VISION:

To become a premier Centre of Learning and Research in Leather and Allied Technologies.

MISSION:

MD1  To provide quality education in the area of Leather Technology with high professional values

MD 2:  To share and disseminate expertise to provide solutions for the problems faced by the Leather industry.

MD 3  To build an expertise based capsule of delivering technology to leather and allied sectors.

MD 4  To provide a learning ambience for innovators, researchers and technologists

1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

   PEO1  To demonstrate core competency in basic mathematics, scientific and engineering fundamental to design, formulate, analyse and solve the problems of leather and allied sectors.

   PEO2  To pursue lifelong multidisciplinary learning as professional engineers, researchers and scientists and effectively communicate technical information

   PEO3  To practice values and exhibit leadership qualities and team spirit to promote entrepreneurship and indigenization

2. PROGRAMME OUTCOMES (POs):

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<th>Graduate Attribute</th>
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<td>PO1 Engineering knowledge</td>
<td>Apply knowledge of mathematics, basic science and engineering science.</td>
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<td>PO2 Problem analysis</td>
<td>Identify, formulate and solve engineering problems.</td>
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3. PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1 Understand and apply the foundational knowledge to make a successful career in leather and leather products sector.

PSO2 Ability to identify the problems of the leather sector and provide solutions.

PSO3 Ability in manning and managing leather sector towards its sustainable development.

4. MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVE WITH PROGRAMME OUTCOMES

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* 1 month internship in leather or leather chemicals unit to be undertaken during summer vacation after semester IV
*Course from the curriculum of other UG Programmes

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| 8.   | LT7712      | Industrial Internship – II*                       | EEC     | 4*             | 0 | 0 | 4*| 2 |
| 9.   | LT7713      | Mini Project                                      | EEC     | 4              | 0 | 0 | 4 | 2 |

**TOTAL** 32 18 0 14 25

* 1 month internship in leather or leather products unit to be undertaken during summer vacation after semester VI

*Course from the curriculum of other UG Programmes

## SEMESTER VIII

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## Employability Enhancement Courses (EEC)

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## SUMMARY

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COURSE DESCRIPTION:
This course aims at developing the language skills necessary for the first year students of Engineering and Technology.

OBJECTIVES:
- To develop the four language skills – Listening, Speaking, Reading and Writing.
- To improve the students’ communicative competence in English.
- To teach students the various aspects of English language usage.

CONTENTS

UNIT I  GREETING AND INTRODUCING ONESELF
Listening- Types of listening – Listening to short talks, conversations; Speaking – Speaking about one’s place, important festivals etc. – Introducing oneself, one’s family/ friend; Reading – Skimming a passage– Scanning for specific information; Writing- Guided writing - Free writing on any given topic ( My favourite place/ Hobbies/ School life, writing about one’s leisure time activities, hometown, etc.); Grammar – Tenses (present and present continuous) -Question types - Regular and irregular verbs; Vocabulary – Synonyms and Antonyms.

UNIT II  GIVING INSTRUCTIONS AND DIRECTIONS
Listening – Listening and responding to instructions; Speaking – Telephone etiquettee - Giving oral instructions/ Describing a process – Asking and answering questions; Reading – Reading and finding key information in a given text - Critical reading - Writing –Process description( non-technical); Grammar – Tense (simple past& past continuous) - Use of imperatives – Subject – verb agreement – Active and passive voice; - Vocabulary – Compound words – Word formation – Word expansion ( root words).

UNIT III  READING AND UNDERSTANDING VISUAL MATERIAL
Listening- Listening to lectures/ talks and completing a task; Speaking –Role play/ Simulation – Group interaction; Reading – Reading and interpreting visual material; Writing– Jumbled sentences – Discourse markers and Cohesive devices – Essay writing (cause & effect/ narrative); Grammar – Tenses (perfect), Conditional clauses –Modal verbs; Vocabulary – Cause and effect words; Phrasal verbs in context.

UNIT IV  CRITICAL READING AND WRITING
Listening- Watching videos/ documentaries and responding to questions based on them; SpeakingInformal and formal conversation; Reading –Critical reading (prediction & inference); Writing– Essay writing ( compare & contrast/ analytical) – Interpretation of visual materials; Grammar – Tenses (future time reference); Vocabulary – One word substitutes (with meanings) – Use of abbreviations & acronyms – Idioms in sentences.

UNIT V  LETTER WRITING AND SENDING E-MAILS
Listening- Listening to programmes/broadcast/ telecast/ podcast; Speaking – Giving impromptu talks, Making presentations on given topics- Discussion on the presentation; Reading –Extensive reading; Writing- Poster making – Letter writing (Formal and E-mail) ;Grammar – Direct and Indirect speech – Combining sentences using connectives; Vocabulary – Collocation;

TEACHING METHODS:
Interactive sessions for the speaking module.
Use of audio – visual aids for the various listening activities.
Contextual Grammar Teaching.
EVALUATION PATTERN:
Internals – 50%
End Semester – 50%

TOTAL : 60 PERIODS

LEARNING OUTCOMES:
• Students will improve their reading and writing skills
• Students will become fluent and proficient in communicative English
• Students will be able to improve their interpersonal communication

TEXTBOOK:

REFERENCES:
3. Redston, Chris & Gillies Cunningham Face2Face (Pre-intermediate Student’s Book & Workbook) Cambridge University Press, New Delhi: 2005

MA7151 MATHEMATICS – I  L T P C  4 0 0 4
(Common to all branches of B.E./B.Tech. Programmes in I Semester)

COURSE OBJECTIVES
• The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals. Students will use these tools to solve application problems in a variety of settings ranging from physics and biology to business and economics.
• To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
• To familiarize the student with functions of several variables. This is needed in many branches of engineering.
• To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I DIFFERENTIAL CALCULUS  12
Representation of functions - New functions from old functions - Limit of a function - Limits at infinity - Continuity - Derivatives - Differentiation rules - Polar coordinate system - Differentiation in polar coordinates - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES  12
Maxima and minima of functions of two variables – Lagrange’s method of undetermined multipliers.

UNIT III INTEGRAL CALCULUS 12
Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLE INTEGRALS 12

UNIT V DIFFERENTIAL EQUATIONS 12
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.

TOTAL : 60 PERIODS

COURSE OUTCOMES
- Understanding of the ideas of limits and continuity and an ability to calculate with them and apply them.
- Improved facility in algebraic manipulation.
- Fluency in differentiation.
- Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
- Understanding the ideas of differential equations and facility in solving simple standard examples.

TEXT BOOKS

REFERENCE BOOKS
OBJECTIVE:

- To introduce the concept and different ways to determine moduli of elasticity and applications.
- To instill the concept of sound, reverberation, noise cancellation, and ultrasonic generation, detection and applications.
- To inculcate an idea of thermal properties of materials, heat flow through materials and quantum physics.
- To promote the basic understanding of interferometers, principles and applications of lasers, optical fibers and sensors.
- To establish a sound grasp of knowledge on the basics, significance and growth of single crystals.

UNIT I  PROPERTIES OF MATTER  9

UNIT II  ACOUSTICS AND ULTRASONICS  9

UNIT III  THERMAL AND MODERN PHYSICS  9

UNIT IV  APPLIED OPTICS  9

UNIT V  CRYSTAL PHYSICS  9
Single crystalline, polycrystalline and amorphous materials – Single crystals: unit cell, crystal systems, Bravais lattices, ditrections and planes in a crystal, Miller indices - interplanlar distance for a cubic crystal - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - structure and significance of NaCl, CsCl, ZnS and graphite - crystal imperfections: point defects, line defects – Burger vectors, dislocations and stacking faults – Growth of single crystals: Bridgman and Czochralski methods.
OUTCOME:
- The students will understand different moduli of elasticity, their determination and applications.
- The students will gain knowledge on the properties of sound, noise cancellation, and production, detection and applications of ultrasonics.
- The students will acquire sound knowledge on thermal expansion and thermal conductivity of materials. Further they will gain an idea of quantum physics.
- The students will gain knowledge on interferometers, lasers and fiber optics.
- The students will secure knowledge on the basics of crystal structures and their significance. Further they gain basic ideas of growing single crystals.

TEXTBOOKS:

REFERENCES:

OBJECTIVES
- To develop an understanding about fundamentals of polymer chemistry.
- Brief elucidation on surface chemistry and catalysis.
- To develop sound knowledge photochemistry and spectroscopy.
- To impart basic knowledge on chemical thermodynamics.
- To understand the basic concepts of nano chemistry.

UNIT I POLYMER CHEMISTRY
Introduction: Functionality-degree of polymerization. Classification of polymers- natural and synthetic, thermoplastic and thermosetting. Types and mechanism of polymerization: addition (free radical, cationic, anionic and living); condensation and copolymerization. Properties of polymers: Tg, tacticity, molecular weight-weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension.

UNIT II SURFACE CHEMISTRY AND CATALYSIS

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY
principles, instrumentation (Block diagram) and applications.

UNIT IV CHEMICAL THERMODYNAMICS
Second law: Entropy-entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Free energy and work function: Helmholtzand 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 V NANO CHEMISTRY

TOTAL: 45 PERIODS

OUTCOMES
- Will be familiar with polymer chemistry, surface chemistry and catalysis.
- Will know the photochemistry, spectroscopy and chemical thermodynamics.
- Will know the fundamentals of nano chemistry.

TEXT BOOKS

REFERENCE BOOKS

GE7151 COMPUTING TECHNIQUES
(Common to all branches of Engineering and Technology) 3 0 0 3

OBJECTIVES:
- To learn programming using a structured programming language.
- To provide C programming exposure.
- To introduce foundational concepts of computer programming to students of different branches of Engineering and Technology.

UNIT I INTRODUCTION
Introduction to Computers – Computer Software – Computer Networks and Internet - Need for logical thinking – Problem formulation and development of simple programs - Pseudo code - Flow Chart and Algorithms.

UNIT II C PROGRAMMING BASICS 9

UNIT III ARRAYS AND STRINGS

UNIT IV POINTERS
Macros - Storage classes –Basic concepts of Pointers– Pointer arithmetic - Example Problems - Basic file operations

UNIT V FUNCTIONS AND USER DEFINED DATA TYPES

TOTAL : 45 PERIODS

OUTCOMES
At the end of the course, the student should be able to:
- Write C program for simple applications
- Formulate algorithm for simple problems
- Analyze different data types and arrays
- Perform simple search and sort.
- Use programming language to solve problems.

TEXTBOOKS:

REFERENCES:

BS7161 BASIC SCIENCES LABORATORY (Common to all branches of B.E / B.Tech Programmes) L T P C
0 0 4 2

PHYSICS LABORATORY: (Any Seven Experiments)

OBJECTIVE:
- To inculcate experimental skills to test basic understanding of physics of materials including properties of matter, thermal and optical properties.
- To induce the students to familiarize with experimental determination of velocity of ultrasonic waves, band gap determination and viscosity of liquids.

