Vision:

To become a premier centre of learning and research in Leather and Allied Technologies.

Mission:

I. To provide quality education in the area of Leather Technology to transform students into graduates with high professional values.

II. To share and disseminate expertise for use in the solution of problems faced by the Leather industry.

III. To conduct need based research projects giving priority to the needs of the industry.

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

V. To provide a learning ambience for innovators, researchers and professional technology authors.

VI. To foster development of advanced human capacity for translational research for solution science.
1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

I. To prepare learners to become successful professional
II. To empower learners with a solid foundation in mathematical, scientific and engineering fundamentals
III. To empower learners in analyzing the trends and forecasting
IV. To enhance abilities in the areas of professional ethics, multidisciplinary approach, effective communication, team building and ability to relate education to the social context
V. To provide an ambience for the learners to emerge as innovators, leaders, solution providers and successful professional

2. PROGRAMME OUTCOMES (POs):

After going through the four years of B.Tech program, Leather Technology Graduates will exhibit the ability to:

<table>
<thead>
<tr>
<th>Graduate Attribute</th>
<th>Programme Outcome</th>
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<tbody>
<tr>
<td>PO1 Engineering knowledge</td>
<td>Apply knowledge of mathematics, basic science and engineering science.</td>
</tr>
<tr>
<td>PO2 Problem analysis</td>
<td>Identify, formulate and solve engineering problems.</td>
</tr>
<tr>
<td>PO3 Design/development of solutions</td>
<td>Design a system or process to improve its performance, satisfying its constraints.</td>
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<tr>
<td>PO4 Conduct investigations of complex problems</td>
<td>Conduct experiments and collect, analyze and interpret the data.</td>
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<tr>
<td>PO5 Modern tool usage</td>
<td>Apply various tools and techniques to improve the efficiency of the system.</td>
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<tr>
<td>PO6 The Engineer and society</td>
<td>Conduct themselves to uphold the professional and social obligations.</td>
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<tr>
<td>PO7 Environment and sustainability</td>
<td>Design the system with environment consciousness and sustainable development.</td>
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<tr>
<td>PO8 Ethics</td>
<td>Interacting industry, business and society in a professional and ethical manner.</td>
</tr>
<tr>
<td>PO9 Individual and team work</td>
<td>Function in a multidisciplinary team.</td>
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<tr>
<td>PO10 Communication</td>
<td>Proficiency in oral and written Communication.</td>
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<tr>
<td>PO11 Project management and finance</td>
<td>Implement cost effective and improved system.</td>
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<tr>
<td>PO12 Life-long learning</td>
<td>Continue professional development and learning as a life-long activity.</td>
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3. PROGRAM SPECIFIC OUTCOMES (PSOs):

By the completion of leather technology program, the student will have following program specific outcomes.

1. Foundational knowledge to make a successful career in leather and leather products sectors.
2. Adequate soft and communication skills to effectively face industry and society.
3. Graduates with professional ethics and social responsibility.
4. Graduates with ability to understand problems of the leather sector and design and develop solutions.

4. Mapping of Programme Educational Objective with Programme Outcomes

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## Mapping of Course Outcomes and Programme Outcomes

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

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**TOTAL** | **28** | **17** | **1** | **10** | **23**

* Audit Course is optional.
**Students have to undergo Internship/Training for a minimum period of 4 weeks during summer and assessments will be done during V semester.
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* Audit Course is optional.

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* Students have to undergo Internship/Training for a period of 4 weeks during summer and assessments will be done during VII semester.
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Registration for any of these courses is optional to students

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### SUMMARY

**B.Tech. Leather Technology**

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OBJECTIVES:
The first semester English course entitled ‘Technical English’ aims to,

• Familiarise first year students of engineering and technology with the fundamental aspects of technical English.

• Develop all the four language skills by giving sufficient practice in the use of the skills in real life contexts.

• Enhance the linguistic and communicative competence of first year engineering and technology students.

UNIT I  INTRODUCING ONESELF  12
Listening: Listening and filling a form, listening to speeches by specialists from various branches of engineering and completing activities such as answering questions, identifying the main ideas of the listening text, style of the speaker (tone and tenor) – Speaking: Introducing oneself – introducing friend/ family - Reading: Descriptive passages (from newspapers / magazines)-Writing: Writing a paragraph (native place, school life)- Grammar: Simple present, present continuous – Vocabulary Development: One word substitution

UNIT II  DIALOGUE WRITING  12
Listening: Listening to conversations (asking for and giving directions) –Speaking: making conversation using (asking for directions, making an enquiry), Role plays-dialogues- Reading: Reading a print interview and answering comprehension questions-Writing: Writing a checklist, Dialogue writing- Grammar: Simple past – question formation (Wh- questions, Yes or No questions, Tag questions)- VocabularyDevelopment: Stress shift, lexical items related to the theme of the given unit.

UNIT III  FORMAL LETTER WRITING  12
Listening: Listening to speeches by famous people and identifying the central message of the speech – answering multiple-choice questions)-Speaking: Giving short talks on a given topic-Reading: Reading motivational essays on famous engineers and technologists (answering open-ended and closed questions)- Writing: Writing formal letters/ emails (Complaint letters)-Grammar: Future Tense forms of verbs, subject and verb agreement-Vocabulary Development: Collocations – Fixed expressions

UNIT IV  WRITING COMPLAINT LETTERS  12

UNIT V  WRITING DEFINITIONS AND PRODUCT DESCRIPTION  12
Listening: Listening to a product description (labeling and gap filling) exercises- Speaking: Describing a product and comparing and contrasting it with other products- Reading: Reading graphical material for comparison (advertisements)-Writing: Writing Definitions (short and long) – compare and contrast paragraphs- Grammar: Adjectives – Degrees of comparison - compound nouns- Vocabulary Development: Use of discourse markers – suffixes (adjectival endings).

TOTAL : 60 PERIODS

Learning Outcomes

At the end of the course the students will have gained,

• Exposure to basic aspects of technical English.

• The confidence to communicate effectively in various academic situations.

• Learnt the use of basic features of Technical English.

Textbook:


Assessment Pattern

• Assessments will assess all the four skills through both pen and paper and computer based tests.

• Assessments can be pen and paper based, quizzes.
MA5158 ENGINEERING MATHEMATICS I
(Common to all branches of B.E. / B.Tech. Programmes in I Semester) 3 1 0 4

OBJECTIVES:

• To develop the use of matrix algebra techniques that is needed by engineers for practical applications.

• To familiarize the students with differential calculus.

• To familiarize the student with functions of several variables. This is needed in many branches of engineering.

• To make the students understand various techniques of integration.

• To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT I   MATRICES  12


UNIT II  DIFFERENTIAL CALCULUS  12


UNIT III  FUNCTIONS OF SEVERAL VARIABLES  12


UNIT IV  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 V    MULTIPLE INTEGRALS  12


TOTAL :60 PERIODS

OUTCOMES:

At the end of the course the students will be able to

• Use the matrix algebra methods for solving practical problems.

• Apply differential calculus tools n solving various application problems.
• Able to use differential calculus ideas on several variable functions.
• Apply different methods of integration in solving practical problems.
• Apply multiple integral ideas in solving areas, volumes and other practical problems.

TEXTBOOKS:

REFERENCES:

PH5151 ENGINEERING PHYSICS L T P C
(Common to all branches of B.E / B.Tech. programmes) 3 0 0 3

OBJECTIVE
• To make the students in understanding the importance of mechanics.
• To equip the students on the knowledge of electromagnetic waves.
• To introduce the basics of oscillations, optics and lasers.
• To enable the students in understanding the importance of quantum physics.
• To elucidate the application of quantum mechanics towards the formation of energy bands in crystalline materials.

UNIT I MECHANICS 9
Moment of inertia (M.I) - Radius of gyration - Theorems of M.I - M.I of circular disc, solid cylinder, hollow cylinder, solid sphere and hollow sphere - K.E of a rotating body – M.I of a diatomic
UNIT II ELECTROMAGNETIC WAVES

Gauss’s law – Faraday’s law - Ampere’s law - The Maxwell’s equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

UNIT III OSCILLATIONS, OPTICS AND LASERS


UNIT IV BASIC QUANTUM MECHANICS

Photons and light waves - Electrons and matter waves - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization - Particle in a infinite potential well - Normalization, probabilities and the correspondence principle.

UNIT V APPLIED QUANTUM MECHANICS

The harmonic oscillator - Barrier penetration and quantum tunneling - Tunneling microscope - Resonant diode - Finite potential wells - particle in a three dimensional box - Bloch's theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands.

TOTAL: 45 PERIODS

OUTCOME

After completion of this course, the students should able to

- Understanding the importance of mechanics.
- Express the knowledge of electromagnetic waves.
- Know the basics of oscillations, optics and lasers.
- Understanding the importance of quantum physics.
- Apply quantum mechanical principles towards the formation of energy bands in crystalline materials.

TEXT BOOKS


REFERENCES
CY5151 ENGINEERING CHEMISTRY (COMMON TO ALL BRANCHES) L T P C

OBJECTIVES:

• To introduce the basic concepts of polymers, their properties and some of the important applications.

• To impart knowledge on the basic principles and preparatory methods of nanomaterials.

• To facilitate the understanding of the laws of photochemistry, photoprocesses and instrumentation & applications of spectroscopic techniques.

• To familiarize the operating principles and applications of energy conversion, its processes and storage devices.

• To inculcate sound understanding of water quality parameters and water treatment techniques.

UNIT I POLYMER CHEMISTRY


UNIT II NANOCHEMISTRY


UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY


UNIT IV ENERGY CONVERSIONS AND STORAGE

Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant – fast breeder reactor. Solar energy conversion - solar cells. Wind energy. Batteries - types of batteries – primary battery (dry cell), secondary battery (lead acid, nickel-cadmium and lithium-ion-battery).
Fuel cells – H2-O2 and microbial fuel cell. Explosives – classification, examples: TNT, RDX, Dynamite; Rocket fuels and propellants – definition and uses.

UNIT V WATER TECHNOLOGY 9


TOTAL: 45 PERIODS

OUTCOMES:

• To recognize and apply basic knowledge on different types of polymeric materials, their general preparation methods and applications to futuristic material fabrication needs.

• To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.

• To identify and apply suitable spectroscopic technique for material analysis and study different forms of photochemical reactions.

• To recognize different forms of energy resources and apply them for suitable applications in energy sectors.

• To demonstrate the knowledge of water and their quality in using at different industries.

TEXT BOOKS:


REFERENCE BOOKS:


COURSE OBJECTIVES: The main learning objective of this course is to prepare the students for:

1. Drawing free hand sketches of basic geometrical shapes and multiple views of objects.
2. Drawing orthographic projections of lines and planes.
3. Drawing orthographic projections of solids.
4. Drawing development of the surfaces of objects.
5. Drawing isometric and perspective views of simple solids.

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION) 1

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

UNITI  PLANE CURVES AND FREE HANDSKETCHING 14

Basic Geometrical constructions, Curves used in engineering practices-Conics – Construction of ellipse, parabola and hyperbola by different methods – 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

UNITII  PROJECTION OF POINTS, LINES AND PLANE SURFACES 15

Orthographic projection- principles-Principle 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.

UNITIII  PROJECTION OF SOLIDS 15

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.

UNITIV  PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES15

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.

UNITV  ISOMETRIC AND PERSPECTIVE PROJECTIONS 12

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

**COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY) 3**

Introduction to drafting packages and demonstration of their use

**TOTAL (L: 15 + P: 60)=75 PERIODS**

**COURSE OUTCOMES:** Upon completion of this course, the students will be able to:

1. Draw free hand sketching of basic geometrical shapes and multiple views of objects.
2. Draw orthographic projections of lines and planes
3. Draw orthographic projections of solids
4. Draw development of the surfaces of objects
5. Draw isometric and perspective views of simple solids.

**TEXT BOOKS:**


**REFERENCES:**


**Publication of Bureau of Indian Standards:**


**Special points applicable to University Examinations on Engineering Graphics:**

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

BS5161       BASIC SCIENCES LABORATORY       L T P C
(Common to all branches of B.E. / B.Tech. Programmes)  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 and band gap determination.

LIST OF EXPERIMENTS:

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
   a) Optical fibre - Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
8. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
12. Photoelectric effect
13. Michelson Interferometer.
15. Melde’s string experiment

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)

OBJECTIVES:
- To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.
• To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
• To demonstrate the analysis of metals and polymers by spectroscopy and viscometry methods.

LIST OF EXPERIMENTS:
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. Determination of sodium and potassium present in water using flame photometer.
12. Pseudo first order kinetics-ester hydrolysis.
14. Phase change in a solid.

OUTCOMES:
• To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
• To determine the amount of metal ions through volumetric and spectroscopic techniques
• To determine the molecular weight of polymers by viscometric method.
• To quantitatively analyse the impurities in solution by electroanalytical techniques
• To design and analyse the kinetics of reactions and corrosion of metals

TEXTBOOKS:
COURSE OBJECTIVES: The main learning objective of this course is to provide hands on training to the students in:

1. Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.
2. Wiring various electrical joints in common household electrical wire work.
3. Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
4. Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & ELECTRICAL)

PART I CIVIL ENGINEERING PRACTICES

PLUMBING WORK:

a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
b) Preparing plumbing line sketches.
c) Laying pipe connection to the suction side of a pump
d) Laying pipe connection to the delivery side of a pump.
e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK:

a) Sawing,
b) Planning and
c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

Wood Work Study:

a) Studying joints in door panels and wooden furniture
b) Studying common industrial trusses using models.

PART II ELECTRICAL ENGINEERING PRACTICES

WIRING WORK:

a) Wiring Switches, Fuse, Indicator and Lamp etc. such as in basic household,
b) Wiring Stair case light.
c) Wiring tube – light.
d) Preparing wiring diagrams for a given situation.
Wiring Study:
   a) Studying an Iron-Box wiring.
   b) Studying a Fan Regulator wiring.
   c) Studying an Emergency Lamp wiring.

GROUP – B (MECHANICAL AND ELECTRONICS)

PART III MECHANICAL ENGINEERING PRACTICES

WELDING WORK:
   a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
   b) Practicing gas welding.

BASIC MACHINING WORK:
   a) (simple)Turning.
   b) (simple)Drilling.
   c) (simple)Tapping.

ASSEMBLY WORK:
   a) Assembling a centrifugal pump.
   b) Assembling a household mixer.
   c) Assembling an air conditioner.

