Yadong Luo : International Business – John Wiley & Co., 2006

PROGRESS THROUGH KNOWLEDGE

AIM

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

OBJECTIVES

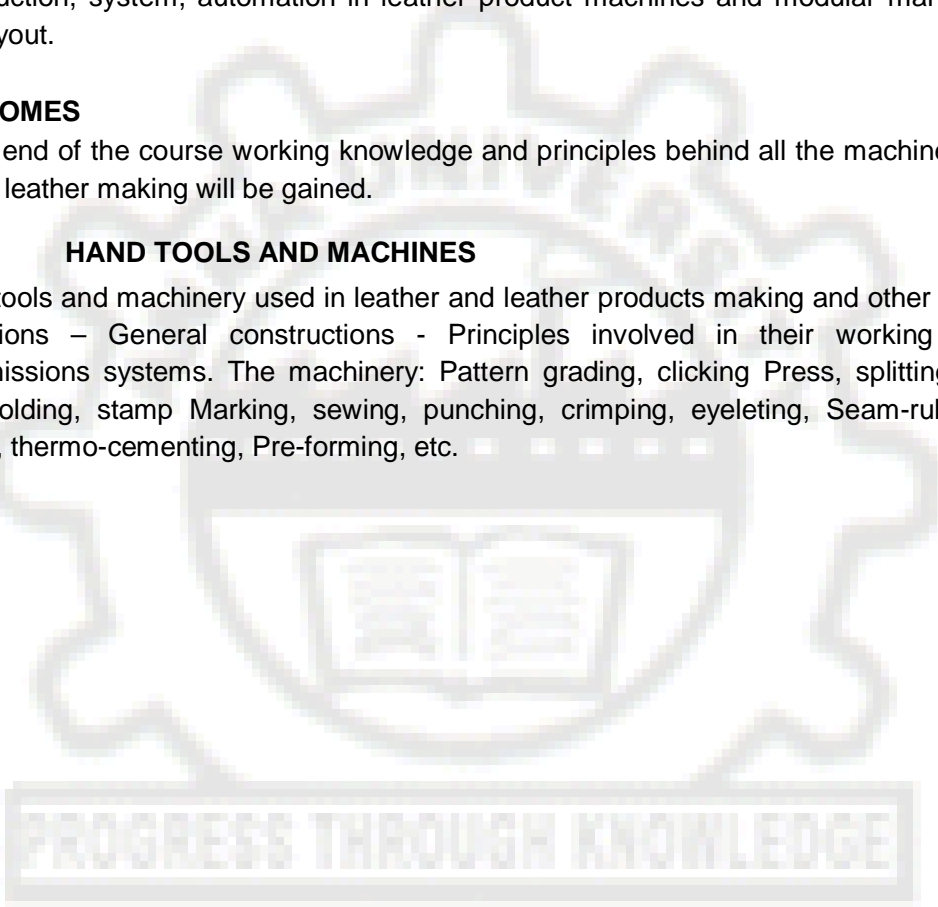
This course covers the hand tools and machines, machines for shoe and footwear construction, system, automation in leather product machines and modular manufacturing and layout.

OUTCOMES

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

UNIT I HAND TOOLS AND MACHINES**8**

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



UNIT II MACHINES FOR SHOE AND FOOTWEAR CONSTRUCTION 8

Machines used in cemented, stitch down, welted, string lasted, DVP & DIP and other types of construction. Principles involved in their working - trouble shooting and & preventive maintenance. Spare parts planning and inventing control.

UNIT III TRANSPORT SYSTEM 5

Different types of material handling system in leather products industry. Manual, semi-automatic and automatic conveyors.

UNIT IV AUTOMATION IN LEATHER PRODUCT MACHINES 11

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

UNIT V MODULAR MANUFACTURING AND LAYOUT 13

Productivity improvements: scheduling, Simulation, Toyota and rink system and Lean manufacturing system.

Factors affecting plant location and construction of factory building for balancing the production line in footwear Industry. Application of Neural-network software in layout preparation.