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. Uniform bending – Determination of young’s modulus
4. Lee’s disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. a) Optical fibre -Determination of Numerical Aperture and acceptance angle  
b) Compact disc- Determination of width of the groove using laser.
10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Post office box -Determination of Band gap of a semiconductor.
13. Viscosity of liquids - Determination of co-efficient of viscosity of a liquid by Poiseuille’s flow

TOTAL: 30 PERIODS

OUTCOME:
Upon completion of the course, the students will be able
- To determine various moduli of elasticity and also various thermal and optical properties of materials.
- To determine the velocity of ultrasonic waves, band gap determination and viscosity of liquids.

CHEMISTRY LABORATORY:

(Minimum of 8 experiments to be conducted)
1. Estimation of HCl using Na₂CO₃ 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.
12. Pseudo first order kinetics-ester hydrolysis.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 30 PERIODS

TEXTBOOKS

GE7161

COMPUTER PRACTICES LABORATORY

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OBJECTIVES
- To understand the basic programming constructs and articulate how they are used to develop a program with a desired runtime execution flow.
- To articulate where computer programs fit in the provision of computer-based solutions to real world problems.
- To learn to use user defined data structures.

**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
10. Program using structures and unions.

**TOTAL: 60 PERIODS**

**OUTCOMES**
At the end of the course, the student should be able to:
- Write and compile programs using C programs.
- Write program with the concept of Structured Programming
- Identify suitable data structure for solving a problem
- Demonstrate the use of conditional statement.

**LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS**
30 Systems with C compiler

**HS7251  TECHNICAL ENGLISH  L  T  P  C**
4  0  0  4

**OBJECTIVES**
- To enable students acquire proficiency in technical communication.
- To enhance their reading and writing skills in a technical context.
- To teach various language learning strategies needed in a professional environment.

**CONTENTS**

**UNIT I  ANALYTICAL READING**
Listening- Listening to informal and formal conversations; Speaking – Conversation Skills(opening, turn taking, closing )-explaining how something works-describing technical functions and applications; Reading –Analytical reading, Deductive and inductive reasoning; Writing- vision statement–structuring paragraphs.

**UNIT II  SUMMARISING**
Listening- Listening to lectures/ talks on Science & Technology; Speaking –Summarizing/ Oral Reporting; Reading – Reading Scientific and Technical articles; Writing- Extended definition –Lab Reports – Summary writing.

**UNIT III  DESCRIBING VISUAL MATERIAL**
Listening- Listening to a panel discussion; Speaking – Speaking at formal situations; Reading – Reading journal articles - Speed reading; Writing-data commentary-describing visual material-writing problem-process- solution-the structure of problem-solution texts- writing critiques

**UNIT IV  WRITING/ E-MAILING THE JOB APPLICATION**
Listening- Listening to/ Viewing model interviews; Speaking –Speaking at different types of interviews – Role play practice ( mock interview); Reading – Reading job advertisements and profile of the company concerned; Writing- job application – cover letter –Résumé preparation.
UNIT V REPORT WRITING

Listening- Viewing a model group discussion; Speaking – Participating in a discussion - Presentation; Reading – Case study - analyse - evaluate – arrive at a solution; Writing – Recommendations- Types of reports (feasibility report)- designing and reporting surveys- – Report format.– writing discursive essays.

TEACHING METHODS:
Practice writing
Conduct model and mock interview and group discussion.
Use of audio – visual aids to facilitate understanding of various forms of technical communication. Interactive sessions.

EVALUATION PATTERN:
Internals – 50%
End Semester – 50%

TOTAL: 60 PERIODS

LEARNING OUTCOMES
- Students will learn the structure and organization of various forms of technical communication.
- Students will be able to listen and respond to technical content.
- Students will be able to use different forms of communication in their respective fields.

TEXTBOOK:

REFERENCES:

MA7251 MATHEMATICS – II
L T P C
4 0 0 4
(Common to all branches of B.E./B.Tech. Programmes in II Semester)

COURSE OBJECTIVES
- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- 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 MATRICES
12

UNIT II VECTOR CALCULUS
12
Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green’s, Gauss divergence and Stoke’s theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTION
12
Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions \( w = z + c, \ az, \ \frac{1}{z}, \ z^2 \) - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION
12

UNIT V LAPLACE TRANSFORMS
12

TOTAL : 60 PERIODS

COURSE OUTCOMES
Upon successful completion of the course, students should be able to:
- Evaluate real and complex integrals using the Cauchy integral formula and the residue theorem
- Appreciate how complex methods can be used to prove some important theoretical results.
- Evaluate line, surface and volume integrals in simple coordinate systems
- Calculate grad, div and curl in Cartesian and other simple coordinate systems, and establish identities connecting these quantities
- Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.

TEXT BOOKS
REFERENCE BOOKS

PH7257 PHYSICS OF MATERIALS L T P C
(Common to Chemical, Ceramic, Food, Leather, Textile, Apparel, Industrial Biotechnology, Pharmaceutical and PET) 3 0 0 3

OBJECTIVE:
- To make the students to understand the basics of phase diagrams and various materials preparation techniques
- To equip the students to have a knowledge on different types of electron theory, basics of quantum mechanics and about superconductors
- To introduce the physics of semiconducting materials and applications of semiconductors in device fabrication
- To familiarize the students with the theory and applications of magnetic and dielectric materials
- To provide the students a sound platform towards learning about advanced materials and their applications.

UNIT I PREPARATION OF MATERIALS 9

UNIT II ELECTRICAL AND SUPERCONDUCTING MATERIALS 9

UNIT III SEMICONDUCTING MATERIALS 9

UNIT IV DIELECTRIC 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 - Ferroelectric materials - Introduction to magnetic materials - Domain theory of ferromagnetism,

UNIT V NEW MATERIALS AND APPLICATIONS 9

TOTAL: 45 PERIODS

OUTCOME:
On completion of the course, the students will be able to
- acquire knowledge of phase diagram, and thin film and nanomaterial preparation techniques
- familiarize with conducting materials, basic quantum mechanics, and properties and applications of superconductors.
- gain knowledge on semiconducting materials based on energy level diagrams, its types, temperature effect. Also, fabrication methods for semiconductor devices will be understood.
- realize with theories and applications of dielectric and ferromagnetic materials
- familiarize with ceramics, composites, metallic glasses, shape memory alloys, biomaterials and their important applications.

REFERENCES:

CY7255 CHEMISTRY FOR TECHNOLOGISTS L T P C
OBJECTIVE
- The students should be conversant with
  - boiler feed water requirements, water treatment techniques,
  - Applications of oil and its properties, principles of different chemical analysis.
  - Different kinds of preparations of important chemicals.

UNIT I WATER TECHNOLOGY 9

UNIT II OILS, FATS, SOAPS & LUBRICANTS 9
Chemical constitution, chemical analysis of oils and fats – free acid, saponification and iodine values, definitions, determinations and significance. Soaps and detergents - cleaning action of soap. Lubricants - definition, characteristics, types and properties – viscosity, viscosity index, carbon residue, oxidation stability, flash and fire points, cloud and pour points, aniline point. Solid lubricants – graphite and molybdenum disulphide.
UNIT III   CHEMICAL ANALYSIS – AN ANALYTICAL INSIGHT  9

UNIT IV   DYE CHEMISTRY  9
Witt’s theory and modern theory of colors – synthesis of methyl red, methyl orange, congo red, malachite green, p-rsaniline, phenolphthalein, fluorescence, eosin dyes.

UNIT V   CHEMICALS AND AUXILIARIES  9

TOTAL: 45 PERIODS

OUTCOME
- Will be familiar with boiler feed water requirements, water treatment techniques.
- Will know the oil and its properties, principles of different chemical analysis.
- Will know the preparations of important chemicals.

TEXT BOOKS

REFERENCES
Resolution of a Given Force into a Force -Couple system, Further Reduction of a System of Forces, Equilibrium in Two and Three Dimensions - Reactions at Supports and Connections.

UNIT III  DISTRIBUTED FORCES
Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Distributed Loads on Beams, Center of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies, Determination of Centroids of Volumes by Integration.
Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration, Polar Moment of Inertia, Radius of Gyration of an Area, Parallel-Axis Theorem, Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates, Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

UNIT IV  FRICTION

UNIT V  DYNAMICS OF PARTICLES

L – 45 + T – 15 TOTAL: 60 PERIODS

OUTCOMES:
- Upon completion of this course, students will be able to construct meaningful mathematical models of physical problems and solve them.

TEXT BOOK

REFERENCES

GE7152  ENGINEERING GRAPHICS

L  T  P  C
3  2  0  4

OBJECTIVES
- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.
CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION)
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HANDSKETCHING
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. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES
Orthographic projection- principles-Principal planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes- Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

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

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

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

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY)
Introduction to drafting packages and demonstration of their use.

L=45+T=30, TOTAL: 75 PERIODS

OUTCOMES:
On Completion of the course the student will be able to
- Perform free hand sketching of basic geometrical shapes and multiple views of objects.
- Draw orthographic projections of lines, Planes and Solids
- Obtain development of surfaces.
- Prepare isometric and perspective views of simple solids.

TEXT BOOK:
REFERENCES:

Publication of Bureau of Indian Standards:

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

GE7162 ENGINEERING PRACTICES LABORATORY
(Common to all Branches of B.E. / B.Tech. Programmes) L T P C 0 0 4 2

COURSE OBJECTIVES
• To provide exposure to the students with hands-on experience on various Basic Engineering Practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP – A (CIVIL & ELECTRICAL)

CIVIL ENGINEERING PRACTICES

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.
• Laying pipe connection to the delivery side of a pump.
• Practice in connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.
WOOD WORK
• Sawing, planing and making joints like T-Joint, Mortise and Tenon joint and Dovetail joint.

STUDY
• Study of joints in door panels and wooden furniture
• Study of common industrial trusses using models.

ELECTRICAL ENGINEERING PRACTICES

• Basic household wiring using Switches, Fuse, Indicator and Lamp etc.,
• Stair case light wiring
• Tube – light wiring
• Preparation of wiring diagrams for a given situation.
• Study of Iron-Box, Fan Regulator and Emergency Lamp

GROUP – B (MECHANICAL AND ELECTRONICS)

MECHANICAL ENGINEERING PRACTICES

WELDING
• Arc welding of Butt Joints, Lap Joints, and Tee Joints
• Gas welding Practice.
• Basic Machining - Simple turning, drilling and tapping operations..
• Study and assembling of the following:
  a. Centrifugal pump
  b. Mixie
  c. Air Conditioner.

DEMONSTRATION ON FOUNDRY OPERATIONS.

ELECTRONIC ENGINEERING PRACTICES

• Soldering simple electronic circuits and checking continuity.
• Assembling electronic components on a small PCB and Testing.
• Study of Telephone, FM radio and Low Voltage Power supplies.