SHEET METAL WORK:
   a) Making of a square tray

FOUNDRY WORK:
   a) Demonstrating basic foundry operations.

PART IV ELECTRONIC ENGINEERING PRACTICES

SOLDERING WORK:
   a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:
   a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:
   a) Studying a FM radio.
   b) Studying an electronic telephone.

TOTAL (P: 60) = 60 PERIODS

COURSE OUTCOMES: Upon completion of this course, the students will be able to:

1. Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.
2. Wire various electrical joints in common household electrical wire work.
3. Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.
4. Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.
COURSE OBJECTIVES

The course titled 'professional communication' aims to:

• Improve the relevant language skills necessary for professional communication.
• Develop linguistic and strategic competence in workplace context.
• Enhance language proficiency and thereby the employability of budding engineers and technologists.

UNIT I  TECHNICAL COMMUNICATION  12

Listening: Listening to telephone conversations (intent of the speaker and note taking exercises)-Speaking: Role play exercises based on workplace contexts, introducing oneself- Reading: Reading the interview of an achiever and completing exercises (skimming, scanning and predicting)- Writing: Writing a short biography of an achiever based on given hints- Grammar: Asking and answering questions, punctuation in writing, prepositional phrases- Vocabulary Development: use of adjectives.

UNIT II  SUMMARY WRITING  12

Listening: Listening to talks/lectures both general and technical and summarizing the main points-Speaking: Participating in debates- Reading: Reading technical essays/articles and answering comprehension questions-Writing: Summary writing-Grammar: Participle forms, relative clauses-Vocabulary Development: Use of compound words, abbreviations and acronyms.

UNIT III  PROCESS DESCRIPTION  12

Listening: Listening to a process description and drawing a flowchart-Speaking: Participating in Group Discussions, giving instructions- Reading: Reading instruction manuals- Writing: Writing process descriptions- Writing instructions- Grammar: Use of imperatives, active and passive voice, sequence words- Vocabulary Development: Technical jargon

UNIT IV  REPORT WRITING  12

Listening: Listening to a presentation and completing gap-filling exercises- Speaking: Making formal presentations- Reading: Reading and interpreting charts/tables and diagrams- Writing: Interpreting charts/tables and diagrams, writing a report- Grammar: Direct into indirect speech, use of phrases- Vocabulary Development: reporting words

UNIT V  WRITING JOB APPLICATIONS  12

Listening: Listening to a job interview and completing gap-filling exercises- Speaking: Mock interview, telephone interviews- Reading: Reading a job interview, SOP, company profile and

TOTAL: 60 PERIODS

LEARNING OUTCOMES

At the end of the second semester the learners should be able to,

• Read and comprehend technical texts effortlessly.
• Write reports of a technical kind.
• Speak with confidence in interviews and thereby gain employability

Textbook

Assessment Pattern
• Assessments will assess all the four skills through both pen and paper and computer based tests.
• Assessments can be pen and paper based, quizzes.

MA5252 ENGINEERING MATHEMATICS – II L T P C
(Common to all branches of B.E. / B.Tech. Programmes in II Semester) 3 1 0 4

OBJECTIVES:

• To acquaint the students with the concepts of vector calculus which naturally arises in many engineering problems.
• To develop an understanding of the standard techniques of complex variable theory in particular analytic function and its mapping property.
• To familiarize the students with complex integration techniques and contour integration techniques which can be used in real integrals.
• To acquaint the students with Differential Equations which are significantly used in Engineering problems.
• To make the students 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 VECTOR CALCULUS 12

UNIT II ANALYTIC FUNCTION 12

UNIT III COMPLEX INTEGRATION 12

UNIT IV DIFFERENTIAL EQUATIONS 12
Method of variation of parameters – Method of undetermined coefficients – Homogenous equations of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.

UNIT V LAPLACE TRANSFORMS 12

TOTAL : 60 PERIODS

OUTCOMES:
Upon successful completion of the course, students will be able to:

• Calculate grad, div and curl and use Gauss, Stokes and Greens theorems to simplify calculations of integrals.
• Construct analytic functions and use their conformal mapping property in application problems.
• Evaluate real and complex integrals using the Cauchy’s integral formula and residue theorem.
• Apply various methods of solving differential equation which arise in many application problems.
• Apply Laplace transform methods for solving linear differential equations.

TEXTBOOKS:

REFERENCES:
GE5153       PROBLEM SOLVING AND PYTHON PROGRAMMING     L  T  P  C
            3  0  0  3

OBJECTIVES:
• To know the basics of algorithmic problem solving.
• To develop Python programs with conditionals and loops.
• To define Python functions and use function calls.
• To use Python data structures - lists, tuples, dictionaries.
• To do input/output with files in Python.

UNIT I       INTRODUCTION TO COMPUTING AND PROBLEM SOLVING          9

Suggested Activities:
• Developing Pseudocodes and flowcharts for real life activities such as railway ticket booking using IRCTC, admission process to undergraduate course, academic schedules during a semester etc.
• Developing algorithms for basic mathematical expressions using arithmetic operations.
• Installing Python.
• Simple programs on print statements, arithmetic operations.

Suggested Evaluation Methods:
• Assignments on pseudocodes and flowcharts.
• Tutorials on Python programs.

UNIT II      CONDITIONALS AND FUNCTIONS               9

Suggested Activities:
• Simple Python program implementation using Operators, Conditionals, Iterative Constructs and Functions.

• Implementation of a simple calculator.

• Developing simple applications like calendar, phone directory, to-do lists etc.

• Flow charts for GCD, Exponent Functions, Fibonacci Series using conditionals and iterative statements.

• External learning - Recursion vs. Iteration.

**Suggested Evaluation Methods:**

• Tutorials on the above activities.

• Group Discussion on external learning.

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**UNIT III SIMPLE DATA STRUCTURES IN PYTHON**


**Suggested Activities:**

• Implementing python program using lists, tuples, sets for the following scenario:
  
  Simple sorting techniques

  Student Examination Report

  Billing Scheme during shopping.

• External learning - List vs. Tuple vs. Set – Implementing any application using all the three data structures.

**Suggested Evaluation Methods:**

• Tutorials on the above activities.

• Group Discussion on external learning component.

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**UNIT IV STRINGS, DICTIONARIES, MODULES**


**Suggested Activities:**

• Implementing Python program by importing Time module, Math package etc.

• Creation of any package (student’s choice) and importing into the application.

**Suggested Evaluation Methods:**

• Tutorials on the above activities.

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**UNIT V FILE HANDLING AND EXCEPTION HANDLING**

7
Introduction to Files – File Path – Opening and Closing Files – Reading and Writing Files – File Position – Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions.

**Suggested Activities:**

- Developing modules using Python to handle files and apply various operations on files.
- Usage of exceptions, multiple except blocks -for applications that use delimiters like age, range of numerals etc.
- Implementing Python program to open a non-existent file using exceptions.

**Suggested Evaluation Methods:**

- Tutorials on the above activities.
- Case Studies.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

On completion of the course, students will be able to:

1. Develop algorithmic solutions to simple computational problems.
2. Develop and execute simple Python programs.
3. Write simple Python programs for solving problems.
4. Decompose a Python program into functions.
5. Represent compound data using Python lists, tuples, dictionaries etc.
6. Read and write data from/to files in Python programs.

**TEXT BOOK:**


(http://greenteapress.com/wp/thinkpython/).

**REFERENCES:**

OBJECTIVES:

• To understand the basic concepts of electric circuits, magnetic circuits and wiring.
• To understand the operation of AC and DC machines.
• To understand the working principle of electronic devices and circuits.

UNIT I     BASIC CIRCUITS AND DOMESTIC WIRING


UNIT II     THREE PHASE CIRCUITS AND MAGNETIC CIRCUITS


UNITIII    ELECTRICAL MACHINES


UNIT IV     BASICS OF ELECTRONICS

Intrinsic semiconductors, Extrinsic semiconductors – P-type and N-type, P-N junction, VI Characteristics of PN junction diode, Zener effect, Zener diode, Zener diode Characteristics-Rectifier circuits-Wave shaping.

UNIT V     CURRENT CONTROLLED AND VOLTAGE CONTROLLED DEVICES

Working principle and characteristics - BJT, SCR, JFET, MOSFET.

TOTAL: 45 PERIODS

OUTCOMES:

CO1  To be able to understand the concepts related with electrical circuits and wiring.
CO2  To be able to study the different three phase connections and the concepts of magnetic
circuits.
CO3 Capable of understanding the operating principle of AC and DC machines.
CO4 To be able to understand the working principle of electronic devices such as diode and zener diode.
CO 5 To be able to understand the characteristics and working of current controlled and voltage controlled devices.

TEXT BOOKS:

REFERENCES:
GE5152  ENGINEERING MECHANICS  LTPC 3104

COURSE OBJECTIVES: The main learning objective of this course is to prepare the students for:

1. Applying the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.

2. Applying the concept of reaction forces (non-concurrent coplanar and noncoplanar forces) and moment of various support systems with rigid bodies in 2D and 3D in equilibrium. Reducing the force, moment, and couple to an equivalent force - couple system acting on rigid bodies in 2D and 3D.

3. Applying the concepts of locating centroids/center of gravity of various sections / volumes and to find out area moments of inertia for the sections and mass moment of inertia of solids.

4. Applying the concepts of frictional forces at the contact surfaces of various engineering systems.

5. Applying the various methods of evaluating kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

UNIT I  STATICS OF PARTICLES  (9+3)

UNIT II  EQUILIBRIUM OF RIGID BODIES  (9+3)

UNIT III  DISTRIBUTED FORCES  (9+3)
Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Distributed Loads on Beams, Centre 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  (9+3)

UNIT V  DYNAMICS OF PARTICLES  (9+3)

TOTAL (L: 45 + T: 15)=60 PERIODS
COURSE OUTCOMES: Upon completion of this course, the students will be able to:

1. Apply the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.

2. Apply the concept of reaction forces (non-concurrent coplanar and noncoplanar forces) and moment of various support systems with rigid bodies in 2D and 3D in equilibrium. Reducing the force, moment, and couple to an equivalent force - couple system acting on rigid bodies in 2D and 3D.

3. Apply the concepts of locating centroids / center of gravity of various sections / volumes and to find out area moments of inertia for the sections and mass moment of inertia of solids.

4. Apply the concepts of frictional forces at the contact surfaces of various engineering systems.

5. Apply the various methods of evaluating kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

TEXT BOOKS:


REFERENCES:


OBJECTIVES:

- To make the students to understand the basics of crystallography and crystal imperfections.
- To introduce various strengthening methods of materials, and also various mechanical properties and their measurement.
- To impart knowledge on the basics of phase diagrams and their applications.
- To learn about iron-carbon system, and about various ferrous and non-ferrous alloys.
- To introduce the preparation, properties and applications of ceramics, composites and nanomaterials.

UNIT I CRYSTALLOGRAPHY 9


UNIT II MECHANICAL PROPERTIES 9


UNIT III PHASE DIAGRAMS 9

Basic concepts - Gibbs phase rule – Unary phase diagram (iron) - Binary phase diagrams: isomorphous systems (Cu-Ni) – determination of phase composition and phase amounts – tieline and lever rule - binary eutectic diagram with no solid solution and limited solid solution (Pb-Sn) – eutectoid and peritectic reactions - other invariant reactions – microstructural development during the slow cooling: eutectic, hypereutectic and hypoeutectic compositions.

UNIT IV FERROUS AND NONFERROUS ALLOYS 9


UNIT V CERAMICS, COMPOSITES AND NANO MATERIALS 9


TOTAL: 45 PERIODS
OUTCOMES:
Upon completion of this course, the students will
• understand the basics of crystallography and its importance in materials properties
• understand the significance of dislocations, strengthening mechanisms, and tensile, creep, hardness and fracture behavior of materials
• gain knowledge on binary phase diagrams, and also will be able to determine the phase composition and phase amount.
• understand about the Fe-C system and various microstructures in it, and also about various ferrous and non-ferrous alloys.
• get adequate understanding on the preparation, properties and applications of ceramics, composites and nanomaterials.

REFERENCES:

GE5161     PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY     L T P C
0 0 4 2

OBJECTIVES:
• To understand the problem solving approaches.
• To learn the basic programming constructs in Python.
• To articulate where computing strategies support in providing Python-based solutions to real world problems.
• To use Python data structures - lists, tuples, dictionaries.
• To do input/output with files in Python.

EXPERIMENTS:
1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same.
2. Python programming using simple statements and expressions.
3. Scientific problems using Conditionals and Iterative loops.
4. Implementing real-time/technical applications using Lists, Tuples.
5. Implementing real-time/technical applications using Sets, Dictionaries.
6. Implementing programs using Functions.
7. Implementing programs using Strings.
9. Implementing real-time/technical applications using File handling.
10. Implementing real-time/technical applications using Exception handling.
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 60 PERIODS
OUTCOMES:
On completion of the course, students will be able to:
• Develop algorithmic solutions to simple computational problems
• Develop and execute simple Python programs.
• Structure simple Python programs for solving problems.
• Decompose a Python program into functions.
• Represent compound data using Python data structures.
• Apply Python features in developing software applications.

EE5261    ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY       L T P C
0   0  4   2

OBJECTIVES
1. To impart hands on experience in verification of circuit laws and measurement of circuit parameters
2. To train the students in performing various tests on electrical motors.
3. It also gives practical exposure to the usage of CRO, power sources & function generators

List of Experiments
1. Verification of Kirchhoff’s Law.
2. Steady state response of AC and DC circuits (Mesh, Node Analysis)
3. Frequency response of RLC circuits.
5. Regulation of single phase transformer.
6. Performance characteristics of DC shunt generator.
7. Performance characteristics of single phase induction motor.
8. Characteristics of PN diode and Zener diode
9. Characteristics of Zener diode
10. Half wave and full wave Rectifiers
11. Application of Zener diode as shunt regulator.
12. Characteristics of BJT and JFET

TOTAL: 60 PERIODS

OUTCOMES:
1. To become familiar with the basic circuit components and know how to connect them to make a real electrical circuit;
2. Ability to perform speed characteristic of different electrical machines
3. Ability to use logic gates and Flip flops
OBJECTIVES
- To understand the basics of random variables with emphasis on the standard discrete and continuous distributions.
- To understand the basic probability concepts with respect to two dimensional random variables along with the relationship between the random variables and the significance of the Central Limit theorem.
- To apply the small/large sample tests through Tests of hypothesis.
- To understand the concept of analysis of variance and use it to investigate factorial dependence.
- To monitor a process and detect a situation when the process is out of control.