TOTAL : 45 PERIODS

REFERENCES

1. Thornton, J.H, "Text Book of Footwear Manufacture", National Trade Press Ltd., London, 1970.
2. Blakeman, J., "An Introduction to applied Science for Boot and Shoe Manufacture", The Anglo American Technical Co.Ltd., London,1924.

OBJECTIVE

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

OUTCOMES

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

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

15

Shifts in production bases, structure of global market, trends in the global trade, major markets, competitors for India, dynamics of global leather trade.

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

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

TOTAL : 45 PERIODS

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.

AIM

To impart knowledge on Occupational Safety and Hazard aspects in leather manufacture

OBJECTIVES

This course covers on the following aspects

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

OUTCOMES

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

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.

PROGRESS THROUGH KNOWLEDGE

AIM

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

OBJECTIVE

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

OUTCOMES

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

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.

LT8018

**SCIENCE AND TECHNOLOGY OF LEATHER
SUPPLEMENTS AND SYNTHETICS**

L T P C

3 0 0 3

AIM

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

OBJECTIVE

The emphasis on the course content will be on the fundamentals of polymerization of various polymers used. Analytical skills on testing of polymers will be emphasized that will enable them to understand various polymer properties and manufacturing methods.

OUTCOMES

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

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

REFERENCES

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.

Attested

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DIRECTOR

3. Elrich. F.R., `Science & Technology of Rubber;`, Academic Press, New York, 1978.
4. Lubin, `Handbook of compsites`, Van Nostrand Reinhold Co., New York.

LT8019

**TECHNOLOGY OF ANIMAL AND TANNERY BY
PRODUCTS UTILISATION**

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

AIM

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

OBJECTIVE

- To address value engineering through the objectives, different stages, procedures and implementation of reengineering.

To make students apply the learned concepts in a case study/project.

UNIT I 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

106

PROGRESS THROUGH KNOWLEDGE

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 Glue making from tannery wastes - Bone glue and deproteinisation of bone - Horn and hoof meal - 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.

AIM

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

OBJECTIVE

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

UNIT I FUNDAMENTALS OF VALUE ENGINEERING AS APPLIED TO LEATHER MANUFACTURE 8

Value- Types –How to add value-Job plan – techniques employed- Who will do value engineering- Organizing the value engineering study-Benefits in leather and allied industries

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

Selection of project and team members – general phase – information phase – function phase – creative phase – evaluation phase – Investigation phase – implementation phase – Audit in leather and allied industries

UNIT III WORK SHEETS AND GUIDE LINES FOR LEATHER AND ALLIED INDUSTRIES 9

Preparation of worksheets – general and information phase – Function Classification, relationship and summary- Meaningful costs- Cost analysis- Idea listing and Comparison – Feasibility ranking – Investigator phase, study summary – guidelines for writing value engineering proposal – Financial aspects – Life cycle cost analysis – Oral presentation – Audit – Case studies and Discussion.

UNIT IV REENGINEERING PRINCIPLES IN LEATHER PROCESSING AND IN LEATHER PRODUCT SECTOR 10

The 6 R's of organizational transformation and reengineering – process reengineering - preparing the workforce – Methodology – PMI leadership expectation – Production and service improvement model – Process improvement in leather and allied industries.

UNIT V IMPLEMENTATION OF REENGINEERING IN LEATHER SECTOR 8

Process analysis techniques – Work flow analysis – Value analysis approach – Nominal group technique – Fish bone diagram – Pareto analysis – team building – Force fields analysis – Implementation in leather and allied industries.

TOTAL : 45 PERIODS

TEXT BOOKS

1. S.S.Iyer, "Value Engineering", New Age Information, 1996.
2. Del L. Younker, "Value Engineering" Marcel Dekker, Inc. 2003
3. M.S.Jayaraman and Ganesh Natarajan, "Business Process Reengineering", Tata McGraw Hill, 1994.

REFERENCE

1. Dr.Johnson, A.Edosomwan, "Organizational Transformation and Process reengineering", British Library Cataloguing in publication data, 1996.