TOTAL: 60 PERIODS

COURSE OUTCOMES
• Ability to fabricate carpentry components and to lay pipe connections including plumbing works.
• Ability to use welding equipments to join the structures
• Ability to do wiring for electrical connections and to fabricate electronics circuits.

MA7356 PROBABILITY AND RANDOM PROCESSES

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
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 12
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 12
Classification – Stationary process – Markov process - Poisson process – Random telegraph process.

UNIT IV CORRELATION AND SPECTRAL DENSITIES 12

UNIT V LINEAR SYSTEMS WITH RANDOM INPUTS 12
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

OUTCOMES:
- Students will be able characterize probability models using probability mass (density) functions & cumulative distribution functions
- Students will be able to describe a random process in terms of its mean and correlation functions.
- Students will demonstrate knowledge in special processes like Poisson, Renewal processes.

TEXTBOOKS:

REFERENCES:

LT7302 INTRODUCTION TO LEATHER MANUFACTURE L T P C
3 0 0 3

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

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; 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 PRE-TANNING PROCESSES 12
Principles and objectives of pre-tanning 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.

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

OUTCOMES
Through this course the student gains a comprehensive view of the underpinning science and technology involved in the manufacture of leathers.

CO-1 Understand the application and alternatives to leather in current global scenario.
CO-2 Have knowledge on pretanning, tanning and post tanning processes
CO-3 Comprehend the process rational for making specific leather
CO-4 Have understanding about the characteristic features of the skin/hides
CO-5 Aware of various preservation techniques of the skin/hides

TEXT BOOKS
### Course Articulation Matrix:

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<td>Understand the application and alternatives to leather in current global scenario.</td>
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<td>CO-2</td>
<td>Have knowledge on pretanning, tanning and post tanning processes</td>
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<td>Comprehend the process rational for making specific leather</td>
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<td>Have understanding about the characteristic features of the skin/hides</td>
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<tr>
<td>CO-5</td>
<td>Aware of various preservation techniques of the skin/hides</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVES:
To impart knowledge on
• Electric circuit laws, single and three phase circuits and wiring
• Working principles of Electrical Machines
• Various electronic devices and measuring instruments

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

UNIT II  AC CIRCUITS
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
Principles of operation and characteristics of DC machines. Transformers (single and three phase), Synchronous machines, three phase and single phase induction motors.

UNIT IV  ELECTRONIC DEVICES & CIRCUITS

UNIT V  MEASUREMENTS & INSTRUMENTATION
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 transformers (CT and PT)

TOTAL: 45 PERIODS

OUTCOMES:
Ability to
• Understand electric circuits and working principles of electrical machines
• Understand the concepts of various electronic devices
• Choose appropriate instruments for electrical measurement for a specific application

REFERENCES
OBJECTIVES
This course aims at introducing fundamental chemistry required for leather manufacture.

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’ and ‘f’ orbitals and
transition metals; Coordination compounds –nomenclature, Theories - Coordination theory,
Werner’s theory; Ligand field theory; Introduction to inorganic tanning materials

UNIT II MOLECULAR BONDING 9
Shapes of molecules - Valence Shell Electron Pair Repulsion method; Valence bond approach and
atomic orbital hybridizations. LCAO-MO theory, pictorial derivation of bonding and anti-bonding
molecular orbitals. MO energy level diagrams for homo nuclear di-atomics; Redox reactions.

UNIT III ORGANIC TANNIN CHEMISTRY 10
Chemistry of condensed and hydrolysable tannins proanthocyanidins, dimers, trimers and other
oligomers. Chemistry of sulphonyl chloride, quinone, oxazolidine, phosphonium and other organic
tanning agents. Methods of preparation of vegetable tannin extracts, spray dried vegetable tannins,
synthetic and other organic tannages.

UNIT IV COLLOIDS & SURFACTANTS 10
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

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

UNIT V APPLICATION TO LEATHER TECHNOLOGY 6
Use of inorganic and organic materials in leather manufacture; Wetting theory, Cohesion & Adhesion.

OUTCOMES:
At the end of the course the students will have basic knowledge of organic, inorganic and physical
chemistry related to leather science and technology.

CO-1 Have the basic knowledge on inorganic compounds
CO-2 Comprehend the knowledge on organic compounds and reaction
mechanism
CO-3 Understand the concept of various molecular bonding
CO-4 Interpret the characteristic of organic compounds and its relevance in
tanning.
CO-5 Perceive the concepts of colloids and surfactants.
TEXT BOOKS
8. Introduction to Colloid and Surface Chemistry, Duncan J. Shaw, Butternorth, Hewemann, (1992)
# Course Articulation Matrix:

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<td>Have the basic knowledge on inorganic compounds</td>
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<td>CO-2</td>
<td>Comprehend the knowledge on organic compounds and reaction mechanism</td>
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<td>Understand the concept of various molecular bonding</td>
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<td>Interpret the characteristic of organic compounds and its relevance in tanning</td>
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<td>CO-5</td>
<td>Perceive the concepts of colloids and surfactants</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVES
To understand the basic structure and function of skin and its components and to understand the various pre-tanning processes/operations

UNIT I COMPONENTS, FUNCTIONS AND COMPOSITION OF SKIN
Organization of skin components in different animals; Structure and function of epidermis, dermis, cutaneous and subcutaneous tissues; hair; fat tissue; nerve; erectorpili 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 complex carbohydrates and proteoglycons; Structure and properties of fatty acids.; Structure, function and properties of amino acids.

UNIT II STRUCTURE, FUNCTION, THERMAL TRANSITION AND DEGRADATION OF COLLAGEN
Structure, function and chemical features of collagen; Types of collagen; Tropocollagen molecules; Sub-units of collagen; Kinetics of fibril formation; 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 PRESERVATION AND PRE-TANNING PROCESSES
Principles of preservation of hides and skins - Defects due to parasitic diseases of livestock that affect leather quality.
Chemistry and principles of different pretanning processes - Soaking, liming, deliming, bating, pickling, depickling and degreasing.

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

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

OUTCOMES
The students will be able to understand

CO-1 To know about various structural components and functions of skin/hide
CO-2 To understand the molecular structure of collagen and its supramolecular assemblies and their characteristics
CO-3 To gain fundamental knowledge on preservation and pre-tanning process
CO-4 Aware of various cleaner pre-tanning processes
CO-5 To determine the quality control requirements of pre-tanning process.
TEXT BOOKS

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<td>CO-1</td>
<td>To know about various structural components and functions of skin/hide</td>
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<td>CO-3</td>
<td>To gain fundamental knowledge on preservation and pre-tanning process</td>
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<td>CO-4</td>
<td>Aware of various cleaner pre-tanning processes</td>
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<td>CO-5</td>
<td>To determine the quality control requirements of pre-tanning process.</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVES
To impart knowledge on basic concepts of chemical engineering unit operations and processes and application in leather and leather chemicals manufacture

UNIT I CONCEPTS & METERING OF FLUIDS

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

UNIT III MECHANICAL SEPARATIONS
Size reduction: Theory and equipment; application in leather chemical processing

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

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

OUTCOMES

CO-1 Know the basic concepts of unit operations, material and energy balances.
CO-2 Understand the fluid dynamics mass and heat transfer in various unit operations such as distillation, extraction, drying and humidification
CO-3 The size reduction and separation and mixing techniques technology of organic and inorganic chemicals involved in the processing of leather and leather chemicals
CO-4 Have knowledge of various chemical processing
CO-5 Have understanding on the water and chemical treatments

REFERENCES
8. Dutta, S.S., An introduction to the principles of leather manufacture, ILTA.
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<td>Know the basic concepts of unit operations, material and energy balances.</td>
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<td>Understand the fluid dynamics mass and heat transfer in various unit operations such as distillation, extraction, drying and humidification</td>
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<td>The size reduction and separation and mixing techniques technology of organic and inorganic chemicals involved in the processing of leather and leather chemicals</td>
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<td>CO-4</td>
<td>Have knowledge of various chemical processing</td>
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<td>CO-5</td>
<td>Have understanding on the water and chemical treatments</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE:
- To train the students in performing various tests on electrical drives, sensors and circuits.

LIST OF EXPERIMENTS:
1. Load test on separately excited DC shunt generator
2. Load test on DC shunt motor
3. Load test on S Transformer
4. Load test on Induction motor
5. Regulation of 3 Alternator
6. Study of CRO
7. Logic gates
8. Operational amplifiers
9. Time constant of RC circuit
10. Characteristics of LVDT
11. Calibration of Rotometer
12. RTD and Thermistor
13. Flapper Nozzle system

TOTAL: 60 PERIODS

OBJECTIVES
To provide an understanding of raw skin and hides and basic knowledge about tanning.

LIST OF EXPERIMENTS
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 (demonstration)
6. Introduction to various mechanical operations/processing equipments/devices (demonstration)

OUTCOMES
To train the students to gain an exposure to leather manufacture.
CO-1 Pursue knowledge on assortment of hides and skins.
CO-2 Trained to manufacture wet blues, E.I. and vegetable tanned leathers.
CO-3 Acquire knowledge on post-tanning and finishing processes

TOTAL: 60 PERIODS
### Course Articulation Matrix:

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<th>CO</th>
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<td>CO-1</td>
<td>Pursue knowledge on assortment of hides and skins.</td>
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<tr>
<td>CO-2</td>
<td>Trained to manufacture wet blues, E.I. and vegetable tanned leathers.</td>
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<tr>
<td>CO-3</td>
<td>Acquire knowledge on post-tanning and finishing processes</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES:

- To provide the mathematical foundations of numerical techniques for solving linear system, eigenvalue problems, interpolation, numerical differentiation and integration and the errors associated with them;
- 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 EIGENVALUE PROBLEMS  


UNIT II  INTERPOLATION AND APPROXIMATION  

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  


UNIT IV  INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS  


UNIT V  BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS  

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.

OUTCOMES:

- Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions.
- Apply numerical methods to obtain approximate solutions to mathematical problems.
- Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
- Analyse and evaluate the accuracy of common numerical methods.

TEXT BOOKS:

REFERENCES:

LT7402 INSTRUMENTAL METHODS OF ANALYSIS FOR LEATHER TECHNOLOGISTS

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

UNIT I INTRODUCTION TO SPECTROSCOPICAL METHODS OF ANALYSIS 13
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.