UNIT I  RANDOM VARIABLES  12
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  TESTS OF SIGNIFICANCE  12
Type I and Type II errors – Tests for single mean, proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – Chi-square test for goodness of fit – Independence of attributes – Non-parametric tests: Test for Randomness and Rank – Sum test (Wilcoxon test).

UNIT IV  DESIGN OF EXPERIMENTS  12
Completely Randomized Design – Randomized Block Design – Latin Square Design – factorial design – Taguchi’s robust parameter design.

UNIT V  STATISTICAL QUALITY CONTROL  12
Control charts for measurements (\(\bar{X}\) and R charts) – Control charts for attributes (p, c and np charts) Tolerance limits – Acceptance sampling.

TOTAL: 60 PERIODS

OUTCOMES
- To analyze the performance in terms of probabilities and distributions achieved by the determined solutions
- To be familiar with some of the commonly encountered two dimensional random variables and be equipped for a possible extension to multivariate analysis
- To apply the basic principles underlying statistical inference (estimation and hypothesis testing)
- To demonstrate the knowledge of applicable large sample theory of estimators and tests
- To obtain a better understanding of the importance of the methods in modern industrial processes.

TEXT BOOKS:
REFERENCES:
Course Articulation Matrix:

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Statement</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
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<th>PSO2</th>
<th>PSO3</th>
<th>PSO4</th>
</tr>
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<tr>
<td>CO1</td>
<td>Understand the discrete and random variables.</td>
<td>3</td>
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<td>3</td>
<td>-</td>
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</tr>
<tr>
<td>CO2</td>
<td>Have knowledge about two dimensional random variables and designing of experiments.</td>
<td>3</td>
<td>3</td>
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<tr>
<td>CO3</td>
<td>Ability to implement statistical quality control methods.</td>
<td>3</td>
<td>3</td>
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<tr>
<td></td>
<td>Probability and Statistics</td>
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</tr>
</tbody>
</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE
This course aims at introducing fundamental inorganic and organic chemistry required for leather manufacture.

UNIT I INTRODUCTION TO INORGANIC COMPOUNDS
A brief survey of the ‘s’ block - binary compounds, complexes, alkalides and electrides. Features of the ‘p’ block and its elements - expansion of the octet, Lewis structures; ‘d’ and ‘f’ orbitals and transition metals; Coordination compounds –nomenclature, Theories - Coordination theory, Werner’s theory; Ligand field theory; MO energy level diagrams for homo nuclear di-atomics. Introduction to inorganic tanning materials.

UNIT II MOLECULAR BONDING
Valence bond approach and atomic orbital hybridizations. LCAO-MO theory, Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, Hyper conjugation and their applications; Dipole moment; Organic acids and bases; their relative strength. Aromaticity: Hückel’s rule, Electrophilic and nucleophilic aromatic substitution reactions, Redox reactions.

UNIT III ORGANIC TANNING AGENTS AND COMPOUNDS

UNIT IV COLLOIDS AND SURFACTANTS

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

OUTCOMES:
On the completion of the course students are expected to
CO1. Have the basic knowledge on inorganic compounds
CO2. Understand the concept of various molecular bonding
CO3. Interpret the characteristic of organic compounds and its relevance in tanning.
CO4. Perceive the concepts of colloids and surfactants.

TEXT BOOKS:
8. Introduction to Colloid and Surface Chemistry, Duncan J. Shaw, Butternorth, Hewemann, (1992)
<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Statement</th>
<th>PO1</th>
<th>PO 2</th>
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<th>PO 6</th>
<th>PO 7</th>
<th>PO 8</th>
<th>PO 9</th>
<th>PO10</th>
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<th>PS O3</th>
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</thead>
<tbody>
<tr>
<td>CO1</td>
<td>Have the basic knowledge of inorganic compounds.</td>
<td>3</td>
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<tr>
<td>CO2</td>
<td>Understand the concept of various molecular bonding.</td>
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<tr>
<td>CO3</td>
<td>Interpret the characteristic of organic compounds and their relevance in tanning.</td>
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<tr>
<td>CO4</td>
<td>Perceive the concepts of colloids and surfactants.</td>
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</tbody>
</table>

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

This course aims at introducing the fundamentals of chemistry and technology of leather manufacture in response to current market scenario, application avenues and future requirements.

UNIT I         APPLICATIONS AND ALTERNATIVES TO LEATHER 7

Current and emerging applications of leather; Properties required for key application avenues; Alternative materials to leather and their application avenues; Uniqueness of leather compared to currently available alternative materials.

UNIT II  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 III      PRE-TANNING AND TANNING PROCESSES 12

Principles and objectives of pre-tanning processes viz., soaking, liming, deliming, bating, pickling, depickling, degreasing and repickling. 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 AND FINISHING PROCESSES 8

Principles and objectives of post tanning processes viz., rechroming, neutralisation, retanning, dyeing and fatliquoring; Various mechanical operations involved; Methods of drying. Principles and objectives of leather finishing; Classification of leather finishing; Types of auxiliaries and finishes used; General machinery employed in leather finishing.

UNIT V PROCESS RATIONALE FOR MAKING SPECIFIC TYPE OF LEATHER 8

General principles in selection of materials and design of processes for making specific type of leathers - shoe upper, upholstery, garment, glove; Properties required for end use application; Modifying the pre-tanning, tanning, post-tanning and finishing processes to suit the end use requirements; Trouble shooting during leather making – case studies.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, students are expected to
CO1. Understand the application and alternatives to leather in current global scenario.
CO2. Have knowledge on pretanning, tanning and post tanning processes.
CO3. Comprehend the process rational for making specific leather.
TEXT BOOKS:
### Course Articulation Matrix:

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Statement</th>
<th>Program Outcome</th>
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</thead>
<tbody>
<tr>
<td>CO1</td>
<td>Understand the application and uniqueness of the leather.</td>
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<tr>
<td>CO2</td>
<td>Understand pre-tanning, tanning, and post-tanning processes.</td>
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<tr>
<td>CO3</td>
<td>Comprehend the process rationale for making specific leather.</td>
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<tr>
<td>Introduction</td>
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<td>to Leather</td>
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<tr>
<td>Manufacture</td>
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<td>PO 1</td>
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</tbody>
</table>

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

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; Various constituents of hides and skins; Fibrous and non-fibrous proteins in skin; Structure and properties of complex carbohydrates and proteoglycans; Structure and properties of fatty acids.; Structure, function and properties of amino acids.

UNIT II COLLAGEN: STRUCTURE, FUNCTION, THERMAL TRANSITION AND DEGRADATION

Structure 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.

TOTAL: 45 PERIODS

OUTCOMES:

The students will be able to understand

CO1. The structure and properties of various biomolecules present in skin
CO2. The nature, biosynthesis, characteristics, structure and functions of collagen and the role of temperature in the stability of collagen and collagen degradation
CO3. The basic principles and technologies of various pre-tanning processes and operations.
**TEXT BOOKS:**


**REFERENCES:**

   “Microbes and Enzymes - Basics and Applied”, R. Puvanakrishnan, Former Sc.G. and Head, Dept. of Biotechnology, CLRI
<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Statement</th>
<th>Program Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>The structural features and functions of the skin.</td>
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<tr>
<td>CO2</td>
<td>Structural and functional aspects of collagen.</td>
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<tr>
<td>CO3</td>
<td>The basic principles and technologies of various pre-tanning operations and quality measures.</td>
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<td></td>
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<td>2</td>
</tr>
<tr>
<td>Theory of Skin Proteins and Pre-Tanning Processes</td>
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<td>2</td>
</tr>
</tbody>
</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
To impart basic knowledge on unit process and operation involving in the leather and leather chemicals.

UNIT I CONCEPTS AND 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 and leather chemicals processing: General concepts of unit operations and unit processes in leather and 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 and surface coating agents: Raw materials; important unit
processes; Types of dye intermediates and dyes; pigments, lacquers

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

**UNIT V WATER AND INORGANIC CHEMICALS**

Treatment of water for domestic and industrial purposes, manufacture of sodium chloride, sodium sulphide, sodium sulphite and bisulphite, soda ash, caustic soda, lime, sulphuric and hydrochloric acids.

**TOTAL: 45 PERIODS**

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

CO1. The basic concepts of unit operations, material and energy balances.
CO2. The fluid dynamics mass and heat transfer in various unit operations such as distillation, extraction, drying and humidification
CO3. The size reduction and separation and mixing techniques technology of organic and inorganic chemicals involved in the processing of leather and leather chemicals

**REFERENCES:**
8. Dutta, S.S., An introduction to the principles of leather manufacture, ILTA.
## Course Articulation Matrix:

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Statement</th>
<th>Program Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>Basic concepts of fluids, material and energy balances.</td>
<td>PO1</td>
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<td>2</td>
</tr>
<tr>
<td>CO2</td>
<td>Heat and mass transfer in various unit operations such as distillation, extraction, drying and humidification</td>
<td>3</td>
</tr>
<tr>
<td>CO3</td>
<td>Knowledge of principles underpinning in various operations and processes in leather and chemical processing.</td>
<td>3</td>
</tr>
<tr>
<td>Principles of Unit Processes and Operations</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
To provide basic practical knowledge about leather manufacture.

LIST OF EXPERIMENTS
1. Assortment of hides and skins, wetblue/EI, crust and finished leather
2. Pre tanning and tanning practice*
3. Post tanning and finishing practice*
4. Introduction to various mechanical operations/processing equipments/devices (demonstration)

*Making Upper and Garment leather using any of the following raw materials cow, buffalo, goat and sheep.

OUTCOMES:
On the completion of the course students are expected to
CO1. Aware of assortment of hides/skins, wetblue/EI, crust and finished leather.
CO2. Know the practice of pretanning, tanning and post tanning.
CO3. Have knowledge on various mechanical operation involved in leather processing.

TOTAL: 60 PERIODS
## Course Articulation Matrix:

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Statement</th>
<th>Program Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>Aware of the assortment of hides/skins, wet blue/EI, crust and finished leathers.</td>
<td>2 3 3 3 − − − − − − 3 3 3 2 - 3</td>
</tr>
<tr>
<td>CO2</td>
<td>Know pre tanning and tanning and post-tanning practices.</td>
<td>2 3 3 3 − − − − − − 3 3 3 2 - 3</td>
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<tr>
<td>CO3</td>
<td>Know various mechanical operations involved in leather manufacture.</td>
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<tr>
<td>Introductory Practice in Leather Manufacture</td>
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<td>2 3 3 3 − − − − − − 3 3 3 2 - 3</td>
</tr>
</tbody>
</table>

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 to create awareness in protection of environment.

**UNIT I  ENVIRONMENT, ECOSYSTEMS, BIODIVERSITY AND SUSTAINABLE DEVELOPMENT  8**

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

**UNIT II  ENVIRONMENTAL POLLUTION AND CHEMISTRY  14**

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

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 – types and sources of leather wastes - elements of integrated waste management and role of stakeholders.

**UNIT III  TREATMENT OF INDUSTRIAL WASTEWATER  10**

Unit operations and processes for the treatment of industrial 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 AND RISK ASSESSMENT  9**


**UNIT V  ENVIRONMENTAL POLICIES AND LEGISLATION  4**

OUTCOME
At the end of this course, the students will be able to appreciate the importance of environmental science and technology.

REFERENCES:
### Course Articulation Matrix:

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<th>Course Outcomes</th>
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<td>PO1</td>
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<tr>
<td>CO1</td>
<td>Appreciate the importance of environmental science and technology.</td>
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<tr>
<td>CO2</td>
<td>Understand the ecosystem, biodiversity and sustainable development.</td>
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<tr>
<td>CO3</td>
<td>Exposure on various wastewater treatment methods.</td>
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<tr>
<td>Environmental Science and Engineering</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE
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 6
Product brief of various light and heavy leather manufacture from hides.

UNIT II HEAVY LEATHER MANUFACTURE FROM HIDES 10
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 10
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 12
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 7
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.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the students will be in a position to
CO1. Understand the various physical and chemical properties requirement for different kinds of heavy leathers
CO2. Comprehend the processing aspects for making different types of heavy leathers.
CO3. Develop the heavy leather for sports goods

TEXT BOOKS:
## Course Articulation Matrix:

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Statement</th>
<th>Program Outcome</th>
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<tbody>
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<td>CO1</td>
<td>Understand the various physical and chemical properties required for different kinds of heavy leathers</td>
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<tr>
<td>CO2</td>
<td>Comprehend the processing aspects for making different types of heavy leathers</td>
<td>-</td>
</tr>
<tr>
<td>CO3</td>
<td>Developing heavy leather for sports goods</td>
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<tr>
<td>Leather Manufacturing from Hides</td>
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</tbody>
</table>

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

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, REFRACTOMETRY AND THERMAL ANALYSIS  11
Polarimetry and refractometry Principle, instrumentation and Applications. 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 V  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:
On the completion of the course students are expected to

CO1. Gain fundamental knowledge on various physico-chemical analytical methods.
CO2. Understand the underpinning science behind various instrumental techniques.
CO3. Aware of various chromatographic techniques.
TEXT BOOKS:

REFERENCES:
### Course Articulation Matrix:

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<th>Course Outcomes</th>
<th>Statement</th>
<th>Program Outcome</th>
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<td>Gain fundamental knowledge of various physico-chemical analytical methods.</td>
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<td>CO2</td>
<td>Understand the underpinning science behind various instrumental techniques.</td>
<td>PO1</td>
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<tr>
<td>CO3</td>
<td>Aware of various chromatographic techniques for leather chemical analysis.</td>
<td>PO1</td>
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<tr>
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<tr>
<td>Instrumental Methods of Analysis</td>
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<td>PO1</td>
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</table>

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

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

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

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

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

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

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.