**LT8021 LEATHER BIOTECHNOLOGY AND ITS APPLICATION IN LEATHER L T P C
3 0 0 3**

UNIT I PROTEINS AND NUCLEIC ACID & ENZYMOLOGY 10

Chemistry of DNA and RNA: Structure, Conformation and function Proteins - Chemistry, structure and Function, Separation Principles in proteins. Classification, assay, characterization, mechanism of action, enzyme kinetics, immobilized enzymes.

UNIT II GENETIC ENGINEERING (RECOMBINANT DNA TECHNOLOGY 10

Principles and methods: Essentials of biotechnology - products of biotechnology, Restriction enzymes, vectors, DNA cloning strategies.

UNIT III BIOTECHNOLOGY FOR HIDES/SKINS IMPROVEMENT 13

Applications in Animal nutrition and animal production: embryo transfer, gene transfer, transgenic animals. Cleaner Leather Processing : Use of enzyme options in beam house operations - Soaking, unhairing, bating, degreasing, offal treatment: Types of enzymes - proteases, lipases - properties, assay systems and production. Types of fermentation,

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Preparation of media, preparation of inoculum, separation and purification of products.

UNIT IV WASTE MANAGEMENT FOR LEATHER **8**

General features of the organic and inorganic pollutants of tannery. Stabilisation and disposal of organic and chemical wastes and their biological treatment. Possible energy generation from wastes.

UNIT V UTILISATION OF COLLAGENOUS TISSUES FOR BIOMEDICAL AND OTHER APPLICATIONS **4**

Collagen and its application in food, cosmetic and medical fields.

TOTAL : 45 PERIODS

REFERENCES

1. Rohm, H.J. and Reed, G. "A Comprehensive treatise on Biotechnology", Verlag Chemie, Weinheim, 1983.
2. Pelczar, J., Reid, R.D. and Chan, F.C.S., "Microbiology", Tata McGraw Hill, 1977.
3. Old, R.W., and Primrose, S.B., "Principles of Genemanipulation" 3/e Cambridge, 1985. Stryer, L. "Biochemistry" 3/e W.H. Freeman and Co. 1989.
4. Lehninger, A.L., Nelson, D.L., Gx M.M "Principles of Biochemistry", CBS Publications, 1993
5. Puvanakrishnan, R and Dhar, S.C. "Enzyme Technology in Beamhouse practices" CLRI Publication.
6. Wriener, N.A., "Biological treatment of waste water", 1982.
7. Schroeder, E.D., "Waste and Waste water treatment", McGraw - Hill Inc. 1983

LT8022

**COMPUTER APPLICATIONS FOR LEATHER AND
LEATHER PRODUCTS**

L T P C

3 0 0 3

AIM

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

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OBJECTIVES

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

UNIT I SYSTEMS ANALYSIS & DESIGN AND IT INFRASTRUCTURE 8

Definition of a System; System development life cycle- System study; System analysis; System Design (Input, output, files, procedure); Implementation and maintenance; Need for the IT Infrastructure; Form factor; Data Center & Disaster Recovery; Security & Threads.

UNIT II DATABASE MANAGEMENT SYSTEM 7

Different types of Database Management Systems and SQL; DDL, DML - Retrieving, Manipulating, Updating tables; Concepts on Leather Industry specific database – with respect to Leather Processing and Product Industry;

UNIT III DATA COMMUNICATIONS 7

Concept of Data Communication, Modes of Transmission -Digital Vs Analog,

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

UNIT IV CONCEPTS FOR WEB BASED APPLICATIONS 12

Tools for Web Designing, Management Information System, ERP System for Leather Processing – Material Management and Inventory Control, Production Planning.

UNIT V 11

E-COMMERCE

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

CAD SYSTEMS

CAD Systems for Leather & Leather Products- Pattern grading & cutting for footwear,

leather goods and garments; Design and development of Leather products; Computerised color matching systems – its principle and application.