UNIT II MOLECULAR SPECTROSCOPY 9
Various transitions in organic and inorganic compounds effected by UV, visible and infrared radiations, various energy level diagrams of saturated, unsaturated and carbonyl compounds, excitation by UV and Visible radiations, Effects of auxochromes and effects of conjugation on the absorption maxima, Applications of UV-Visible and IR spectroscopy. QUANTITATIVE SPECTROSCOPY: Beer-Lambert’s Law, Limitations, Deviations (Real, Chemical, Instrumental) Nesslerimetry. Estimation of dyes, Cr and Fe using Beer-Lambert’s Law

UNIT III ATOMIC SPECTROSCOPY 6
Atomic Absorption Spectrophotometry; Principle, Instrumentation and Application, Various interferences observed in AAS (Chemical, radiation and excitation); Flame photometry; Principle, Instrumentation and applications

UNIT IV POLARIMETRY AND REFRACTOMETRY 4
Polarimetry and refractometry Principle, instrumentation and Applications

UNIT V THERMAL ANALYSIS 7
Thermogravimetry: Instrumentation, applications, thermograms of some important compounds; Differential thermal analysis: principle, Instrumentation and applications, Principles and applications of DSC, DTA in leather and leather chemicals

UNIT VI CHROMATOGRAPHIC METHODS 6
Classification of chromatographic methods, column, Thin layer, paper, Gas, GPC, High performance liquid chromatographical methods (principles, mode of separation, instrumentation and technique) for the analysis of leather auxiliaries

TOTAL : 45 PERIODS
OUTCOMES
Students will gain fundamental knowledge on various physico-chemical analytical methods and understand the underpinning science behind various instrumental techniques.

CO-1  Gain fundamental knowledge on various physico-chemical analytical methods.
CO-2  Understand the underpinning science behind various instrumental techniques.
CO-3  Understand the fundamentals of the molecular interaction with electromagnetic radiations
CO-4  Understand the theoretical knowledge about handing of instruments
CO-5  Aware of various chromatographic techniques

TEXT BOOK

REFERENCES
### Course Articulation Matrix:

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<td>CO-1</td>
<td>Gain fundamental knowledge on various physico-chemical analytical methods.</td>
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<td>Understand the underpinning science behind various instrumental techniques.</td>
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<td>CO-3</td>
<td>Understand the fundamentals of the molecular interaction with electromagnetic radiations</td>
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<tr>
<td>CO-4</td>
<td>Understand the theoretical knowledge about handing of instruments</td>
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<tr>
<td>CO-5</td>
<td>Aware of various chromatographic techniques</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES
This course aims at imparting knowledge in the technology of making different types of heavy leathers from hides.

UNIT I PRODUCT BRIEF OF LEATHERS FROM HIDES
Product brief of various light and heavy leather manufacture from hides.

UNIT II HEAVY LEATHER MANUFACTURE FROM HIDES
Property requirement of sole, harness, saddle and other industrial leathers from hides; Process design considerations; Choice of raw material; Traditional and modern methods; International standards required for the heavy leathers.

UNIT III LIGHT LEATHER MANUFACTURE FROM HIDES
Property requirement of upper, garment and other light leathers from hides; Process design considerations; Choice of raw material; International standards requirements for the light leathers from hides.

UNIT IV PROCESS TECHNOLOGY FOR LEATHERS FROM HIDES
Process details to achieve the specifications for the following leathers: Full chrome/Semi chrome/Chrome retan - uppers, suedes, nubuck, lining, nappa, shrunken grain, upholstery, burnishable, printed leathers; Upgradation technologies; Rectification of defects in hides.

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

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.

CO-1 To understand the basic product brief of light and heavy leather manufacture from hides.
CO-2 To gain knowledge in property requirement and process design of heavy leather
CO-3 To gain knowledge in property requirement and process design of light leather
CO-4 Articulate in-depth knowledge in process technology for leather from hides
CO-5 Understand the physical and chemical properties of raw materials used in sports goods leathers

TEXT BOOKS
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<tr>
<td>CO-1</td>
<td>To understand the basic product brief of light and heavy leather manufacture from hides.</td>
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<td>CO-2</td>
<td>To gain knowledge in property requirement and process design of heavy leather</td>
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<tr>
<td>CO-3</td>
<td>To gain knowledge in property requirement and process design of light leather</td>
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<tr>
<td>CO-4</td>
<td>Articulate indepth knowledge in process technology for leather from hides</td>
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<tr>
<td>CO-5</td>
<td>Understand the physical and chemical properties of raw materials used in sports goods leathers</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVES
To impart knowledge on the chemistry of various inorganic and organic tanning materials and systems

UNIT I  CHROMIUM CHEMISTRY  14
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, oxolation and polymerisation, Stiasny's series, McClandish precipitation point.

UNIT II  FACTORS CONTROLLING CHROME TANNING  8
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 III  MECHANISM OF INORGANIC TANNAGES  14
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.
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.

UNIT IV  VEGETABLE TANNIN CHEMISTRY  12
Vegetable tannins - definition and classification, Occurrence; Chemistry of hydrolysable tannins - gallotannins, ellagi tannins - their structural aspects including tannin dimers, trimers. Tannins as well as non-tannins, polyphenolic constituents present in popular tanning materials like avaram, konnam, wattle, cutch, babul, myrobalan, etc., and their physico-chemical properties and their effect on the physical properties of leathers.

UNIT V  MECHANISM OF VEGETABLE AND OTHER ORGANIC TANNAGES  12
Mechanism of tanning with aldehydes, oil, oxazolidine and other organic tanning agents; Synthetic tannins - Classification - properties, uses in leather industry.

TOTAL: 60 PERIODS

OUTCOMES
Students will gain knowledge of inorganic and organic tannages and their mechanism of interaction with emphasis on chromium and vegetable tanning.
CO-1  Understand the chemistry of chromium and factors controlling chrome tanning.
CO-2  Understand the mechanism of inorganic tannages.
CO-3  Comprehend the chemistry of vegetable tannins and mechanism vegetable and organic tanning
CO-4  Have knowledge on mechanism of oil and aldehyde tanning
CO-5  Understand the parameters influence on tanning
TEXT BOOKS
1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES
To impart knowledge on analytical methods for the analysis of leather, leather chemicals and process liquors generated during processing of leathers

UNIT I ANALYSIS OF LEATHER CHEMICALS 12
Principles of analytical methods employed in analysis of pretanning chemicals – Lime, unhairing, deliming and bating agents; Vegetable tanning materials and extracts; Aldehydes; Chrome extracts and liquors; Principles of analytical and instrumental methods employed in analysis of syntans, dyes, oils and fats, fatliquor, finishing auxiliaries. Specifications recommended by standards organizations.

UNIT II 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 III ANALYSIS OF LEATHERS 8
Principles of analytical and instrumental methods employed in analysis of various chrome leathers, vegetable tanned leathers; Specifications recommended by standards organizations. Principles of analytical and instrumental methods employed in analysis of eco-sensitive substances- Pentachlorophenol (PCP), Formaldehyde, Hexavalent chromium [Cr(VI)], azodyes etc., present in finished leathers.

UNIT IV MICROBIOLOGY FOR LEATHER 8
Testing of bacterial action on raw hides and skins and in the different stages of Leather Manufacture. 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.

UNIT V PHYSICAL TESTING OF LEATHERS 9
Orientation of fibre structure of skins/hides and leathers using various microscopes; Sampling position for physical testing of leathers. Different physical testing methods - principles involved. Static and Dynamic methods, Non-destructive testing of leathers.

TOTAL : 45 PERIODS

OUTCOMES
At the end of the course, the student would understand

CO-1 The analytical chemistry behind the testing of leather chemicals and leathers
CO-2 Various techniques for analyzing leather chemicals, spent process liquors, and pelts/ leathers.
CO-3 Quality Standards of various leather chemicals and leather end products
CO-4 Gain experience on microbiology testing techniques of leathers
CO-5 Have knowledge on various physical testing methods of leathers
TEXT BOOKS
## Course Articulation Matrix:

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<td>The analytical chemistry behind the testing of leather chemicals and leathers</td>
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<tr>
<td>CO-2</td>
<td>Various techniques for analyzing leather chemicals, spent process liquors, and pelts/ leathers.</td>
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<tr>
<td>CO-3</td>
<td>Quality Standards of various leather chemicals and leather end products</td>
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<tr>
<td>CO-4</td>
<td>Gain experience on microbiology testing techniques of leathers</td>
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<tr>
<td>CO-5</td>
<td>Have knowledge on various physical testing methods of leathers</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES
To impart knowledge on biotechnological applications in processing of skins into leather.

UNIT I PROTEINS AND NUCLEIC ACID & ENZYMEOLOGY 10

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

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

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

TOTAL: 45 PERIODS

OUTCOMES
At the end of the course, the student will understand basic biotechnology concepts and its relevance for application in leather processing.

CO-1 Understand basic biotechnology concepts and its relevance for application in leather processing.
CO-2 Principles of genetic engineering
CO-3 Have knowledge in enzyme for leather processing.
CO-4 Manage the waste generated from leather industries.
CO-5 Application of collagen in other fields
REFERENCES
### Course Articulation Matrix:

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<tr>
<td>CO-1</td>
<td>Understand basic biotechnology concepts and its relevance for application in leather processing.</td>
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<td>Have knowledge in enzyme for leather processing.</td>
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<td>CO-4</td>
<td>Manage the waste generated from leather industries.</td>
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<td>CO-5</td>
<td>Application of collagen in other fields</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES

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.

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. \(\text{Cr}_2\text{O}_3\) content
   c. Acid combined with chromium
   d. Basicity: Proctor and Lehigh basicities
   e. Degree of olation

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. Un-saponifiables
   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.
OUTCOMES
At the end of the course, the students will have practical experience and understanding on the analysis of various leather chemicals, pelts/leathers and eco-sensitive substances by means of qualitative and quantitative methods of analyses

CO-1 Have practical experience and understanding the analysis of various leather chemicals
CO-2 Understand the challenges of eco-sensitive substances and their qualitative and quantitative analytical methods.
CO-3 Gain experience in analyzing chrome & vegetable tanning agents

TOTAL : 60 PERIODS
### Course Articulation Matrix:

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<th>CO</th>
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<th>PSO1</th>
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</thead>
<tbody>
<tr>
<td>CO-1</td>
<td>Have practical experience and understanding the analysis of various leather chemicals</td>
<td>2</td>
<td>3</td>
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<tr>
<td>CO-2</td>
<td>Have practical knowledge of pelt/leather analysis</td>
<td>2</td>
<td>3</td>
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<tr>
<td>CO-3</td>
<td>Understand the challenges of eco-sensitive substances and their qualitative and quantitative analytical methods.</td>
<td>2</td>
<td>3</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVES
To carry out the practical leather processing of heavy and finished leathers from raw hides.

- Heavy leathers like sole, saddle, belting etc., from hides
- Finished leathers from different bovine hides and calf skins
1. Manufacture of vegetable tanned and chrome sole leathers;
2. Processing of belting leathers, harness and saddle leathers; (minimum one)
3. Manufacture of following leathers (minimum four) from different raw materials and tannages:
   - Upholstery leathers
   - Upper leathers
   - Nappa leathers
   - Patent leathers
   - Shrunken grain leathers
   - Nubuck /Suede upper leathers
   - Burnishable upper leathers
   - Oil-pull up leathers

OUTCOMES
At the end of the course students will gain confidence in leather manufacturing from hides.

CO-1 Develop different kinds of leathers from hides.
CO-2 Comprehend the processing aspects for making leathers from hides.
CO-3 Understand the process – property correlation for making various types of heavy leathers.