OUTCOMES:

At the end of the course, the student would understand

CO1. The analytical chemistry behind testing of leather chemicals and leathers.
CO2. Various methods of analyses of leather chemicals, spent process liquors and pelts/leathers.
CO3. Quality Standards of various leather chemicals and leathers.
TEXT BOOKS:
Course Articulation Matrix:

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<tr>
<th>Course Outcomes</th>
<th>Statement</th>
<th>PO1</th>
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<th>PS O3</th>
<th>PS O4</th>
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<td>The analytical chemistry behind the testing of leather chemicals and leathers</td>
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<td>CO2</td>
<td>Various techniques for analyzing leather chemicals, spent process liquors, and pelts/leathers.</td>
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<tr>
<td>CO3</td>
<td>Quality Standards of various leather chemicals and leather end products</td>
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</table>

Principles of Testing for Leather | 3 | 2 | - | - | 3 | 3 | - | - | - | - | - | - | 3 | - | - | 3 |

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

UNIT I CHROMIUM CHEMISTRY 10
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 7
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 10
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 9
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 vegetable tanning materials and their physico-chemical properties and their effect on the physical properties of leathers.

UNIT V MECHANISM OF VEGETABLE AND OTHER ORGANIC TANNAGES 9
Mechanism of tanning with aldehydes and other organic tanning agents; Synthetic tannins - Classification - properties, uses in leather industry.

TOTAL: 45 PERIODS
OUTCOMES:

At the end of the course, the students will be in the position to

CO1. Understand the chemistry of chromium and factors controlling chrome tanning.
CO2. Understand the mechanism of inorganic tannages.
CO3. Comprehend the chemistry of vegetable tannins and mechanism vegetable and organic tanning.

TEXT BOOKS:

**Course Articulation Matrix:**

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Statement</th>
<th>Program Outcome</th>
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<tbody>
<tr>
<td>CO1</td>
<td>Understand the chemistry of chromium and factors controlling chrome tanning.</td>
<td>3 2 - - 3 - - - - - - - 3 3 - - 3</td>
</tr>
<tr>
<td>CO2</td>
<td>Understand the mechanism of inorganic tannages.</td>
<td>3 2 - - 3 - - - - - - - 3 3 - - 3</td>
</tr>
<tr>
<td>CO3</td>
<td>Comprehend the chemistry of vegetable tannins and mechanism vegetable and organic tanning</td>
<td>3 2 - - 3 - - - - - - - 3 3 - - 3</td>
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<td>Theory of Tannages</td>
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<td>3 2</td>
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</tbody>
</table>

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

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
- Manufacture of vegetable tanned and chrome sole leathers;
- Processing of belting leathers, harness and saddle leathers; (minimum one)
- 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, the students will be able to

CO1. Develop different types of leathers from hides
CO2. Comprehend the processing aspects for making leathers from hides.
CO3. Understand the process – property correlation for making various types of leathers from hides.

TOTAL: 90 PERIODS
## Course Articulation Matrix:

<table>
<thead>
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<th>Course Outcomes</th>
<th>Statement</th>
<th>Program Outcome</th>
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<tr>
<td>CO1</td>
<td>Develop different kinds of leathers from hides.</td>
<td>PO1 3 2 3 - - - 3 3 - - 3</td>
</tr>
<tr>
<td>CO2</td>
<td>Comprehend the processing aspects for making leathers from hides.</td>
<td>PO1 3 2 3 - - - 3 3 - - 3</td>
</tr>
<tr>
<td>CO3</td>
<td>Understand the process – property correlation for making various types of heavy leathers.</td>
<td>PO1 3 2 3 - - - 3 3 - - 3</td>
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<tr>
<td>Practice on Leather from Hides</td>
<td>- 2 3 - - 2 2 - - - 3 3 - - 3 3 - - 3</td>
<td>- 2 3 - - 2 2 - - - 3 3 - - 3 3 - - 3</td>
</tr>
</tbody>
</table>

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

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 Deliming Agents
a. Analysis of ammonium salts
b. Analysis of boric acid

Analysis of Bate Agent
Enzyme Assay

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 and 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

Chemical Analysis of pelts and leathers

OUTCOMES:
At the end of the course, the students will be able to
CO1. Have practical experience and understanding on the analysis of various leather chemicals
CO2. Have practical knowledge on pelts/leathers analysis
CO3. Understand the challenges of eco-sensitive substances and their qualitative and quantitative analytical methods

TOTAL: 60 PERIODS
## Course Articulation Matrix:

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<th>Statement</th>
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<tbody>
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<td>CO1</td>
<td>Have practical experience and understanding the analysis of various leather chemicals</td>
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<tr>
<td>CO2</td>
<td>Have practical knowledge of pelt/leather analysis</td>
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<tr>
<td>CO3</td>
<td>Understand the challenges of eco-sensitive substances and their qualitative and quantitative analytical methods.</td>
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</table>

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

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

UNIT I  PROPERTIES OF LEATHER  9
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  8
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  8
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  8
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  12
Process of manufacture of leathers such as glazed kid, nappa garment, fine glove, suede garment and lining; Quality control aspects with special reference to light leather manufacture.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1. Understand the property variations of different leathers
CO2. Design suitable processing variations that are required to manufacture leather from skin.
CO3. Develop speciality leathers from skin

TEXT BOOKS:

3. CLRI Process Bulletins.
Course Articulation Matrix:

<table>
<thead>
<tr>
<th>Course Outcomes</th>
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<th>PO1</th>
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<th>PS O2</th>
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<th>PS O4</th>
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</thead>
<tbody>
<tr>
<td>CO1</td>
<td>Understand the property variations of different leathers from skin</td>
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<tr>
<td>CO2</td>
<td>Design suitable processing variations that are required to manufacture leather from skin.</td>
<td>3</td>
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<tr>
<td>CO3</td>
<td>Develop specialty leathers from skin</td>
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<tr>
<td>Leather Manufacture from Skins</td>
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</tbody>
</table>

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

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  FATLIQOURS AND FATLIQUORING OF LEATHER  10


UNIT III  SYNTANS AND RETANNING OF LEATHER  10

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

UNIT IV  PRACTICE OF POST TANNING PROCESSES AND OPERATIONS  10

Practice of post tanning processes viz., 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:

On the completion of the course students are expected to

CO1. Understand post tanning processes and their importance to the manufacture of various types of leathers
CO2. Have knowledge on chemistry of post tanning auxiliaries
CO3. Understand the mechanism of dyeing, fatliquoring and retanning.
TEXT BOOKS:
### Course Articulation Matrix:

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Statement</th>
<th>Program Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>Understand post tanning processes and their importance to the manufacture of various types of leathers.</td>
<td>PO1  2 3 2 − − − 3 − − − − 3 3 - - 3</td>
</tr>
<tr>
<td>CO2</td>
<td>Know about the chemistry of post tanning auxiliaries.</td>
<td>PO1  2 3 2 − − − 3 − − − − 3 3 - - 3</td>
</tr>
<tr>
<td>CO3</td>
<td>Understand the mechanism of dyeing, fatliquoring and retanning.</td>
<td>PO1  2 3 2 − − − 3 − − − − 3 3 - - 3</td>
</tr>
<tr>
<td>Theory of Post Tanning Process</td>
<td></td>
<td>PO1  2 3 2 − − − 3 − − − − 3 3 - - 3</td>
</tr>
</tbody>
</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE
To provide practical knowledge on microscopical and microbiological testing of leathers and 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

Fastness Properties
a. Rub fastness
b. Light fastness

TOTAL: 60 PERIODS

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

CO1. Microscopical analysis/identification of leathers.
CO2. Microbiological testing of raw skins/hides, pelts and leathers and various process liquors.
CO3. Performing various physical testing methods for assessing leathers.
## Course Articulation Matrix:

<table>
<thead>
<tr>
<th>Course Outcomes</th>
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<th>Program Outcome</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>PO1</td>
</tr>
<tr>
<td>CO1</td>
<td>Using miscopy technique for assessing leathers at different stages</td>
<td>3</td>
</tr>
<tr>
<td>CO2</td>
<td>Isolation and characterization of bacteria and fungi from leathers and tan liquors</td>
<td>3</td>
</tr>
<tr>
<td>CO3</td>
<td>Performing various physical testing methods for assessing leathers.</td>
<td>3</td>
</tr>
<tr>
<td>Physical Testing and Analysis Lab</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

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

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OBJECTIVE
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

CO1. Processing different types of leathers from skin
CO2. Practice in making specialty leathers from different skins
CO3. Knowledge on process recipe for making different leather.
## Course Articulation Matrix:

<table>
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<tr>
<th>Course Outcomes</th>
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<th>PO1</th>
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<td>Processing different types of leathers from skin</td>
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<td>3</td>
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<td>CO2</td>
<td>Practical experience in manufacturing specialty leathers from different skins.</td>
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<tr>
<td>CO3</td>
<td>Knowledge on process recipe for making different leathers.</td>
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<tr>
<td>Practice on Leather from Skins</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
Each student is expected to 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. The evaluation for this course will be carried out in fifth semester. During fifth semester the student should submit (to assigned faculty) an industrial training report on practical internship undertaken. The report should be based on the practical experience gained at the industry, which should be duly certified by the production in-charge of the industry. The objective of the training is to enhance the practical knowledge of the students on various aspects associated with leather manufacture. Faculty will assess the students to judge the level of proficiency, originality and capacity for application of the practical knowledge attained by the student during the training period.

TOTAL DURATION: 4 WEEKS
Course Articulation Matrix:

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<td>PO3 PO4 PO5 PO6</td>
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</table>

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

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 and garments; Property requirements for leather and other materials; Accessories for Leather goods and 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  OPERATIONS

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 AND 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 AND MANAGEMENT

Project Feasibility reports, plant lay out, costing and pricing for leather goods and garments. Analysis of International market trends for goods and garments – EU, USA and other markets. Social auditing of leather goods and garment units - occupational Health and Safety, ISO 9000 and 14000.

OUTCOMES:

Through this course student will be able to know

CO1. Various components for the manufacture of leather good and garments

CO2. Processing steps involved in the making of leather good and garments

CO3. Different machineries involved in the products manufacture

CO4. Techniques to design and develop leather goods and garments

CO5. Organisation and management of leather goods and garments manufacturing unit
REFERENCES:

6. A course manual on leather garment pattern designing.
8. Leather and sports goods – Pattern and Template marker, NIMI Publications, 2011
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</tr>
<tr>
<td>CO1</td>
<td>Various components for the manufacture of leather goods and garments.</td>
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</tr>
<tr>
<td>CO2</td>
<td>Processing steps involved in the making of leather good and garments.</td>
<td>3</td>
</tr>
<tr>
<td>CO3</td>
<td>Different types of machinery involved in the manufacture of the products.</td>
<td>3</td>
</tr>
<tr>
<td>CO4</td>
<td>Techniques to design and develop leather goods and garments.</td>
<td>3</td>
</tr>
<tr>
<td>CO5</td>
<td>Organisation and management of leather goods and garments manufacturing</td>
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<td>Leather Goods and Garments Technology</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
To impart knowledge on the chemistry and properties of various auxiliaries used in leather processing

UNIT I  INTRODUCTION
Leather Auxiliaries – Roles and Functions, Classification of Auxiliaries based on applications and chemistry

UNIT II  SYNTANS
Syntans – Introduction to raw materials and background to relevant chemistries of production such as sulfonation, condensation, polymerisation etc. Technology for preparation of aromatic sulfonic acid – formaldehyde /urea-formaldehyde and sulfone based syntans. Role of syntan product chemistries in obtaining desired feel in leather. General manufacturing principles of acrylic, PU and other polymeric syntans

UNIT III  FATLIQUORS

Chemistry of oils and fats – Differences, chemical structure of fatty acids, classification of oils, differences between animal, vegetable and mineral oils. Chemical modification of oils for applications in leather. Differences between natural and synthetic fatliquors. General manufacturing principles of fatliquors

UNIT IV  DYSES AND PIGMENTS
Theory of colour. Fundamentals of colour matching
Particle size. Relevance of particle size to colour.

Chemical constituents of dyes. Classification of dyes and introduction to chromophores. Structural features of dyes. General manufacturing principles of dyes

Pigments – classification, relevance of particle size to colour. Introduction to various types of pigments and their chemistries. General manufacturing principles of pigments

Differences between dyes and pigments

UNIT V  CHEMISTRY OF FINISHING CHEMICALS
Classification of finishes. Chemistry of film formation and theory of adhesion.

Binders – chemical classification, General understanding of polymeric, protein and other types of binders.

General understanding of the chemistries of plasticizers, feel modifiers, waxes, slip agents.

TOTAL: 45 PERIODS
OUTCOMES:

On the completion of the course students are expected to

CO1. Understand the structure and properties of various leather auxiliaries
CO2. Have knowledge on the chemistry of finishing chemicals
CO3. Understand the role of finishing chemicals in leather manufacture.

TEXT BOOKS AND REFERENCES:

### Course Articulation Matrix:

| Course Outcomes | Statement                                                                 | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 | PSO4 |
|-----------------|---------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|
| CO1             | Understand the structure and properties of various leather auxiliaries   | 3   | 3   | 2   | −   | −   | −   | 2   | −   | −   | −    | −    | 2    | 3    | −    | −    | −    | 3    |
| CO2             | Know about the chemistry of leather chemicals                            | 3   | 3   | 2   | −   | −   | −   | 2   | −   | −   | −    | −    | 2    | 3    | −    | −    | −    | 3    |
| CO3             | Understand the role of finishing chemicals in leather manufacture.      | 3   | 3   | 2   | −   | −   | −   | 2   | −   | −   | −    | −    | 2    | 3    | −    | −    | −    | 3    |
| Science and Technology of Leather Auxiliaries |                                                              | 3   | 3   | 2   | −   | −   | −   | 2   | −   | −   | −    | −    | 2    | 3    | −    | −    | −    | 3    |

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

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. Binder to pigment ratio, 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, transfer coating, texture modification/creation using perforation, scaling, engraving and foil transfer.
OUTCOMES:

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

CO1. Appreciate the role of various finishing agents and auxiliaries used in leather finishing
CO2. Formulate strategies for finishing different types of leathers
CO3. Upgradation technologies for enhancing value to low grade substrates
CO4. Knowledge on different machineries used in leather finishing

REFERENCES:

### Course Articulation Matrix:

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<tr>
<td></td>
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<td>PO1</td>
</tr>
<tr>
<td>CO1</td>
<td>Appreciate the role of various finishing agents and auxiliaries used in leather.</td>
<td>3</td>
</tr>
<tr>
<td>CO2</td>
<td>Formulate various finishing strategies for different types of leathers.</td>
<td>3</td>
</tr>
<tr>
<td>CO3</td>
<td>Upgradation technologies for enhancing value to low grade substrates</td>
<td>3</td>
</tr>
<tr>
<td>CO4</td>
<td>Knowledge of different types of machinery used in leather finishing.</td>
<td>3</td>
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<tr>
<td>Theory of Leather Finishing</td>
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</tr>
</tbody>
</table>

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

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

Practical training/demonstration to students in the following areas:

- 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 are expected to

CO1. Have practical experience in finishing of various types of leathers.
CO2. Understand recent technology involved in leather finishing.
CO3. Aware of various machinery operation involving in leather finishing.
### Course Articulation Matrix:

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<th>PS O2</th>
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<th>PS O4</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>Have practical experience in finishing of different types of leathers.</td>
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<tr>
<td>CO2</td>
<td>Understand the technology used in leather finishing.</td>
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<tr>
<td>CO3</td>
<td>Aware of various machinery operations involved in leather finishing.</td>
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<td>Finishing Practice Laboratory</td>
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</tbody>
</table>

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

To provide practical training in fabrication of various leather goods and garments.