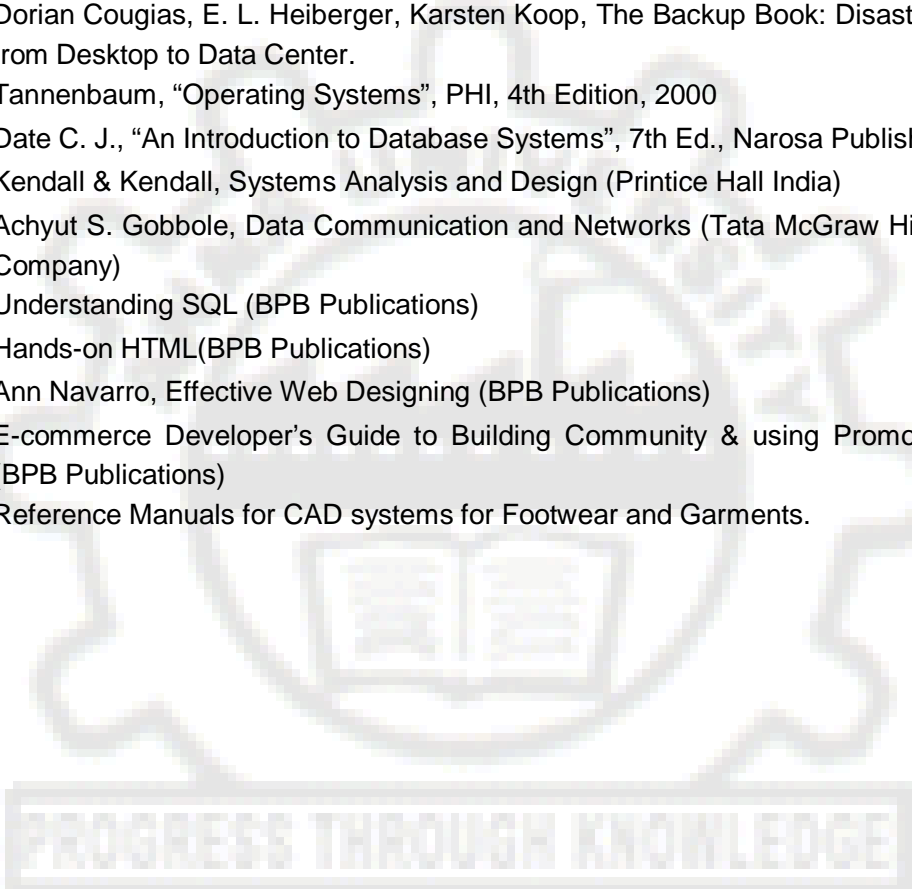
TOTAL: 45 PERIODS

TEXT BOOK

1. Alex Leon & Mathews Leon, "Fundamentals of Information Technology", Leon Techworld, 1999.

REFERENCES

1. Dorian Cougias, E. L. Heiberger, Karsten Koop, The Backup Book: Disaster Recovery from Desktop to Data Center.
2. Tannenbaum, "Operating Systems", PHI, 4th Edition, 2000
3. Date C. J., "An Introduction to Database Systems", 7th Ed., Narosa Publishing, 2004
4. Kendall & Kendall, Systems Analysis and Design (Printice Hall India)
5. Achyut S. Gobbole, Data Communication and Networks (Tata McGraw Hill Publishing Company)
6. Understanding SQL (BPB Publications)
7. Hands-on HTML(BPB Publications)
8. Ann Navarro, Effective Web Designing (BPB Publications)
9. E-commerce Developer's Guide to Building Community & using Promotional Tools (BPB Publications)
10. Reference Manuals for CAD systems for Footwear and Garments.



OBJECTIVES:

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

UNIT I INTRODUCTION TO DISASTERS 9

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

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9

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

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9

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

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS 9

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal

Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:

The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context,
- Disaster damage assessment and management.

TEXTBOOKS:

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi, 2010.

REFERENCES

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

GE8073

HUMAN RIGHTS

**LT P C
3 0 0 3**

OBJECTIVES :

- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I

9

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II

9

Evolution of the concept of Human Rights Magna carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III	9
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.	
UNIT IV	9
Human Rights in India – Constitutional Provisions / Guarantees.	
UNIT V	9
Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.	
	TOTAL : 45 PERIODS

OUTCOME :

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

REFERENCES:

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.