TOTAL : 90 PERIODS
### Course Articulation Matrix:

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<tr>
<td>CO-1</td>
<td>Develop different kinds of leathers from hides.</td>
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<td>3</td>
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<tr>
<td>CO-2</td>
<td>Comprehend the processing aspects for making leathers from hides.</td>
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<td>3</td>
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<tr>
<td>CO-3</td>
<td>Understand the process – property correlation for making various types of heavy leathers.</td>
<td>3</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVES

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

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

UNIT II  FATLIQUORS AND FATLIQUORING OF LEATHER  10

UNIT III SYNTANS AND RETANNING OF LEATHER  10

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

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

TOTAL : 45 PERIODS

OUTCOMES

Students will be able to understand post tanning processes like neutralization and its importance to the manufacture of various types of leathers, chemistry of post tanning auxiliaries and mechanism of dyeing, fatliquoring and retanning.

CO-1 Have knowledge on different dyes and its principles and its color theory for leather applications
CO-2 Have knowledge on different fatliquors used in leather manufacture
CO-3 Have knowledge on different types of syntans used in leather manufacture
CO-4 Articulation on use of dyes syntans and fatliquors for different leather end products
CO-5 Understanding the application of different post tanning machineries towards manufacture of different leathers
TEXT BOOKS
## Course Articulation Matrix:

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<tr>
<td>CO-1</td>
<td>Have knowledge on different dyes and its principles and its color theory for leather applications</td>
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<tr>
<td>CO-2</td>
<td>Have knowledge on different fatliquors used in leather manufacture</td>
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<td>CO-3</td>
<td>Have knowledge on different types of syntans used in leather manufacture</td>
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<td>CO-4</td>
<td>Articulation on use of dyes syntans and fatliquors for different leather end products</td>
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<tr>
<td>CO-5</td>
<td>Understanding the application of different post tanning machineries towards manufacture of different leathers</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES
This course aims at imparting knowledge in the technology of making different types of light leathers from skins.

UNIT I PROPERTIES OF LEATHER
Classification of leathers, Definition of various leather properties, Understanding and measurement of properties, Relevance and significance of various leather properties in manufacture and usage for different end application.

UNIT II UPPER AND LINING LEATHERS
Shoe upper, lining leathers: Choice of raw materials, relationship between each leather property and process parameter; Rational of preparation of the same.

UNIT III GARMENT AND GLOVE LEATHERS
Garment nappa, fine glove leathers: Choice of raw materials, relationship between each leather property and process parameter; Rational of preparation of the same.

UNIT IV OTHER SPECIALITY LEATHERS
Chamois, suede garment, glazed kid leathers etc: Choice of raw materials, relationship between each leather property and process parameter; Rational of preparation of the same.

UNIT V LIGHT LEATHER MANUFACTURE
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

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 their manufacture from skins.

CO-1 Understand the property variations of different leathers
CO-2 Design suitable processing variations that are required to manufacture leather from skin
CO-3 Develop speciality leathers from skin
CO-4 Correlate and understand the leather property and process parameter.
CO-5 Comprehend the quality control aspects of light leather

TEXT BOOKS
3. CLRI Process Bulletins.
## Course Articulation Matrix:

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<tbody>
<tr>
<td>CO-1</td>
<td>Understand the property variations of different leathers</td>
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<td>CO-2</td>
<td>Design suitable processing variations that are required to manufacture</td>
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<td>CO-3</td>
<td>Develop speciality leathers from skin</td>
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<tr>
<td>CO-4</td>
<td>Correlate and understand the leather property and process parameter.</td>
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<tr>
<td>CO-5</td>
<td>Comprehend the quality control aspects of light leather</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
COURSE DESCRIPTION
This course aims to help the students acquire the employability skills necessary for the workplace situations. It also attempts to meet the expectations of the employers by giving special attention to language skills, presentation skills, group discussion skills and soft skills. This will be achieved through expert guidance and teaching activities focusing on employability skills.

COURSE 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 reading skills, writing skills, and soft skills necessary for the workplace situations
- To make them employable graduates

CONTENTS
UNIT I  READING AND WRITING SKILLS  9
Reading: skimming & scanning strategies – note making skills – interpreting visual material (charts & tables) – critical reading – fast reading necessary for reading letters & files - preparing job applications - writing covering letter and résumé - applying for jobs online - email etiquette – writing official letters (placing an order, letters to consumers, etc. ) writing reports – collecting, analyzing and interpreting data

UNIT II  SOFT SKILLS  9
Hard skills & soft skills – soft skills: self-management skills & people skills - training in soft skills - persuasive skills – sociability skills – interpersonal skills – team building skills – leadership skills – problem solving skills – adaptability - stress management – motivation techniques – life skills -

UNIT III  PRESENTATION SKILLS  9
Preparing slides with animation related to the topic – organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice — presenting the visuals effectively – 5 minute presentation

UNIT IV  GROUP DISCUSSION SKILLS  9
Participating in group discussions – understanding group dynamics - brainstorming the topic — questioning and clarifying – GD strategies (expressing opinions, accepting or refusing others opinions, turn taking) – activities to improve GD skills – viewing recorded GD - mock GD

UNIT V  INTERVIEW SKILLS  9

LEARNING OUTCOMES
- Students will be able to make presentations and participate in group discussions with high level of self-confidence.
- Students will be able to perform well in the interviews
- They will have adequate reading and writing skills needed for workplace situations

TOTAL : 45 PERIODS
REFERENCES:

EXTENSIVE READING

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

LT7513 MATERIAL TESTING LABORATORY - II

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

MICROSCOPY LAB
a. Setting up of a compound microscope
b. Preparation of microscopical slides by paraffin embedding method and by freezing method
c. Identification of hides and skins from their morphological and histological pattern of Buffalo, Cow, Sheep, Goat, Pig and other species.
d. Microscopical assessment of fibre structure during the process - Soaking, liming, pickling and tanning and different finished leathers.

MICROBIOLOGY LAB
a. Preparation of various culture media
b. Staining of bacteria
c. Enumeration of bacteria in hides and skins and in tan liquors
d. Isolation and identification of fungi/mold/yeast in raw hides/skins, leathers and tan liquors
e. Mildew resistance test for leathers
f. Identification of insect and parasitic damages in skins/hides/leathers (Entomology demo only)

PHYSICAL TESTING LAB
Strength Properties
a. Tensile Strength and Elongation at break
b. Tongue tear strength
c. Stitch tear and slit tear strengths
d. Grain crack and bursting strengths

Wear and Comfort Properties
a. Static/dynamic water absorption
b. Water vapour permeability
c. Abrasion resistance
d. Perspiration resistance

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

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

CO-1  Microscopical analysis/identification of leathers
CO-2  Microbiological testing of raw skins/hides, pelts and leathers and various process liquors
CO-3  Performing various physical testing methods for assessing leathers.
### Course Articulation Matrix:

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<tbody>
<tr>
<td>CO-1</td>
<td>Microscopical analysis/identification of leathers</td>
<td>2</td>
<td>3</td>
<td>1</td>
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<tr>
<td>CO-2</td>
<td>Microbiological testing of raw skins/hides, pelts and leathers and various process liquors</td>
<td>2</td>
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<td>CO-3</td>
<td>Performing various physical testing methods for assessing leathers.</td>
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OBJECTIVES

To carry out the practical for manufacture of light leathers from raw goat, sheep and calf 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: 90 PERIODS

OUTCOMES

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

CO-1 Processing different types of leathers from skin
CO-2 Practice in making specialty leathers from different skins
CO-3 Knowledge on process recipe for making different leather
**Course Articulation Matrix:**

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<tbody>
<tr>
<td>CO-1</td>
<td>Processing different types of leathers from skin</td>
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<td>Practice in making specialty leathers from different skins</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
Each student during should undertake 1 month practical training on aspects associated with leather manufacture in Tanneries and or Leather Chemical supplier units as a part of Industrial Internship – I during the summer vacation after fourth semester. However evaluation for this course will be done in fifth semester. During fifth semester the student should submit (to assigned faculty) an industrial training report on practical internshio undertaken by/assigned to him/her 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 enhance the practical knowledge of the students on various aspects associated with leather manufacture. Faculty in his/her assessment should judge the level of proficiency, originality and capacity for application of the practical knowledge attained by the student during the training period.

**OUTCOMES**
At the end of the course students will gain confidence in

- **CO-1** Provide opportunity to explore students’ interest
- **CO-2** Recognize the real working environment
- **CO-3** Builds balance between classroom knowledge with practical application

**TOTAL DURATION: 4 WEEKS**
### Course Articulation Matrix:

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<td>Provide opportunity to explore students’ interest</td>
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<td>Builds balance between classroom knowledge with practical application</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES
To impart knowledge on materials and processes/operations involved in leather finishing.

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

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

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

UNIT IV PRINCIPLES OF FINISHING, FINISH FORMULATIONS AND THEIR
APPLICATION
Impregnation: Terminology, types of impregnating binders, characteristics, selection of systems
for corrected and full grain impregnation, formulations, application methods and precautions
Finishing: Definition, aims, film formation mechanisms, properties of films such as glass transition
temperature / minimum film forming temperature, transparency, gloss and resistance to heat, light
and solvent. Pigment volume concentration, plasticizer, wetting agents, role in dispersion and
stability - requirements in multiple coat technique – such as clearing coat, sealer coat, base coat,
top and feel coat. Single coat composition methods like spraying, curtain coating, roller coating etc.
Cationic finishes and their relative merits. Foam finish; Eco- friendly finishing - Volatile Organic
Compounds (VOC) reductions. Finish formulation for various types of leathers.

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

TOTAL : 45 PERIODS

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

CO-1 Appreciate the role of various finishing agents and auxiliaries used in
leather finishing
CO-2 Formulate strategies for finishing different types of leathers
CO-3 Upgradation technologies for enhancing value to low grade substrates
CO-4 Knowledge on different machineries used in leather finishing
CO-5 Understand the principles of finishing mechanisms
REFERENCES
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE
To educate students about the importance of studying environmental science and engineering in leather practicing and to create awareness in protection of environment.

UNIT I  ENVIRONMENT, ECOSYSTEMS, BIODIVERSITY AND SUSTAINABLE DEVELOPMENT  
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  
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  TREATMENT OF TANNERY WASTEWATER  
Unit operations and processes for the treatment of tannery wastewater - 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 - tertiary treatment – reverse osmosis.

UNIT IV  ENVIRONMENTAL IMPACT & RISK ASSESSMENT  

UNIT V  ENVIRONMENTAL POLICIES AND LEGISLATION  

TOTAL : 45 PERIODS
OUTCOMES
At the end of this course, the students will be able to appreciate the importance of environmental science and technology in leather manufacture.

CO-1 Appreciate the importance of environmental science and technology.
CO-2 Understand the ecosystem, biodiversity and sustainable development.
CO-3 Exposure on various wastewater treatment methods.
CO-4 Broad spectrum knowledge on environmental pollution.
CO-5 Understanding Environmental policies and acts.