Practical training to students in the following areas:
1. Free hand object drawing practice
2. Leather goods and garments working sketch practice
3. Fashion illustration and color application
4. Good’s and garment’s leather assortment
5. Physical observation of goods and 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: 60 PERIODS

OUTCOMES:

At the end of this course, the students are expected to

CO1. Have practical experience in designing of leather goods and garments.
CO2. Have practical knowledge in fabrication of leather goods and garments.
CO3. Aware of computer application involved in leather goods and garments development.
<table>
<thead>
<tr>
<th>Course Outcomes</th>
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<th>PO2</th>
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<tbody>
<tr>
<td>CO1</td>
<td>Have practical experience in designing leather goods and garments.</td>
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<tr>
<td>CO2</td>
<td>Have practical knowledge in fabrication of leather goods and garments.</td>
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<tr>
<td>CO3</td>
<td>Aware of computer applications involved in developing leather goods and garments.</td>
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</table>

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

To impart knowledge on the manufacture, evaluation and application of materials and components used in footwear manufacture

UNIT I FOOTWEAR MATERIALS AND COMPONENTS 9

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

UNIT II DESIGN AND PATTERN DEVELOPMENT 9

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

UNIT III CUTTING, PRE-CLOSING AND CLOSING 13

Principles of cutting – Manual and Mechanical, Clicking room design and management, Skiving operation, Splitting operation, Sewing machines function and classification, Topline and other edge treatments, Reinforcement operations, Types of seams, Sewing machine needles, Description and different types of needle points.

UNIT IV PRELASTING AND LASTING 10

Principles and methods of Pre-lasting and lasting, Lasted upper preparation, Sole preparation, Sole cementing, Heat activation, Sole attaching process, Quality control measures in lasting room and Health and Safety aspects in Shoe industry. Quality control measures in lasting room and Shoe room techniques.

UNIT V METHODS OF SHOE CONSTRUCTION 4

Various methods of shoe construction.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of this course, the students are expected to

CO1. Understand the construction of a shoe and its components.
CO2. Understand the design and pattern development.
CO3. Have knowledge on prelasting and lasting.

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.
### Course Articulation Matrix:

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<tr>
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<td>PO1</td>
</tr>
<tr>
<td>CO1</td>
<td>Understand the construction of the shoe and its components.</td>
<td>-</td>
</tr>
<tr>
<td>CO2</td>
<td>Comprehend the design and pattern development.</td>
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<tr>
<td>CO3</td>
<td>Know prelasting and lasting techniques.</td>
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<tr>
<td>Footwear Technology</td>
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</tbody>
</table>

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

To provide orientation on the machineries used for leather and leather products manufacture

UNIT I MECHANICAL POWER TRANSMISSION AND FLUID POWER SYSTEMS

Mechanical power transmission system components- Belts, chains, Gears and Cams. Introduction to Fluid power – Advantages and Applications – Fluid power systems – Types of fluids - Properties of fluids.

UNIT II PRINCIPLES AND OPERATION OF LEATHER PROCESSING MACHINERIES

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.

UNIT III PRINCIPLES AND OPERATION OF LEATHER PRODUCT MACHINERIES

Salient features and purpose of the various machinery used in leather product manufacturing – Clicking, Splitting, Skiving, Sewing machines – Flat bed, Post bed, Cylinder bed machines, strap cutting machine, Lasting machines – Forepart lasting, Heel seat lasting, Side lasting, Post lasting machines, Heat setting, Ponding, Roughing, Heat activator, Sole pressing, Shoe polishing machine

UNIT IV TRANSPORT SYSTEMS AND AUTOMATION IN LEATHER PRODUCT MANUFACTURING


UNIT V LAYOUT AND MAINTENANCE

Lay out for a small/medium tannery and leather product unit. Arrangements of machines as per the sequence of operation for standard leather processing/ product making. Preventive maintenance and safety in the use of leather and leather product machineries.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of this course, the students are expected to

CO1. Understand the working principles of machineries used in leather.
CO2. Have knowledge on transport systems and automation in leather product manufacture.
CO3. Aware of layout and maintenance of tannery and leather product unit.
REFERENCES:

## Course Articulation Matrix:

<table>
<thead>
<tr>
<th>Course Outcomes</th>
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<td>CO1</td>
<td>Understand the working principles of various machinery used in leather.</td>
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<td>CO2</td>
<td>Know about transport systems and automation in leather product manufacture.</td>
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<tr>
<td>CO3</td>
<td>Aware of layout and maintenance of tannery and leather product unit.</td>
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<td>Leather and Leather Products Machineries</td>
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</table>

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

To provide practical training in fabrication of leather footwear.

DESIGNING AND PATTERN MAKING


CUTTING AND CLICKING

Hand and Machine cutting, Basic Pattern cutting practice, Fabric and other materials, Leather cutting practice, Pattern nesting practice, Cutting practice of Footwear components, Pattern area Assessment practice, Knowledge on Clicking machine and Cutting Dies, Quality of Footwear components.

PRE-CLOSING AND CLOSING


LASTING AND FINISHING


TOTAL: 90 PERIODS

OUTCOMES:

At the end of this course, the students are expected to

CO1. Have practical experience in design and fabrication of footwear.
CO2. Have practical knowledge on cutting and clicking process.
CO3. Have practical knowledge on lasting and finishing process
## Course Articulation Matrix:

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<tr>
<th>Course Outcomes</th>
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<tbody>
<tr>
<td>CO1</td>
<td>Have practical experience in the design and fabrication of footwear.</td>
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<tr>
<td>CO2</td>
<td>Have practical knowledge of cutting and clicking process.</td>
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<tr>
<td>CO3</td>
<td>Have practical knowledge on lasting and finishing process.</td>
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<td>Leather Footwear – Design and Fabrication Laboratory</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
Each student is expected to undertake 1 month practical training on aspects associated with leather or leather products manufacture as a part of Industrial Internship – II during the summer vacation after sixth semester. The evaluation of this programme will be carried out in seventh semester. During seventh semester the student should submit (to assigned faculty) an industrial training report on practical internship undertaken. The report should be based on the practical experience gained at the industry, which should be duly certified by the production in-charge of the industry. The objective of the training is to enhance the practical knowledge of the students on various aspects associated with leather manufacture. Faculty will assess the students to judge the level of proficiency, originality and capacity for application of the practical knowledge attained by the student during the training period.

TOTAL DURATION: 4 WEEKS
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
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.

TOTAL : 90 PERIODS
### Course Articulation Matrix:

<table>
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<tr>
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<th>Statement</th>
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<td>Project I</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.

TOTAL: 240PERIODS
Course Articulation Matrix:

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<td>Project II</td>
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</tbody>
</table>

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

LT5001 ADVANCED PHYSICS AND CHEMISTRY OF SKIN – I  L T P C
3 0 0 3

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

UNIT I HISTOLOGY OF SKIN 10
Histology and fibre packing in skins. Techniques for study of macro-ultra and microstructural details of skins. Primary, secondary, tertiary and quaternary structure of collagen.

UNIT II MOLECULAR ARCHITECTURE OF COLLAGEN 10
Molecular architecture of collagen. Inter and intra-change forces in the stabilisation and aggregation of collagen molecules. Three dimensional network of collagen fibres in skins and leather matrix.

UNIT III PHYSICO-CHEMICAL PROPERTIES OF COLLAGEN 7
Hydration, fibre swelling and phase transitions in collagen fibres and their role in dimensional stability of skin and leather matrix.

UNIT IV THERMO-MECHANICAL PROPERTIES OF COLLAGEN 9
Molecular mechanisms in relaxation and folding with special reference to native collagen and tanned collagen. Helix to coil transition and effects of thermo-mechanical stress on connective tissue fibres.

UNIT V CROSSLINKING MECHANISM 9
Shrinkage and cross linking phenomena in native, chrome tanned and vegetable tanned collagen. Influence of electromagnetic and high energy radiation on native collagen.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the students are expected to

CO1. Have comprehensive knowledge on the chemistry and physics of Skin.
CO2. Understand the molecular architecture, hydration, swelling, phase transitions, dimensional stability, relaxation, shrinkage.
CO3. Understand the cross-linking phenomena of collagen/processed collagen/leather.
TEXT BOOKS AND REFERENCES:

<table>
<thead>
<tr>
<th>Course Articulation Matrix:</th>
<th>Course Outcomes</th>
<th>Statement</th>
<th>Program Outcome</th>
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<tr>
<td></td>
<td>CO1</td>
<td>Have comprehensive knowledge on the chemistry and physics of Skin.</td>
<td>- 3 2 3 - - - - - - 3 3 - - -</td>
</tr>
<tr>
<td></td>
<td>CO2</td>
<td>Understand the molecular architecture, hydration, swelling, phase transitions, dimensional stability, relaxation, shrinkage.</td>
<td>- 3 2 3 - - - - - - 3 3 - - -</td>
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<td></td>
<td>CO3</td>
<td>Understand the cross-linking phenomena of collagen/processed collagen/leather.</td>
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<td>ADVANCED PHYSICS AND CHEMISTRY OF SKIN – I</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 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 REACTIVITY OF COLLAGEN 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 DIFFUSION AND TRANSPORT PHENOMENA 9


UNIT III MOLECULAR BEHAVIOUR OF COLLAGEN 15

Molecular level changes in collagen at various process conditions (viz., soaking, liming/dehairing, deliming/bating, pickling, tanning, dyeing and fatliquoring).

UNIT IV MACRO AND MICRO STRUCTURAL BEHAVIOUR OF COLLAGEN 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.

UNIT V SURFACE SCIENCE FOR LEATHER 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:

At the end of the course, the students are expected to

CO1. Have an appreciation and understanding on the underpinning scientific concept on skin and leather.
CO2. Understand the diffusion and transport phenomena.
CO3. Understand the molecular behavior of collagen.
TEXT BOOKS AND REFERENCES:

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<th>Course Outcomes</th>
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<tr>
<td>CO1</td>
<td>Have an appreciation and understanding on the underpinning scientific concept on skin and leather.</td>
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<td>CO2</td>
<td>Understand the diffusion and transport phenomena.</td>
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<td>CO3</td>
<td>Understand the molecular behavior 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
OBJECTIVE

To enable the students to understand the science behind various marketing activities.

UNIT I  INTRODUCTION TO CONSUMER BEHAVIOUR  9

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  PSYCOLOGICAL IMPACT ON CONSUMER  9

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  SOCIAL IMPACT ON CONSUMER  6

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

UNIT IV  CONSUMER DATA COLLECTION AND ANALYSIS  9

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  MARKETING STRATEGY  12


TOTAL: 45 PERIODS

OUTCOMES:

On completion of the course students are expected to

CO1. Acquire knowledge on consumer behavior
CO2. Understand social impact on consumer
CO3. Acquire knowledge on marketing strategy

REFERENCES:

3. Research for Marketing decisions- Paul, Donald, Herald- Prentice Hall (India)
   Zikmund: Exploring Marketing Research, 8e, Thomson 2006
4. Naresh K. Malhotra, Marketing Research, An applied Orientation, Pearson Education
   Asia. Panda, Shiba Charan, Entrepreneurship Development, New Delhi, Anmol
   Publications.
   Delhi, 1995.
   Entrepreneurs, Sage, New Delhi, 2002
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<tr>
<td>CO1</td>
<td>Acquire knowledge on consumer behaviour</td>
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<td>CO2</td>
<td>Understand the social impact on consumer</td>
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<tr>
<td>CO3</td>
<td>Acquire knowledge on marketing strategy</td>
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<td>CONSUMER BEHAVIOUR AND BUSINESS ORIENTATION</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
To impart knowledge on ecofriendly options for leather 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 ECO-FRIENDLY 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:
At the end of the course, the students are expected to

CO1. Have knowledge on the cleaner process technology in the leather processing.
CO2. Understand the cleaner tanning, post tanning and finishing systems.
CO3. Have knowledge on the fundamentals of bio beam house processing.

REFERENCES:
### Course Articulation Matrix:

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<td>CO1</td>
<td>Have knowledge on the cleaner process technology in the leather processing.</td>
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<tr>
<td>CO2</td>
<td>Understand the cleaner tanning, post tanning and finishing systems.</td>
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<td>CO3</td>
<td>Have knowledge on the fundamentals of bio beam house processing.</td>
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<tr>
<td>ECO-BENIGN OPTIONS FOR LEATHER PROCESSING</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 impart knowledge on financial management concepts and principles of engineering economics

UNIT I  FINANCIAL ACCOUNTING  

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

UNIT III  WORKING CAPITAL MANAGEMENT  

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

UNIT V  ENGINEERING ECONOMICS  

OUTCOME:

At the end of this course, the students are expected to

CO1. Understand the financial management and economics.
CO2. Understand the profit value analysis
CO3. Have knowledge in capital management and engineering economics

TEXT BOOKS


REFERENCES:

2. Charles T.Homgren, Cost Accounting, PHI 1985
<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Statement</th>
<th>PO 1</th>
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<td>Understand the financial management and economics.</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE

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

UNIT I INTRODUCTION 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 AND VENDORS 10
1. Finance
2. Production planning, control and maintenance
3. Sales and 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 and testing
4. End user training and Going Live
5. Post Evaluation and Maintenance

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

TOTAL: 45 PERIODS

OUTCOMES:

At the end of this course, the students are expected to

CO1. Have knowledge on ERP and related technologies.
CO2. Understand the ERP implementation life cycles.
CO3. Understand the ERP case studies.
REFERENCES:

## Course Articulation Matrix:

<table>
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<th>Course Outcomes</th>
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<td>ENTERPRISE RESOURCES PLANNING</td>
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</table>

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

This course aims to provide necessary knowledge and attitude to understand and appreciate the process of starting and developing a new venture.

UNIT I QUALITY OF ENTREPRENEURS 8


UNIT II PLANNING AND DEVELOPMENT 8


UNIT III FINANCIAL MANAGEMENT 10


UNIT IV ORGANIZATIONAL MANAGEMENT 9

Building Team – creating growth oriented organizational culture. Employee motivation, retention strategies. Organizational 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 BUSINESS DEVELOPMENT STRATEGIES 10


TOTAL: 45 PERIODS
OUTCOMES:

At the end of this course, the students are expected to

CO1. Have knowledge on entrepreneurial tasks such as, generating idea, planning business
CO2. Have knowledge on financial management
CO3. Understand the organizational management and business development strategies.

REFERENCES:

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<td>CO3</td>
<td>Understand the organizational management and business development strategies.</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 impart knowledge on fashion forecasting for leather and leather products.

UNIT I HISTORICAL EVALUATION AND 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:
On completion of the course students are expected to
CO1. Have knowledge on international trends and fashion considerations in leather.
CO2. Understand the leather products styling.
CO3. Have knowledge on fashion forecast

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

| Course Outcomes | Statement                                                                 | Program Outcome |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO1             | Have knowledge on international trends and fashion considerations in leather. | - 3 3 - 3 - 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO2             | Understand the leather products styling.                                  | - 3 3 - 3 - 3 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO3             | Have knowledge on fashion forecast.                                        | - 3 3 - 3 - 3 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| FASHION FORCASTING FOR LEATHER AND LEATHER PRODUCTS | - 3 3 - 3 - 3 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

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

UNIT I  MANAGEMENT AND GENERAL EMPLOYMENT PRACTICES 15
Human resource planning, Organizational design, HR budgeting, Motivation, Leadership, Employee involvement vs engagement, Job design: Job Analysis - Job description and job specification, Performance management; Performance and potential appraisals, Human resource audit, Workplace ethics and behaviour, International HRM

UNIT II  STAFFING 6
Equal employment opportunity, recruitment, selection, successive 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 Planning and Development

Contemporary issues: Strategic talent management, Knowledge management and learning organizations, BPR, TQM and Intellectual capital management. HR Outsourcing

UNIT IV  COMPENSATION BENEFITS 5
Job evaluation, Pay structures, Skill based, Competency based and Performance based pay system, Benefit programs, Pay delivery administration

UNIT V  HEALTH, SAFETY, SECURITY AND LABOUR RELATIONS 12
Introduction to occupational safety-Employee assistance programs, safety management and approaches, theft, fraud, investigations, corrections; Labour laws in India, unfair labour practices, collective bargaining

TOTAL: 45 PERIODS

OUTCOMES:
On the completion of course students are expected to

CO1. Have knowledge on management and employment practices.
CO2. Aware of fundamentals of human resource development
CO3. Understand the management concepts and relate them to contemporary issues.
TEXT BOOKS AND REFERENCES:
### Course Articulation Matrix:

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<td>Aware of fundamentals of human resource development</td>
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<td>CO3</td>
<td>Understand the management concepts and relate them to contemporary issues.</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 impart knowledge on international marketing and foreign trade aspects of leather industry

UNIT I  INTRODUCTION  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  MANAGEMENT OF IMPORT AND EXPORT  11

UNIT III  DOMESTIC AND IMPORT TRADE MANAGEMENT  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  IMPORT POLICY  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  MARKETING STRATEGY  9
Marketing Management in the Indian context Introduction-concept-process functions- Role of Marketing in modern Organization- Marketing environment-Socio economic forces- Marketing Planning-Understanding Buyerand Organizational behavior- Product Management -Pricing decisions-Promotion Decisions

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students are expected to

CO1. Understand the basics of international trade, government policies in export
CO2. Have knowledge on aspects of world trade related to leather sector and custom tariff
CO3. Understand the international marketing.
TEXT BOOKS AND REFERENCES:

1. Wagdre, H. International Marketing Management, Adhyayan Publisher, 2007
**Course Articulation Matrix:**

<table>
<thead>
<tr>
<th>Course Outcomes</th>
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<td>CO1</td>
<td>Understand the basics of international trade, government policies in export</td>
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<tr>
<td>CO2</td>
<td>Have knowledge on aspects of world trade related to leather sector and custom tariff</td>
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<tr>
<td>CO3</td>
<td>Understand the international marketing.</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
To impart knowledge on leather and leather products costing

UNIT I   COSTING METHODS  9
Cost accounting, elements of cost, classification of cost elements – examples from leather industry, methods of costing

UNIT II  COST ANALYSIS  5
Cost profit volume analysis, breakeven analysis; standard costing, analysis of variance

UNIT III  LEATHER AND LEATHER PRODUCT COSTING  17
Costing of leather and leather products – material, labour, power and overhead expenses

UNIT IV   RISK ANALYSIS OF FOREIGN EXCHANGE  9
Foreign exchange mechanisms, exchange rates; foreign exchange exposure management – risks, strategies to reduce risk

UNIT V    BUDGET MANAGEMENT  5
Budget, types of budgets, budgeting and control in tanneries and leather products industry

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course, the students are expected to

CO1. Manage the costing of leather and leather products.
CO2. Have knowledge on budget management.
CO3. Understand the risk analysis of foreign exchange.

REFERENCES:
1. “Costing in leather processing industry”, ICWAI, 2001
2. Bulijan, J., “Costs of tannery waste treatment”, UNIDO, 2005
### Course Articulation Matrix:

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<td>CO1</td>
<td>Manage the costing of leather and leather products.</td>
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<td>CO2</td>
<td>Have knowledge on budget management.</td>
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<td>CO3</td>
<td>Understand the risk analysis of foreign exchange.</td>
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<td>LEATHER AND LEATHER PRODUCTS COSTING</td>
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</table>

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

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 and competitive – Bidding - Outsourcing - purchasing operation - Buying capital goods and 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 and Design - Product planning and selection; Inventory management - Retail pricing; Retail communication - Customer Service

UNIT V GLOBAL SOURCING STRATEGY 9
Globalization and its influences - The role and importance of global sourcing - Global sourcing process and strategy - Investigation and tendering - Supplier selection and development - Operationalization of global sourcing strategy - Performance Measurement - The benefits and challenges of global sourcing - Coping with custom clearance uncertainties - Sourcing on the Internet - Supplier relationship development - Merchandising language for sourcing

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course, the students will be in the position to understand

CO1. Fundamentals of procurement and merchandising
CO2. Retail sector
CO3. Marketing and sourcing
TEXT BOOKS AND REFERENCES:

   Publisher: Prentice Hall
2. Integrated Retail Management by James R. Ogden & Denise T. Ogden, 2007,
3. Charles W L Hill. And Arun Kumar Jain. International Business: competing in the
4. John D. Daniels Lee H Radebaugh, International Business: Environments and
### Course Articulation Matrix:

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<td>CO1</td>
<td>Understand the fundamentals of procurement and merchandising</td>
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<td>CO2</td>
<td>Understand retail sector</td>
<td>-    -    3    3    3    3    -    -    -    -    -    -    -    -    -    -    2    3</td>
</tr>
<tr>
<td>CO3</td>
<td>Understand marketing and sourcing</td>
<td>-    -    3    3    3    3    -    -    -    -    -    -    -    -    -    -    2    3</td>
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<td>PRODUCT MERCHANDISING</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 provide skills and knowledge on organization and management for leather sector.

UNIT I  RAW MATERIAL RESOURCE MANAGEMENT  10


Raw materials – Hides and skins: Meat consumption pattern – Slaughter and mortality rates – Availability of hides and skins in India and world – Storage and grading systems – Pricing and other marketing factors - Major markets and sources of supply from India and world – Scenarios for future

UNIT II  INDUSTRY MANAGEMENT  10


Fabrication Industries – Products: Structure and Distribution of Product industries in India and World - Pattern of Leather utilization – Capacity, Production, Employment pattern - Components of design and fashion

UNIT III  DOMESTIC TRADE MANAGEMENT  8

Domestic Trade – India: Production and Consumption pattern of Footwear in India – Market demand for Leather and Synthetic (non- leather ) footwear - Market for Leather goods, garments, gloves and other leather articles in India – Import of Footwear and Products into India – Emerging market scenario in India

Export Trade – India: Export and Import policy - Export trends of leather and products – major markets for India - Importance of Brands, Fashion, Certification issues – Priorities for Future

UNIT IV  INTERNATIONAL TRADE MANAGEMENT  7


UNIT V  DEVELOPMENT STRATEGY  10


TOTAL : 45 PERIODS
OUTCOMES:
At the end of the course, the students are expected to
CO1. Have knowledge in raw material resource management.
CO2. Understand the domestic and international trade in leather.
CO3. 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
<table>
<thead>
<tr>
<th>Course Outcomes</th>
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<tbody>
<tr>
<td></td>
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<td>PO 1</td>
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<tr>
<td>CO1</td>
<td>Have knowledge in raw material resource management.</td>
<td>-</td>
</tr>
<tr>
<td>CO2</td>
<td>Understand the domestic and international trade in leather.</td>
<td>-</td>
</tr>
<tr>
<td>CO3</td>
<td>Have knowledge on industry, trade management and development strategy in leather.</td>
<td>-</td>
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<tr>
<td>ORGANISATION</td>
<td>AND MANAGEMENT OF LEATHER MANUFACTURE</td>
<td>-</td>
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</tbody>
</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
To impart knowledge on Occupational Safety and Hazard aspects in leather manufacture

UNIT I           SAFETY PHILOSOPHY, HAZARD IDENTIFICATION AND ASSESSMENT
Legal framework of safety and health in India International conventions and trends; Responsibilities and enforcement mechanism. Need for safety and 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
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
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
Planning for emergencies; Control of fire and explosion; Dealing with medical emergencies

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

TOTAL: 45 PERIODS
OUTCOMES:

At the end of the course, the students will be in the position to understand the

CO1. Legal framework of safety and health in India and international conventions
CO2. Hazard identification and assessment
CO3. Productive machine safety in the leather industry
CO4. Work ecology and ergonomics
CO5. Emergency prevention and preparedness safety and health management

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<td>Legal framework of safety and health in India and international conventions</td>
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<td>PO 7 PO 8 PO 9</td>
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<td>PO 10 PO 11 PS O1</td>
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<tr>
<td>CO2</td>
<td>Hazard identification and assessment</td>
<td>- - - 3 3 - 3 -</td>
</tr>
<tr>
<td>CO3</td>
<td>Productive machine safety in the leather industry</td>
<td>- - - 3 3 - 3 -</td>
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<tr>
<td>CO4</td>
<td>Work ecology and ergonomics</td>
<td>- - - 3 3 - 3 -</td>
</tr>
<tr>
<td>CO5</td>
<td>Emergency prevention and preparedness safety and health management</td>
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SAFETY IN LEATHER INDUSTRIES - - - 3 3 - 3 -     - 3 3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE
To impart knowledge on the use of leather supplements used as substitutes for leather in the manufacture of leather products.

UNIT I INTRODUCTION 6
Technology of the most common polymeric materials used in leather industry as supplements. Polymer and Rubber industries in India.

UNIT II SUPPLEMENT SYNTHESIS 15
Manufacture of industrially important polymers for plastics, fibres and lastomer - Polyethylene, polypropylene, polyvinyl chloride, polyvinyl alcohol, polyacrylonitrile, polystyrene, polyurethane, fluoro-carbon polymers, epoxy resins, polyamides, polyster, alkyd resins, silicone polymers, cellulosics.

UNIT III POLYMER FABRICATION 6
Fabrication of polymeric materials, compounding and mixing, casting, extrusion, fibre spinning, molding, coating, foam fabrication.

UNIT IV TESTING OF POLYMERS 8
Testing of polymers. Mechanical and Thermal testing.

UNIT V POLYMER MODIFICATION 10
Manufacture of rubber and elastomers. Natural rubber, processing, vulcanizing synthetic elastomers, butadiene copolymer, neutral rubber, polyisoprene polybutadiene. Polymer and rubber industries in India.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the students are expected to

CO1. Have knowledge on the chemistry of most common polymeric materials used in leather industry as supplements.
CO2. Understand the fundamentals of polymerization of various polymers used.
CO3. Gain knowledge on analytical skills on testing of polymers.

REFERENCES:
### Course Articulation Matrix:

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<td>Have knowledge on the chemistry of most common polymeric materials used in leather industry as supplements.</td>
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<td>CO2</td>
<td>Understand the fundamentals of polymerization of various polymers used.</td>
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<tr>
<td>CO3</td>
<td>Gain knowledge on analytical skills on testing of polymers.</td>
<td>3</td>
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<td>SCIENCE AND TECHNOLOGY OF LEATHER SUPPLEMENTS AND SYNTHETICS</td>
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<td>3</td>
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</tbody>
</table>

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

To impart knowledge on the preparation and use of tannery by-products that are generated at abattoirs and tanneries.

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 ANIMAL RENDERING AND BLOOD UTILIZATION


UNIT III UTILIZATION 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 IV TANNERY BYPRODUCTS CHARACTERISTICS

Details of solid wastes from tannery; composition and characteristics – raw trimmings, fleshings, hair wastes, shavings, wetblue/crust/finished leather trimmings, buffing waste.