REFERENCES
# Course Articulation Matrix:

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVES
To impart knowledge on making leather goods and garments

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

UNIT II
i) Production planning - Nomenclature used for component identification in various leather garments skirts, jackets, trousers etc and various leather goods – Wallet, hand bags, Executive bags etc. Process scheduling and line balancing.
iii) Assembling - Pre assembly and assembly operations – skiving, splitting, folding, sewing etc. Various types of assembly techniques for leather goods and garments.
iv) Quality - Quality control measures in leather products manufacture.

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

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

UNIT V ORGANISATION & MANAGEMENT

OUTCOMES
Through this course students will be able to know

CO-1 To understand various components associated with the manufacture of leather good and garments
CO-2 To understand various processing steps involved in the making of leather goods and garments
CO-3 To be aware of machineries involved in the leather goods/garments manufacture
CO-4 To design leather goods and garments
CO-5 To determine the requirements for the establishment of leather goods and garments manufacturing unit
REFERENCES
6. A course manual on leather garment pattern designing.
8. Leather and sports goods – Pattern and Template marker, NIMI Publications, 2011
### Course Articulation Matrix:

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

OBJECTIVES
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  PRINCIPLES AND MECHANISM OF LEATHER MACHINERY  20
General principles and mechanism involved in various tannery machines. Mechanism of cutting and shearing action of helical blade systems. Bush, ball, roller and ring oil bearing, cam springs glars and their application and function in tannery machinery.

UNIT II  DESIGN, SELECTION AND CONSTRUCTION OF EQUIPMENT  21
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  24
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, autospray, driers measuring machine etc.
Tutorial/practical sessions on adjustment of machinery parts of above machines for proper functioning in leather processing.

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  5
Preventive maintenance and safety in the use of leather machinery

TOTAL : 75 PERIODS
OUTCOMES
At the end of this course, the students will be able to understand the working principles of machineries used in leather manufacture and their use and maintenance.

CO-1 Have knowledge of mechanical power transmission and fluid power systems
CO-2 Understand the working principles of leather processing machineries
CO-3 Understand the working principles of leather product machineries
CO-4 Have knowledge on transport systems and automation in leather product manufacture
CO-5 Aware of layout and maintenance of tannery and leather product unit

REFERENCES
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<td>CO-4</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
AIM
To provide practical training in fabrication of various leather goods and garments.
1. Free hand object drawing practice
2. Leather goods and garments working sketch practice
3. Fashion illustration and color application
4. Good's & garment's leather assortment
5. Physical observation of goods & garments accessories and reinforcement materials
6. Practice in various kinds of tools and machineries operation and its function
7. Goods and garments pattern preparation and pattern laying on leather
8. Goods and garments leather and reinforcement material cutting and lining material cutting
9. Pre-assembly and stitching operations
10. Pattern design for leather goods and garments
11. Practice in goods and garments making
12. Goods and garments quality control checking
13. Pattern grading and practice in CAD/CAM

TOTAL : 90 PERIODS

OUTCOMES
At the end of this course, the students will have practical experience and understanding in design and fabrication of leather goods and garments.

CO-1 Have practical experience in designing leather goods and garments.
CO-2 Have practical knowledge in fabrication of leather goods and garments.
CO-3 Aware of computer applications involved in developing leather goods and garments.
Course Articulation Matrix:

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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
AIM
To provide practical training in various methods of finishing of leathers.

OBJECTIVES
To train the students gain practical experience in:
- 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-repellent leathers

TOTAL: 60 PERIODS

OUTCOMES
At the end of this course, the students will have practical experience and understanding in finishing of various types of leathers.

CO-1 Have practical experience in finishing of various types of leathers
CO-2 Understand recent technology involved in leather finishing
CO-3 Aware of various machinery operation involving in leather finishing
## Course Articulation Matrix:

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
AIM
To impart knowledge of various materials and components used in footwear manufacture.

OBJECTIVES
To give focus on the manufacture, evaluation and application of materials and components used in footwear manufacture.

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

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

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

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

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

TOTAL : 45 PERIODS

OUTCOMES
At the end of this course, the students will be able to understand the construction of a shoe and its components.

CO-1  Understand the construction of a shoe and its components
CO-2  Understand the design and pattern development
CO-3  Have knowledge on cutting, pre closing and closing
CO-4  Have knowledge on prelasting and lasting
CO-5  Knowledge of various shoe construction

REFERENCES
2. “Shoes and Leather News”, Published by bureau of foreign and domestic commerce, Dept of commerce, US, 1940.
3. B.Venkatappaiah, (1997), "Introduction to modern footwear technology" Chennai. -GOTETI GRAPHICS
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<td>CO-4</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
AIM
To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

OBJECTIVES
- To understand the need for quality, its evolution, basic concepts, contribution of quality gurus, TQM framework, Barriers and Benefits of TQM.
- To understand the TQM Principles.
- To learn and apply the various tools and techniques of TQM.
- To understand and apply QMS and EMS in any organization.

UNIT I  INTRODUCTION  9
Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality –Definition of TQM-- Basic concepts of TQM —Gurus of TQM (Brief introduction) -- TQM Framework- Barriers to TQM –Benefits of TQM.

UNIT II  TQM PRINCIPLES  9

UNIT III  TQM TOOLS & TECHNIQUES I  9

UNIT IV  TQM TOOLS & TECHNIQUES II  9

UNIT V  QUALITY MANAGEMENT SYSTEM  9

TOTAL: 45 PERIODS

OUTCOMES:
CO-1  Ability to apply TQM concepts in a selected enterprise
CO-2  Ability to apply TQM principles in a selected enterprise
CO-3  Ability to understand Six Sigma and apply Traditional tools, New tools,
Benchmarking and FMEA.

CO-4 Ability to understand Taguchi’s Quality Loss Function, Performance Measures and apply QFD, TPM, COQ and BPR.

CO-5 Ability to apply QMS and EMS in any organization

TEXT BOOK:

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<td>CO-3</td>
<td>Ability to understand Six Sigma and apply Traditional tools, New tools, Benchmarking and FMEA.</td>
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<tr>
<td>CO-4</td>
<td>Ability to understand Taguchi's Quality Loss Function, Performance Measures and apply QFD, TPM, COQ and BPR.</td>
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<tr>
<td>CO-5</td>
<td>Ability to apply QMS and EMS in any organization</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
AIM
This course aims to impart knowledge on the chemistry and properties of various auxiliaries used in leather processing.

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

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

UNIT III  
Introduction to 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, sulphonylation, transesterification, phosphorylation reactions for fatliquor preparation. Stability of emulsions, grain and particle sizes of emulsions, factors controlling grain sizes of emulsions. Fatliquor manufacturing technology. Introduction to theory of colors, chromphoric groups, structural features of dyes; acid, basic and reactive dye classification. Chemistry and technology of dye manufacture.

UNIT IV  
Introduction to 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. Introduction to definition of binders, chemical classification of binders, acrylic, protein, polyurethane. Manufacturing of binder formulations.

UNIT V  
Different types of top coat formulations, choice of polymers for surface protection, role of plasticizers, internal and external plasticizers. Principles of feel modification of polymer surfaces, types of feel modifiers and matting agents. Manufacturing techniques.

TOTAL : 45 PERIODS
**OUTCOMES:**
The students will be able to understand the structure and properties of various leather auxiliaries and its application in leather proceeding.

**CO-1**  To gain knowledge on different leather auxiliaries used in leather manufacturing
**CO-2**  Have knowledge in the preparation of different types of tanning agents
**CO-3**  Understand the chemistry of oil and oil modification for the leather lubrication
**CO-4**  Understand chemistry and application of different dyes and pigments used in leather manufacturing
**CO-5**  Have knowledge on the chemistry of finishing chemicals

**TEXT BOOKS AND REFERENCES**
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
AIM
To provide practical training in 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

OUTCOMES
At the end of this course, the students will have practical experience and understanding in design and fabrication of leather shoes.

CO-1 Have practical experience in the design and fabrication of footwear.
CO-2 Have practical knowledge of cutting and clicking process.
CO-3 Have practical knowledge on lasting and finishing process.

TOTAL : 90 PERIODS
### Course Articulation Matrix:

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
Each student during should undertake 1 month practical training in leather and or leather products manufacturing unit as a part of Industrial Internship – II during the summer vacation after sixth semester. However evaluation for this course will be done in seventh semester. During seventh semester the student should submit (to assigned faculty) an industrial training report on practical internship undertaken by/assigned to him/her 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 enhance the practical knowledge of the students on various aspects associated with leather and or leather products manufacture. Faculty in his/her assessment should judge the level of proficiency, originality and capacity for application of the practical knowledge attained by the student during the training period.

OUTCOMES
CO-1 Provides real work experience
CO-2 Opportunity to explore students’ interest
CO-3 Students will be able to integrate classroom knowledge and theory with practical application
CO-4 Provides a nice learning curve for students with little experience
CO-5 Develops professional skills and competencies

TOTAL DURATION: 4 WEEKS
### Course Articulation Matrix:

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<td>CO-4</td>
<td>Provides a nice learning curve for students with little experience</td>
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<tr>
<td>CO-5</td>
<td>Develops professional skills and competencies</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
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. 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, plan of work and/or preliminary data determined in the laboratory/industry.

**VIVA VOCE**

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

**OUTCOMES**

- CO-1  Apply the fundamental concept learnt during the theory courses
- CO-2  Identification of industrial problems
- CO-3  Review of literature
- CO-4  Identify the Knowledge gap
- CO-5  Ability to plan and design process for the current problem

**TOTAL : 60 PERIODS**
**Course Articulation Matrix:**

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<td>Apply the fundamental concept learnt during the theory courses</td>
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<td>Identify the Knowledge gap</td>
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<tr>
<td>CO-5</td>
<td>Ability to plan and design process for the current problem</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
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. 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, plan of work, experimental details, data determined in the laboratory/industry, results, discussion of the data presented, conclusion and future work. Proper bibliographic details are necessary in the report.

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.

OUTCOMES
CO-1  Ability to identify a problem and define project objectives
CO-2  Ability to plan and execute work
CO-3  Ability to collect data and compile results
CO-4  Ability to analyse the results
CO-5  Ability to present and communicate the findings effectively

TOTAL : 280 PERIODS
### Course Articulation Matrix:

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<td>Ability to identify a problem and define project objectives</td>
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<tr>
<td>CO-3</td>
<td>Ability to collect data and compile results</td>
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<tr>
<td>CO-4</td>
<td>Ability to analyse the results</td>
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<tr>
<td>CO-5</td>
<td>Ability to present and communicate the findings effectively</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
AIM
To impart knowledge on the advanced physical and chemical concepts of native collagen and collagen processed into leather.