UNIT V TANNERY BYPRODUCTS UTILIZATION

Technologies for utilization of raw trimmings – Glue, Gelatin; fleshing waste – glue, energy recovery; hair waste – composite, keratin hydrolysate; chrome and veg shavings – board, protein fillers; utilization of crust/finished leather trimmings.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students will be in the position to

CO1. Have gained knowledge on the preparation of several by-products emerging from slaughter houses and tanneries.
CO2. Understand the utilization by products.
CO3. Have knowledge in various methods of waste to wealth creation.
REFERENCES:

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<td>CO1</td>
<td>To gain knowledge on the preparation of several by-products emerging from slaughter houses and tanneries.</td>
<td>-</td>
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<tr>
<td>CO2</td>
<td>Understand the utilization by products.</td>
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<tr>
<td>CO3</td>
<td>Have knowledge in various methods of waste to wealth creation.</td>
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<td></td>
<td>TECHNOLOGY OF ANIMAL AND TANNERY BY PRODUCTS UTILISATION</td>
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</table>

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

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

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


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


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


UNIT V  IMPLEMENTATION OF REENGINEERING IN LEATHER SECTOR  8


TOTAL: 45 PERIODS

OUTCOMES:

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

CO1. Apply the learned concepts in a case study/project.
CO2. Understand the concept of value engineering.
CO3. Have knowledge in reengineering in leather sector.
TEXT BOOKS AND REFERENCES:

2. Del L. Younker, “Value Engineering” Marcel Dekker, Inc. 2003
### Course Articulation Matrix:

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<tr>
<td>CO1</td>
<td>Apply the learned concepts in a case study/project.</td>
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<tr>
<td>CO2</td>
<td>Understand the concept of value engineering.</td>
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<tr>
<td>CO3</td>
<td>Have knowledge in reengineering in leather sector.</td>
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<td>VALUE ENGINEERING IN LEATHER SECTOR</td>
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</table>

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

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

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 and Disaster Recovery; Security and 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 and 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 and 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.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students are expected to

CO1. Have knowledge on information technology
CO2. Comprehend the application aspects of DBMS, Data communication principles, Web Designing, ERP, MIS, E-Commerce
CO3. Have knowledge on CAD applications in leather/leather products manufacture.
TEXT BOOKS AND REFERENCES:

5. Kendall and Kendall, Systems Analysis and Design (Prentice Hall India)
7. Understanding SQL (BPB Publications)
8. Hands-on HTML (BPB Publications)
11. Reference Manuals for CAD systems for Footwear and Garments.
<table>
<thead>
<tr>
<th>Course Outcomes</th>
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<th>PS O2</th>
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<td>CO1</td>
<td>Have knowledge on information technology</td>
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<tr>
<td>CO2</td>
<td>Comprehend the application aspects of DBMS, Data communication principles, Web Designing, ERP, MIS, E-Commerce</td>
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<tr>
<td>CO3</td>
<td>Have knowledge on CAD applications in leather/leather products manufacture.</td>
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<tr>
<td>COMPUTER APPLICATIONS FOR LEATHER AND LEATHER PRODUCTS</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE
To impart knowledge on CAD/CAM for leather products design and manufacture.

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 and 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.

TOTAL: 45 PERIODS

OUTCOMES:
On completion of the course students are expected to

CO1. Understand the concepts of computer applications in leather products sector.
CO2. Have knowledge on CAD for pattern engineering, last and sole modelling for footwear.
CO3. 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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<tr>
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<tr>
<td>CO1</td>
<td>Understand the concepts of computer applications in leather products sector.</td>
<td>PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 PO 12 PS O1 PS O2 PS O3 PS O4</td>
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<tr>
<td>CO2</td>
<td>Have knowledge on CAD for pattern engineering, last and sole modelling for footwear.</td>
<td>3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3</td>
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<tr>
<td>CO3</td>
<td>Have knowledge in advanced computational techniques in CAD, rapid prototyping.</td>
<td>3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3</td>
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<tr>
<td>CAD/CAM FOR LEATHER PRODUCTS DESIGN AND MANUFACTURE</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
To impart basics and fundamental knowledge on polymer science for leather applications.

UNIT I INTRODUCTION
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 SYNTHESIS OF POLYMERS USED IN LEATHER
Polypropylene manufacturing; Acrylic manufacturing; Atom transfer radical 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 CHARACTERIZATION METHODS
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 PROCESSING TECHNIQUES FOR POLYMERS USED IN LEATHER
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 POLYMER RECYCLING
Recycling, remoulding, depolymerisation, incineration, biodegradable polymers for leather applications.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course, the students are expected to
CO1. Have knowledge on polymer synthesis, characterization and processing technology.
CO2. Understand the application of polymers in leather.
CO3. Have knowledge in polymer recycling.
REFERENCES:

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</tr>
<tr>
<td>CO1</td>
<td>Have knowledge on polymer synthesis, characterization and processing technology.</td>
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<tr>
<td>CO2</td>
<td>Understand the application of polymers in leather.</td>
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</tr>
<tr>
<td>CO3</td>
<td>Have knowledge in polymer recycling.</td>
<td>3 3 - - - - 3 - - - - 3 3 - - 3</td>
</tr>
<tr>
<td>POLYMER SCIENCE AND ITS APPLICATIONS IN LEATHER</td>
<td>3 3 - - - - 3 - - - - 3 3 - - 3</td>
<td>1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively</td>
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</table>
OBJECTIVE

This subject is to impart knowledge on waste management primarily associated with leather industries.

UNIT I INTRODUCTION TO TANNERY WASTE

Definition of pollution- different types of environmental pollution- classification of pollutants in water and wastewater – characterization of pollutants in water and wastewater - types of sampling, and significance of sampling, precautions to be taken while sampling and preservation of samples and discharge standards
Tannery wastewater: TDS, BOD, COD, floating solids, grit particles, suspended solids, dissolved solids, organic and inorganic matters. Tannery solid waste: trimmings, flesh, hair and chrome shavings.

UNIT II PRIMARY WASTEWATER TREATMENT


UNIT III SECONDARY WASTEWATER TREATMENT

Introduction to microbial metabolism – Bacterial growth – Kinetics of Biological Growth. Aerobic suspended growth system - Aerobic attached growth system - Anaerobic suspended growth system - Anaerobic attached growth system – Advanced Biological System – UASB – EGSB

UNIT IV TERTIARY WASTEWATER TREATMENT


UNIT V SOLID WASTE DISPOSAL


TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students are expected to

CO1. Understand various waste management technologies.
CO3. Have knowledge in management of solid waste.
REFERENCES:
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<tr>
<td>CO1</td>
<td>Understand various waste management technologies.</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.

OBJECTIVE
- 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
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

UNIT III  TQM TOOLS AND TECHNIQUES I

UNIT IV  TQM TOOLS AND TECHNIQUES II

UNIT V  QUALITY MANAGEMENT SYSTEM
OUTCOMES:

On completion of the course students are expected to have

CO1. Ability to apply TQM concepts in a selected enterprise
CO2. Ability to apply TQM principles in a selected enterprise
CO3. Ability to apply the various tools and techniques of TQM
CO4. Ability to apply QMS and EMS in any organization

TEXT BOOK


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<td>Ability to apply the various tools and techniques of TQM</td>
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<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
OBJECTIVES

To impart knowledge on biotechnological applications in processing of skins into leather.

UNIT I PROTEINS AND NUCLEIC ACID AND ENZYMOLOGY


UNIT II GENETIC ENGINEERING (RECOMBINANT DNA TECHNOLOGY)

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

UNIT III ENZYMES FOR LEATHER PROCESSING

Cleaner Leather Processing: Use of enzyme options in beam house operations - Soaking, unhairing, bating, degreasing, offal treatment: Types of enzymes - proteases, lipases - properties, assay systems and production. Types of fermentation, Preparation of media, preparation of inoculum, separation and purification of products.

UNIT IV WASTE MANAGEMENT FOR LEATHER

General features of the organic and inorganic pollutants of tannery. Stabilization 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

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

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students are expected to

CO1. Understand basic biotechnology concepts and its relevance for application in leather processing.
CO2. Have knowledge in enzyme for leather processing.
CO3. Manage the waste generated from leather industries.
REFERENCES

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<td>Understand basic biotechnology concepts and its importance for application in leather processing.</td>
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<td>Have knowledge in enzyme for leather processing.</td>
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<td>Manage the waste generated from leather industries.</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES:
- Teach history and philosophy of Indian Constitution.
- Describe the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- Summarize powers and functions of Indian government.
- Explain emergency rule.
- Explain structure and functions of local administration.

UNIT I INTRODUCTION
History of Making of the Indian Constitution-Drafting Committee- (Composition & Working) - Philosophy of the Indian Constitution-Preamble-Salient Features

UNIT II CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES

UNIT III ORGANS OF GOVERNANCE
Parliament-Composition-Qualifications and Disqualifications-Powers and Functions-Executive President-Governor-Council of Ministers-Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions

UNIT IV EMERGENCY PROVISIONS

UNIT V LOCAL ADMINISTRATION
District’s Administration head- Role and Importance-Municipalities- Introduction- Mayor and role of Elected Representative-CEO of Municipal Corporation-Pachayati raj- Introduction- PRI- Zila Pachayat-Elected officials and their roles- CEO ZilaPachayat- Position and role-Block level-Organizational Hierarchy (Different departments)-Village level- Role of Elected and Appointed officials-Importance of grass root democracy

TOTAL: 45 PERIODS

OUTCOMES:
CO1: Able to understand history and philosophy of Indian Constitution.
CO2: Able to understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
CO3: Able to understand powers and functions of Indian government.
CO4: Able to understand emergency rule.
CO5: Able to understand structure and functions of local administration.

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TEXTBOOKS:
4. The Constitution of India (Bare Act), Government Publication, 1950
OBJECTIVES:
- Develop knowledge of self-development
- Explain the importance of Human values
- Develop the overall personality through value education
- Overcome the self-destructive habits with value education
- Interpret social empowerment with value education

UNIT I  INTRODUCTION TO VALUE EDUCATION  9
Values and self-development – Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non-moral valuation, Standards and principles, Value judgements

UNIT II  IMPORTANCE OF VALUES  9
Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness. Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature, Discipline

UNIT III  INFLUENCE OF VALUE EDUCATION  9
Personality and Behaviour development - Soul and Scientific attitude. Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship Happiness Vs suffering, love for truth.

UNIT IV  REINCARNATION THROUGH VALUE EDUCATION  9

UNIT V  VALUE EDUCATION IN SOCIAL EMPOWERMENT  9
Equality, Non violence, Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Studying effectively

TOTAL: 45 PERIODS

OUTCOMES:
CO1 – Gain knowledge of self-development
CO2 – Learn the importance of Human values
CO3 – Develop the overall personality through value education
CO4 – Overcome the self-destructive habits with value education
CO5 – Interpret social empowerment with value education

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REFERENCES:
OBJECTIVES:
- Understand the methodology of pedagogy.
- Compare pedagogical practices used by teachers in formal and informal classrooms in developing countries.
- Infer how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.
- Illustrate the factors necessary for professional development.
- Identify the Research gaps in pedagogy.

UNIT I INTRODUCTION AND METHODOLOGY: 9
Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions - Overview of methodology and Searching.

UNIT II THEMATIC OVERVIEW 9
Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.

UNIT III EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES 9
Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT IV PROFESSIONAL DEVELOPMENT 9
Professional development: alignment with classroom practices and follow up support - Peer support - Support from the head teacher and the community - Curriculum and assessment - Barriers to learning: limited resources and large class sizes

UNIT V RESEARCH GAPS AND FUTURE DIRECTIONS 9
Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.

TOTAL: 45 PERIODS

OUTCOMES:
- Understand the methodology of pedagogy.
- Understand Pedagogical practices used by teachers in formal and informal classrooms in developing countries.
- Find how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.
- Know the factors necessary for professional development.
- Identify the Research gaps in pedagogy.

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OBJECTIVES:
- Develop healthy mind in a healthy body thus improving social health also improve efficiency
- Invent Do’s and Don’t’s in life through Yam
- Categorize Do’s and Don’t’s in life through Niyam
- Develop a healthy mind and body through Yog Asans
- Invent breathing techniques through Pranayam

UNIT I INTRODUCTION TO YOGA 9
Definitions of Eight parts of yog. (Ashtanga)

UNIT II YAM 9
Do’s and Don’t’s in life.
Shaucha, santosh, tapa, swadhyay, iswarapranidhan

UNIT III NIYAM 9
Do’s and Don’t’s in life.
Ahinsa, satya, astheya, Bramhacharya and aparigraha

UNIT IV ASAN 9
Various yog poses and their benefits for mind & body

UNIT V PRANAYAM 9
Regularization of breathing techniques and its effects-Types of pranayam

TOTAL: 45 PERIODS

OUTCOMES:
CO1 – Develop healthy mind in a healthy body thus improving social health also improve efficiency
CO2 – Learn Do’s and Don’t’s in life through Yam
CO3 – Learn Do’s and Don’t’s in life through Niyam
CO4 – Develop a healthy mind and body through Yog Asans
CO5 – Learn breathing techniques through Pranayam

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REFERENCES:
1. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata
2. ‘Yogic Asanas for Group Tarining-Part-I” : Janardan Swami Yogabhyasi Mandal, Nagpur
OBJECTIVES:
- Develop basic personality skills holistically
- Develop deep personality skills holistically to achieve happy goals
- Rewrite the responsibilities
- Reframe a person with stable mind, pleasing personality and determination
- Discover wisdom in students

UNIT I  NEETISATAKAM-HOLISTIC DEVELOPMENT OF PERSONALITY - I  
Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride & heroism) – Verses- 26,28,63,65 (virtue)

UNIT II  NEETISATAKAM-HOLISTIC DEVELOPMENT OF PERSONALITY - II  
Verses- 52,53,59 (dont's) - Verses- 71,73,75,78 (do's)

UNIT III  APPROACH TO DAY TO DAY WORK AND DUTIES  
Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48 - Chapter 3-Verses 13, 21, 27, 35 Chapter 6-Verses 5,13,17,23, 35 - Chapter 18-Verses 45, 46, 48

UNIT IV  STATEMENTS OF BASIC KNOWLEDGE – I  
Statements of basic knowledge - Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18

UNIT V  PERSONALITY OF ROLE MODEL - SHRIMAD BHAGWADGEETA
Chapter2-Verses 17, Chapter 3-Verses 36,37,42 -  Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63

TOTAL: 45 PERIODS

OUTCOMES:
CO1: To develop basic personality skills holistically
CO2: To develop deep personality skills holistically to achieve happy goals
CO3: To rewrite the responsibilities
CO4: To reframe a person with stable mind, pleasing personality and determination
CO5: To awaken wisdom in students

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REFERENCES:
1. Gopinath,Rashtriya Sanskrit Sansthanam P, Bhartrihari’s ThreeSatakam , Niti-sringar-vairagya, New Delhi,2010
2. Swami Swarupananda , Srimad Bhagavad Gita, Advaita Ashram,Publication Department, Kolkata,2016
COURSE OBJECTIVES
The course will introduce the students to
- get a knowledge about Indian Culture
- Know Indian Languages and Literature religion and philosophy and the fine arts in India
- Explore the Science and Scientists of Ancient, Medieval and Modern India
- Understand education systems in India

UNIT I INTRODUCTION TO CULTURE 9
Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India.