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

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

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

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

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

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

TOTAL : 45 PERIODS

OUTCOMES
- CO-1 Have comprehensive knowledge on the chemistry and physics of Skin
- CO-2 Understand the molecular architecture, hydration, swelling, phase transitions, dimensional stability, relaxation, shrinkage.
- CO-3 Have knowledge on cross-linking phenomena of collagen/processed collagen/leather.
- CO-4 Ability to analyze the various thermo-mechanical properties of collagen
- CO-5 Comprehend the electromagnetic and high energy radiation on collagen
TEXT BOOKS AND REFERENCES
### Course Articulation Matrix:

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<tr>
<td>CO-1</td>
<td>Have comprehensive knowledge on the chemistry and physics of Skin.</td>
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<td>CO-2</td>
<td>Understand the molecular architecture, hydration, swelling, phase transitions, dimensional stability, relaxation, shrinkage.</td>
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<tr>
<td>CO-3</td>
<td>Have knowledge on cross-linking phenomena of collagen/processed collagen/leather.</td>
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<tr>
<td>CO-4</td>
<td>Ability to analyze the various thermo-mechanical properties of collagen</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
AIM
To attempt micro-level understanding of leather making

OBJECTIVES
- 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 pre-tanning materials, Electrophilic and nucleophilic reactions at protein sites.

UNIT II  9

UNIT III  15
Molecular level processes and changes in soaking, liming/dehairing, deliming/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

OUTCOMES
CO-1 Have an appreciation and understanding on the underpinning scientific concept on skin and leather
CO-2 Understand the diffusion and transport phenomena
CO-3 Have knowledge on molecular behavior of collagen
CO-4 Acquire knowledge on molecular level changes and dimensional changes in leather making
CO-5 Obtaining coherent knowledge on surface science applications with leather making
TEXT BOOKS AND REFERENCES
## Course Articulation Matrix:

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<tbody>
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<td>CO-1</td>
<td>Have an appreciation and understanding on the underpinning scientific concept on skin and leather</td>
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<tr>
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<td>Obtaining coherent knowledge on surface science applications with leather making</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
AIM
To enable the students to understand the science behind various marketing activities.

OBJECTIVE
The purpose of this course to give an overview on consumer purchase decision making process, the factors that influence the consumers' buying behaviour and the process by which this knowledge can be used in marketing products and service.

UNIT I
Consumer, Shopper and Buyer. Consumer decision making process – problem recognition, information search, alternative evaluation, choice, transaction and consumption, post purchase behavior, cognitive dissonance.

UNIT II
Psychological influence - symbolic consumption, self image, personality, personal values, life style, psychographics, groups. Memory and learning, perception and cognition, motivation, emotion, mood, self image, belief, attitude, intention, gender, age.

UNIT III
Sociological influence – cultural, sub cultural, cross cultural, social class, ethnic, religion, club, group, family.

UNIT IV
Consumer Research - Identifying research opportunity, developing the research questionnaire, selecting the research design – quantitative, qualitative, sample size and type. Data collection, data analysis, reporting.

UNIT V

TOTAL : 45 PERIODS

OUTCOMES
CO-1 To acquire knowledge on consumer behavior
CO-2 Ability to empathize social impact on consumer
CO-3 To acquire knowledge on marketing strategy
CO-4 Comprehensive understanding psychological impact on consumer
CO-5 Ability to Interpret data analysis and research opportunity
REFERENCES
   Blackwell: Consumer Behaviour, 10e, Thomson 2007
   Thomson 2006
3. Research for Marketing decisions- Paul, Donald, Herald- Prentice Hall (India) Zikmund:
   Exploring Marketing Research, 8e, Thomson 2006
   Panda, Shiba Charan, Entrepreneurship Development, New Delhi, Anmol Publications.
   Sage, New Delhi, 2002
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
AIM
To impart knowledge on ecofriendly options for leather processing.

OBJECTIVE
- 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  12
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 based beam house processing.

UNIT II  CLEANER PROCESSING: TANNING  10
Less chrome and chrome-free tanning systems. Latest concepts and trends in leather processing.

UNIT III  CLEANER PROCESSING: POST TANNING  8
Formaldehyde, Phenol, AOX free post tanning systems; Latest concepts and trends in leather processing.

UNIT IV  INTEGRATED CLEANER PROCESSING  8
Cleaner processing based on Eco-labelling. Integrated strategies to achieve permissible BOD, COD and TDS standards of tannery effluents.

UNIT V  ADVANCED CLEANER FINISHING TECHNIQUES  7
Role of finishing equipments such as HVLP spray, foam finishing, etc in cleaner perspective. Aqueous finishing concepts and formulation; Other novel finishing techniques to reduce VOC. Cleaner finishing of splits for shoe suede, garment suede, grain finished effect and specialty finishes - processing technologies and finishing techniques specially suited for the purpose. Upgradation of lower ends for better utilisation.

TOTAL : 45 PERIODS

OUTCOMES
CO-1 Have knowledge on the cleaner process technology in the leather processing.
CO-2 Understand the cleaner tanning, post tanning and finishing systems.
CO-3 Have knowledge on the fundamentals of bio beam house processing.
CO-4 Acquire knowledge on latest trends in leather processing
CO-5 To understand the finishing techniques for better utilization

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
AIM
To impart knowledge on financial management concepts and principles of engineering economics

UNIT I  FINANCIAL ACCOUNTING  13

UNIT II  PROFIT VALUE ANALYSIS  10

UNIT III  WORKING CAPITAL MANAGEMENT  8

UNIT IV  CAPITAL BUDGETING  8
Significance of capital budgeting – payback period – present value method – Accounting rate of return method.

UNIT V  ENGINEERING ECONOMICS  7

TOTAL : 45 PERIODS

OUTCOMES
CO-1  Understand the financial management and economics.
CO-2  Understand the profit value analysis
CO-3  Have knowledge in capital management and engineering economics
CO-4  Ability to Identify the accounting rate of return method
CO-5  To analyse demand laws

TEXT BOOKS

REFERENCES
2. Charles T.Homgren, Cost Accounting, PHI 1985
## Course Articulation Matrix:

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
AIM
To introduce enterprise resource planning principles to leather technologists.

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

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
OUTCOMES

CO-1 Have knowledge on ERP and related technologies
CO-2 Understand the ERP implementation life cycles
CO-3 Understand the ERP case studies
CO-4 Have thorough knowledge on Quality management and ERP market
CO-5 Understand the growth and advantages of ERP

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
AIM
This course aims to provide necessary knowledge and attitude to understand and appreciate the process of starting and developing a new venture.

OBJECTIVE
To gain knowledge of entrepreneurial tasks such as, generating an idea, planning a business based on the idea, conducting the feasibility study, pitching for the finance, taking risk, starting the venture and expanding while abiding by various rules and laws applicable to the business venture in leather sector.

UNIT I

UNIT II

UNIT III

UNIT IV
Building Team – creating growth oriented organisational culture. Employee motivation, retention strategies. Organisational structure with clear roles, responsibilities, authorities and accountabilities. Attracting talent with ESOP and other incentives and benefits. Training development to enhance the quality of operators, supervisors and managers of the tannery.

UNIT V

TOTAL : 45 PERIODS
OUTCOMES

CO-1  Have knowledge on entrepreneurial tasks such as, generating idea, planning business
CO-2  Have knowledge on financial management
CO-3  Understand the organizational management and business development strategies
CO-4  Acquire knowledge to enhance the productivity
CO-5  Have knowledge on Intellectual property

REFERENCES
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
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.

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

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

UNIT III  PRODUCT DEVELOPMENT  9

UNIT IV  PRESENTATION TECHNIQUES  9
Organisation of shows and preparation of art portfolios; advertising; effect of foreign languages in the presentation and promotional activities.

UNIT V  FASHION FORECAST  8
Direction of fashion trends in leather and leather products production and marketing.

TOTAL : 45 PERIODS

OUTCOMES
CO-1 Have knowledge on international trends and fashion considerations in leather
CO-2 Understand the leather products styling
CO-3 Have knowledge on fashion forecast
CO-4 Thorough knowledge on promotional activities
CO-5 To impart market research and track record

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

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
AIM
To impart human resource management skills to the students.

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

UNIT I MANAGEMENT AND GENERAL EMPLOYMENT PRACTICES 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 III 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

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

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

UNIT IV COMPENSATION AND BENEFITS 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

OUTCOMES
CO-1 Have knowledge on management and employment practices.
CO-2 Aware of fundamentals of human resource development
CO-3 Understand the management concepts and relate them to contemporary issues.
CO-4 Understand competency and various contemporary issues
CO-5 Vast knowledge on occupational safety and labour laws

TEXT BOOKS AND REFERENCES
## Course Articulation Matrix:

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
AIM
To impart knowledge on international marketing and foreign trade aspects of leather industry

OBJECTIVE
- 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
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

TOTAL : 45 PERIODS

OUTCOMES
CO-1 Understand the basics of international trade, government policies in export
CO-2 Have knowledge on aspects of world trade related to leather sector and custom tariff
CO-3 Understand the international marketing
CO-4 Thorough knowledge on India's new foreign trade Policy
CO-5 Perceive marketing management and promotion decisions
TEXT BOOKS
1. Wagdre, H. International Marketing Management, Adhyayan Publisher, 2007
### Course Articulation Matrix:

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
UNIT I
Cost accounting, elements of cost, classification of cost elements – examples from textile industry, methods of costing

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

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

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

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

TOTAL : 45 PERIODS

OUTCOMES

CO-1 Manage the costing of leather and leather products.
CO-2 Have knowledge on budget management
CO-3 Understand the risk analysis of foreign exchange.
CO-4 Able to analyse costing
CO-5 Perceive cost accounting and various methods of costing

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
AIM
To impart knowledge on leather products merchandising that relates to the domestic and global leather and leather product merchandising.

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

UNIT I  PRINCIPLES OF MARKETING MANAGEMENT  9

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 - 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

OUTCOMES
CO-1 Understand the basic principles of marketing management
CO-2 Understand the purchasing principles and management
CO-3 Fundamentals of procurement and merchandising
CO-4 Basic knowledge of Retail sector
CO-5 Knowledge of Global Marketing and Global sourcing

TOTAL : 45 PERIODS
REFERENCES
1. Apparel Product Design and Merchandising Strategies by Cynthia L. Regan. Publisher: Prentice Hall
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
AIM
To impart knowledge on leather products machinery used in leather product sector.

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

UNIT I    HAND TOOLS AND MACHINES  8
Hand tools and machinery used in leather and leather products making and other auxiliaries operations – General constructions - Principles involved in their working - Power transmissions systems. The machinery: clicking Press, splitting, skiving, edge-folding, stamping, 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

TOTAL : 45 PERIODS

OUTCOMES
CO-1 Understand the working principles of various machinery used in leather.
CO-2 Understand the principles and operation of Leather Processing Machineries
CO-3 Understand the principles and operation of Leather Products Machineries
CO-4 Know about transport systems and automation in leather product manufacture
CO-5 Aware of layout and maintenance of tannery and leather product unit.

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
UNIT I  TRENDS IN LIVESTOCK POPULATION  5
Social relevance and historical growth of leather sector. 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 net-work and market intelligence, Resource and product related strategies.

TOTAL : 45 PERIODS

OUTCOMES

CO-1 Have knowledge in raw material resource management
CO-2 Have knowledge about leather industry in India and world
CO-3 Understand the domestic trade management in leather
CO-4 Understand the international trade management in leather
CO-5 Have knowledge on industry, trade management and development strategy in leather
TEXT BOOKS AND REFERENCES
1. Report of All India Survey on Raw Hides and Skins, CLRI, 1987 and 2004
2. Report on Capacity Utilisation and Scope for modernization of Indian tanning industry , CLRI, 1990
3. Report of the Committee on The Development of Leather and Leather Manufactures for Exports (Seetharamaiah Committee Report) , Govt of India 1972
6. Bulletins of India’s Foreign Trade in Leather and Leather Products , CLRI
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
AIM
To impart knowledge on Occupational Safety and Hazard aspects in leather manufacture

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

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

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

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

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

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

TOTAL : 45 PERIODS

OUTCOMES

CO-1 Acquire knowledge on legal framework of safety and health in India and international conventions
CO-2 To understand Hazard identification and assessment methods
CO-3 Have knowledge on machinery safety’s in the leather industry
CO-4 Comprehensive knowledge on Work ecology and ergonomics
CO-5 Acquire familiarity on emergency prevention and preparedness safety and health management
REFERENCES
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
AIM
To impart knowledge on the use of leather supplements used as substitutes for leather in the manufacture of leather products

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

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

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

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

UNIT IV Testing of polymers. Mechanical and Thermal testing.

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

TOTAL : 45 PERIODS

OUTCOMES
CO-1 Have knowledge on the chemistry of most common polymeric materials used in leather industry as supplements.
CO-2 Understand the fundamentals of polymerization of various polymers used
CO-3 Able to manufacture industrially important polymers
CO-4 Gain knowledge on analytical skills on testing of polymers.
CO-5 Knowledge on polymer modification
REFERENCES
Course Articulation Matrix:

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
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
At the end of the course the students would have gained knowledge on the preparation of several by-products emerging out of the leather and leather products sector.

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

UNIT II DIFFERENT METHODS OF RENDERING
Bone products and their utilisation. Keratinous proteins - various sources keratinous based products and their uses.

UNIT III ANIMAL BLOOD, ITS PRODUCTS AND THEIR UTILISATION

UNIT IV UTILISATION OF ORGANS AND GLANDS FROM SLAUGHTERED ANIMALS
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 STATUS OF VARIOUS BY-PRODUCTS IN INDIA
Process studies on Glue making from tannery wastes - Bone glue and deproteinisation of bone - Horn and hoof meal - Protein meals by different methods

TOTAL : 45 PERIODS

OUTCOMES

CO-1 Knowledge of various animal byproducts and their significance
CO-2 To gain knowledge on the preparation of several by-products emerging from slaughter houses and tanneries
CO-3 Understand the utilization by products.
CO-4 Understand the characteristics of tannery byproducts
CO-5 Have knowledge in various methods of waste to wealth creation.
REFERENCES
### Course Articulation Matrix:

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
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

OUTCOMES
 CO-1 Understand the concept of value engineering
 CO-2 Application of Job plan in Leather industries
 CO-3 Knowledge of worksheets and guidelines for leather and allied industries
 CO-4 Have knowledge in reengineering in leather sector
 CO-5 Apply the learned concepts in a case study/project.
TEXT BOOKS
2. Del L. Younker, “Value Engineering” Marcel Dekker, Inc. 2003

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<td>CO-5</td>
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AIM
To make students capable of using Computer and related technologies for an effective management of leather and leather products industry

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

UNIT I  INTRODUCTION AND IT INFRASTRUCTURE
Concept of Data Communication, Modes of Transmission - Digital Vs Analog, Types of Communication - Simplex, Half Duplex, Full Duplex; Communication Protocols - FTP, HTTP, TCP/IP, WAP; Network topologies; Network Types (LAN, WAN and MAN); Need of IT Infrastructure; Form factor; Data Center & Disaster Recovery; Security & Threads;

UNIT II  ROLE OF INFORMATION TECHNOLOGY IN LEATHER SECTOR
Introduction to System Development; System development life cycle- System Study; System Analysis; System Design (Input, output, files, procedure); Deployment (Implementation) and maintenance.

UNIT III  DATABASE MANAGEMENT SYSTEMS AND ITS APPLICATIONS IN LEATHER SECTOR
Fundamental Concepts of Database Technology & Data Organization; Database Model Concepts; Data Security; Data Integration; Retrieving, Manipulating, Updating tables; Databases relevant to Leather Sector.

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

UNIT V  E-COMMERCE AND CAD SYSTEMS
E-Commerce-Definition; Traditional Commerce V/s E-Commerce; Benefits of e-commerce; Various e-commerce models-B2B, B2C; Introduction to special input/output systems required for CAD. CAD Systems for Leather & Leather Products: Computerized techniques for pattern creation, grading, pattern nesting, consumption calculation costing. Pattern conversion techniques for leather products, standard DXF, AMMA DXF; Computerised color matching systems – its principle and application.

OUTCOMES
CO-1 Have knowledge on information technology and its infrastructure
CO-2 To understand the role of information technology in leather sector
CO-3 To comprehend the application aspects of DBMS, Data communication principles, Web Designing, ERP, MIS, E-Commerce
CO-4 To apprehend the concepts of web-based applications
CO-5 Have knowledge on CAD applications in leather/leather products manufacture.
TEXT BOOK

REFERENCES
4. Kendall & Kendall, Systems Analysis and Design (Prentice Hall India)
6. Understanding SQL (BPB Publications)
7. Hands-on HTML(BPB Publications)
10. Reference Manuals for CAD systems for Footwear and Garments.
## Course Articulation Matrix:

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<td>Have knowledge on information technology and its infrastructure</td>
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<td>To understand the role of information technology in leather sector</td>
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<td>CO-3</td>
<td>To comprehend the application aspects of DBMS, Data communication principles, Web Designing, ERP, MIS, E-Commerce</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
AIM
To impart knowledge on CAD/CAM for leather products design and manufacture.

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

UNIT I  COMPUTER APPLICATIONS IN LEATHER AND PRODUCT SECTOR  12
Introduction to computer: Concepts of CAD/CAM. Capabilities and operation of graphical workstations, graphic terminals, input/output devices, interface and storage devices, net-working concepts of LAN and WAN, principles of digital and analog conversion.

UNIT II  HARDWARE IN CAD  12
Introduction to special input/output systems required for CAD.
Digitization: 2D & 3D systems, input devices: Digitizer, pattern scanner
Output devices: Printer, Plotter, Spreader and cutters. Different types, working principles and applications.
Introduction to CAD software: Garment, Leather goods footwear.

UNIT III  PATTERN ENGINEERING  8
Computerized techniques for pattern creation, grading, pattern nesting, consumption calculations and costing, pattern conversion techniques for Leather products, standard DXF, AMMA DXF.

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.

OUTCOMES

CO  Statement
CO-1 Understanding the concepts of computer applications in leather products sector.
CO-2 Have knowledge in various Hardwares sued in CAD.
CO-3 To have comprehensive knowledge in Pattern engineering techniques for leather and leather products
CO-4 Ability to designing last and sole modelling for footwear using CAD.
CO-5 Have knowledge in advanced computational techniques in CAD, rapid prototyping
REFERENCES
6. Desai and Abel, “Introduction to FEM”. “Step by Step guide to CAD for footwear”: CAD Centre, SDDC, CLRI.
### Course Articulation Matrix:

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
UNIT I
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
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
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
Compounding of polymers - fillers, plasticizers, antioxidants, UV stabilizers, colouring agents and flame retardants. Polymer processing - compression, moulding, injection, extrusion, calendering and film casting; Preparation and properties of polyesters, polyamides, epoxy and silicone polymers; Conductive polymers, super absorbent polymers.

UNIT V
Recycling, remoulding, depolymerisation, incineration, biodegradable polymers.

TOTAL : 45 PERIODS

OUTCOMES

CO-1 Knowledge of natural polymers and synthetic polymers
CO-2 Have knowledge on polymer synthesis
CO-3 Understanding characterization methods for polymers
CO-4 Understand the application of polymers in leather.
CO-5 Have knowledge in polymer recycling.
REFERENCES
## Course Articulation Matrix:

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES:
- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I

UNIT II

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

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

UNIT V

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

CO-1 Acquire the basic knowledge of human rights and classification
CO-3 Understand the Theories and perspectives of UN Laws – UN Agencies to monitor and compliance
CO-4 To gain knowledge about the Human Rights in India – Constitutional Provisions / Guarantees
CO-5 Learn and understand the Human Rights of Disadvantaged People

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<td>Geneva convention of 1864, Universal Declaration of Human Rights, 1948</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
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 stakeholders- 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

CO-1 To provide students an exposure to disasters, their significance and types
CO-2 Differentiate the types of disasters, causes and their impact on environment and society
CO-3 To comprehend in vulnerability assessment and various methods of risk reduction measures as well as mitigation
CO-4 Ability to draw the hazard and vulnerability profile of India, Scenarios in the Indian context
CO-5 Have knowledge on Disaster damage assessment and management

TEXTBOOKS:

REFERENCES
1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
### Course Articulation Matrix:

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<td>Differentiate the types of disasters, causes and their impact on environment and society</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES:

- To understand the global trends and development methodologies of various types of products and services
- To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification
- To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- To develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer

UNIT I  FUNDAMENTALS OF PRODUCT DEVELOPMENT  9

UNIT II  REQUIREMENTS AND SYSTEM DESIGN  9

UNIT III  DESIGN AND TESTING  9

UNIT IV  SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT  9

UNIT V  BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY  9

TOTAL: 45 PERIODS
OUTCOMES:
Upon completion of the course, the students will be able to:

CO-1 Understand the Fundamentals of product development methodologies and Management
CO-2 Acquire knowledge in Requirement Engineering, System Design & Modeling
CO-3 Detailed Design and Testing study
CO-4 Understand Sustenance Engineering And End-Of-Life (Eol) Support
CO-5 Gain knowledge of the Innovation & Product Development process in the Business Context

TEXTBOOKS:
1. Book specially prepared by NASSCOM as per the MoU.

REFERENCES:
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<th>CO</th>
<th>Statement</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
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<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
<th>PSO3</th>
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<td>CO-1</td>
<td>Understand the Fundamentals of product development methodologies and Management</td>
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<td>CO-2</td>
<td>Acquire knowledge in Requirement Engineering, System Design &amp; Modeling</td>
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<td>CO-3</td>
<td>Detailed Design and Testing study</td>
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<td>CO-4</td>
<td>Understand Sustenance Engineering And End-Of-Life (Eol) Support</td>
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<td>CO-5</td>
<td>Gain knowledge of the Innovation &amp; Product Development process in the Business Context</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.