UNIT II INDIAN LANGUAGES AND LITERATURE 9
Indian Languages and Literature – I: Languages and Literature of South India, – Indian Languages and Literature – II: Northern Indian Languages & Literature

UNIT III RELIGION AND PHILOSOPHY 9
Major religions practiced in India and Understanding their Philosophy – religious movements in Modern India (Selected movements only)

UNIT IV FINE ARTS IN INDIA (ART, TECHNOLOGY & ENGINEERING) 9
Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India

UNIT V EDUCATION SYSTEM IN INDIA 9
Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

TOTAL: 45 PERIODS

COURSE OUTCOMES
After successful completion of the course the students will be able to
- Understand philosophy of Indian culture.
- Distinguish the Indian languages and literature.
- Learn the philosophy of ancient, medieval and modern India.
- Acquire the information about the fine arts in India.
- Know the contribution of scientists of different eras.
- Understand education systems in India

REFERENCES:
5. Satya Prakash, “Founders of Sciences in Ancient India”, Vijay Kumar Publisher, 1989
Course Objectives: The main learning objective of this course is to make the students an appreciation for:
1. Introduction to Sanga Tamil Literature.
2. ‘Agathinai’ and ‘Purathinai’ in Sanga Tamil Literature.
3. ‘Attruppadai’ in Sanga Tamil Literature.
4. ‘Puranaanuru’ in Sanga Tamil Literature.
5. ‘Pathitrupaththu’ in Sanga Tamil Literature.

UNIT I SANGA TAMIL LITERATUREANINTRODUCTION

UNIT II ‘AGATHINAI’AND’PURATHINAI’
Tholkappiyar’s Meaningful Verses–Three literature materials–Agathinai’s message– History of Culture from Agathinai– Purathinai–Classification–Mesage to Society from Purathinai.

UNIT III ‘ATTRUPPADAI’.

UNIT IV ‘PURANAANURU’
Puranaanuru on Good Administration, Ruler and Subjects–Emotion & its Effect in Puranaanuru.

UNIT V ‘PATHITRUPATHTHU’
Pathitrupaththuin ‘Ettuthogai’–Pathitrupaththu’s Parables–Tamil dynasty: Valor, Administration, Charity in Pathitrupaththu–Mesage to Society from Pathitrupaththu.

Total (L:45) = 45 PERIODS

COURSE OUTCOMES: Upon completion of this course, the students will be able to:
1. Appreciate and apply the messages in Sanga Tamil Literature in their life.
2. Differentiate ‘Agathinai’ and ‘Purathinai’ in their personal and societal life.
3. Appreciate and apply the messages in ‘Attruppadai’ in their personal and societal life.
4. Appreciate and apply the messages in ‘Puranaanuru’ in their personal and societal life.
5. Appreciate and apply the messages in ‘Pathitrupaththu’ in their personal and societal life.

REFERENCES:
COURSE DESCRIPTION
This course offers an introduction to language and communication. The primary goal of this course is to familiarize students with key ideas related to communication using language as well as non-verbal means. Ideas related to the use of language and the underlying power structures are also examined. The course also examines the role of media in communication and in the dissemination of ideas as well as opinions.

Objectives
✓ To familiarize students with the concept of communication using linguistic and non-linguistic resources.
✓ To help students ask critical questions regarding facts and opinions.
✓ To provide students with the material to discuss issues such as language and power structures.
✓ To help students think critically about false propaganda and fake news.

Learning Outcomes
➢ Students will be able to use linguistic and non-linguistic resources of language in an integrated manner for communication.
➢ Students will be able to analyze communication in terms of facts and opinions.
➢ Students will be able to discuss, analyze and argue about issues related to language and power.

UNIT I  LINGUISTIC AND NON-LINGUISTIC RESOURCE OF COMMUNICATION: 9
a) Writing and Speech
b) Distinction between language structure and language use, form and function, acceptability and grammaticality
c) Gestures and Body language, pictures and symbols, cultural appropriacy
d) Communicative Competency, context and situation, combination of linguistic and non-linguistic elements of communication

UNIT II  STRUCTURE OF WRITING/CONVERSATION: 9
a) Language skills and the communication cycle; speaking and listening, writing and reading
b) Initiating and closing conversations, intervention, turn taking
c) Writing for target reader, rhetorical devices and strategies
d) Coherence and Cohesion in speech and writing

UNIT III  POWER STRUCTURE AND LANGUAGE USE: 9
a) Gender and language use
b) Politeness expressions and their use
c) Ethical dimensions of language use
d) Language rights as part of human rights

UNIT IV  MEDIA COMMUNICATION: 9
a) Print media, electronic media, social media
b) Power of media
c) Manufacturing of opinion, fake news and hidden agendas

UNIT V  PERSUASIVE COMMUNICATION AND MISCOMMUNICATION: 9
a) Fundamentals of persuasive communication
b) Persuasive strategies
c) Communication barriers
TEXT BOOKS:

HU5172                                                                                              VALUES AND ETHICS                                            L  T  P  C
                                                                                                 3  0  0  3

OBJECTIVES:
- Teach definition and classification of values.
- Explain Purusartha.
- Describe Sarvodaya idea.
- Summarize sustenance of life.
- Conclude views of hierarchy of values.

UNIT I  DEFINITION AND CLASSIFICATION OF VALUES
Extrinsic values- Universal and Situational values- Physical- Environmental-Sensuous- Economic-Social-Aesthetic-Moral and Religious values

UNIT II  CONCEPTS RELATED TO VALUES
Purusartha-Virtue- Right- duty- justice- Equality- Love and Good

UNIT III  IDEOLOGY OF SARVODAYA
Egoism- Altruism and universalism- The Ideal of Sarvodaya and Vasudhaiva Kutumbakam

UNIT IV  SUSTENANCE OF LIFE
The Problem of Sustenance of value in the process of Social, Political and Technological Changes

UNIT V  VIEWS ON HIERARCHY OF VALUES
The Problem of hierarchy of values and their choice, The views of Pt. Madan Mohan Malviya and Mahatma Gandhi

OUTCOMES:
CO1: Able to understand definition and classification of values.
CO2: Able to understand purusartha.
CO3: Able to understand sarvodaya idea.
CO4: Able to understand sustenance of life.
CO5: Able to understand views of hierarchy of values.

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TEXTBOOKS:
2. Little, William, : An Introduction of Ethics (Allied Publisher, Indian Reprint 1955)
OBJECTIVES:
- Illustrate human relations at work its relationship with self.
- Explain the importance of interacting with people at work to develop teamwork.
- Infer the importance of physical health in maintaining human relations at work.
- Describe the importance of staying psychologically healthy.
- Identify the essential qualities for progressing in career.

UNIT I UNDERSTANDING AND MANAGING YOURSELF
Human Relations and You: Self-Esteem and Self-Confidence: Self-Motivation and Goal Setting; Emotional Intelligence, Attitudes, and Happiness; Values and Ethics and Problem Solving and Creativity.

UNIT II DEALING EFFECTIVELY WITH PEOPLE
Communication in the Workplace; Specialized Tactics for Getting Along with Others in the Workplace; Managing Conflict; Becoming an Effective Leader; Motivating Others and Developing Teamwork; Diversity and Cross-Cultural Competence.

UNIT III STAYING PHYSICALLY HEALTHY
Yoga, Pranayam and Exercise: Aerobic and anaerobic.

UNIT IV STAYING PSYCHOLOGICALLY HEALTHY
Managing Stress and Personal Problems, Meditation.

UNIT V DEVELOPING CAREER THRUST

TOTAL: 45 PERIODS

OUTCOMES:
Students will be able to
CO1: Understand the importance of self-management.
CO2: Know how to deal with people to develop teamwork.
CO3: Know the importance of staying healthy.
CO4: Know how to manage stress and personal problems.
CO5: Develop the personal qualities essential for career growth.

TEXT BOOK:

REFERENCES:

COURSE DESCRIPTION
Psychological Processes course is designed for students to be aware of the basic principles of psychology for the better understanding of people’s psyche and behaviour around them. This course enables learners to use the optimal use of different forms of thinking skills and thereby results in effective communication in diverse situations. Every unit of the syllabus highlights the psychological process of people, the most powerful and constructive use of perceptions.

OBJECTIVES
The major objectives of this course is
- To develop students’ awareness – on psychology, learning behavior and usage of perception effectively.
- To learn to use the various kinds of thinking in a formal context.
➢ To critically evaluate content and comprehend the message on the bases of perception, personality and intelligence.

**UNIT 1: INTRODUCTION**

**UNIT 2: SENSORY & PERCEPTUAL PROCESSES**
Some general properties of Senses: Visual system – the eye, colour vision – Auditory system – Hearing, listening, Sounds - Other senses - Selective attention; physiological correlates of attention; Internal influences on perception learning – set - motivation & emotion - cognitive styles; External influences on perception figure and ground separation – movement – organization – illusion; Internal- external interactions: Constancy - Depth Perception- Binocular & Monocular Perception; Perceptual defense & Perceptual vigilance; Sensory deprivation -Sensory bombardment; ESP - Social Perception.

**UNIT 3: COGNITION & AFFECT**

**UNIT 4: THINKING, PROBLEM-SOLVING & DECISION MAKING**

**UNIT 5: PERSONALITY & INTELLIGENCE**
Psychological phenomena & Attributes of humans - cognition, motivation, and behavior - thoughts, feelings, perceptions, and actions – personality dimensions, traits, patterns - Specialized knowledge, performance accomplishments, automaticity or ease of functioning, skilled performance under challenge - generative flexibility, and speed of learning or behavior change.

References

**HU5175                      EDUCATION, TECHNOLOGY AND SOCIETY                             L T P C 3 0 0 3**

**COURSE DESCRIPTION**
This course introduces students to multidisciplinary studies in Education, Technology and Society. Students will get an understanding of the relationship between education, technology and society. They will also learn about the long lasting impact of good education in a technologically advanced society.

**COURSE OBJECTIVES:**
The course aims
➢ To help learners understand the basics of different types of technology utilised in the field of education
➢ To make them realize the impact of education in society
➢ To make them evolve as responsible citizen in a technologically advanced society

**LEARNING OUTCOMES**
By the end of the course, learners will be able to
Understand the various apps of technology apps and use them to access, generate and present information effectively.

Apply technology based resources and other media formats equitably, ethically and legally.

Integrate their technical education for betterment of society as well as their personal life.

UNIT I INDIAN EDUCATION SYSTEM
Gurukul to ICT education – Teacher as facilitator – Macaulay's Minutes – English medium vs Regional medium – Importance of Education in Modern India - Challenges in Education

UNIT II LEARNING THEORIES

UNIT III TECHNOLOGICAL ADVANCEMENTS
Web tools – Social media in education – elearning – MOOCs – Mobile assisted learning – Learning Apps – Blended learning - Self-directed learning

UNIT IV EDUCATIONAL TECHNOLOGY
Technological implications on Education – Teaching, Learning & Testing with Technology - Advantages and drawbacks – Critical analysis on the use of technology

UNIT V ETHICAL IMPLICATIONS
Plagiarism – Online Copyright issues – Ethical and value implications of education and technology on individual and society.

TOTAL: 45 PERIODS

TEACHING METHODS
Teaching modes include guest lectures, discussion groups, presentations, visual media, and a practicum style of learning.

EVALUATION
As this is course is not a content based course, it focuses more on the ethical use of technology in education and society, and so, evaluation can be based on assignments and discussions. So there is no need for an end semester examination. Internals marks can be taken for the total marks.

INTERNAL (100 % WEIGHTAGE)
(a) Written Test (40 marks)
(b) Assignment: Write a real time report of the technology use in any school / college (15 marks)
(c) Presentation: Students choose any one of the technological tools and present its relevance to education and society (15 marks)
(d) Group discussion: Students discuss in groups on case studies relating to various challenges in education and technology use in society (20 marks)
(e) Blog entry: Making weekly blog posts in Class Blog on the topics related to the course posted by the instructor and commenting on others' posts. (10 marks)

REFERENCES
1) Education and Social order by Bertrand Russel
2) Theories of learning by Bower and Hilgard
3) Technology and Society by Jan L Harrington

HU5176 PHILOSOPHY

OBJECTIVES
- To create a new understanding by teaching philosophy through a comparison of Indian and Western traditions.
- To Foster critical thinking and imagination by dealing with inter-related concepts in literature and science.
- To bridge the gap between the sciences and humanities through introspective analyses.
- To nurture an understanding of the self and elucidates ways to progress towards a higher understanding of one’s self and others.
UNIT I  KNOWLEDGE

UNIT II  ORIGIN

UNIT III  WORD

UNIT IV  KNOWLEDGE AS POWER/OPPRESSION

UNIT V  SELF KNOWLEDGE/BRAHMAN

OUTCOMES:
On completion of the course, the students will be able to:
1. Think sceptically, ask questions and to arrive at deductions.
2. Connect and relate different branches of thought.
3. Comprehends the relation between language, thought and action.
4. Arrive at a better understanding of self and others and forms a new outlook.

REFERENCES:
7. Bacon, Francis: Power as Knowledge

HU5177APPLICATIONS OF PSYCHOLOGY IN EVERYDAY LIFE

UNIT I  INTRODUCTION
Nature and fields.

UNIT II  PSYCHOLOGY IN INDUSTRIES AND ORGANIZATIONS
Job analysis; fatigue and accidents; consumer behavior.

UNIT III  PSYCHOLOGY AND MENTAL HEALTH
Abnormality, symptoms and causes psychological disorders.
UNITIV  PSYCHOLOGY AND COUNSELING
Need of Counseling, Counselor and the Counselee, Counseling Process, Areas of Counseling.

UNITV  PSYCHOLOGY AND SOCIAL BEHAVIOUR
Group, Group dynamics, Team Building, Prejudice and stereotypes; Effective Communication, conflict and negotiation.

TOTAL: 45 PERIODS

TEXTBOOKS
COURSE DESCRIPTION
This course offers an introduction to Gender Studies that asks critical questions about the meanings of sex and gender in Indian society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary drawing from Indian literature and media studies, to examine cultural assumptions about sex, gender, and sexuality. This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with class, caste and other social identities. This course also seeks to build an understanding of the concepts of gender, gender-based violence, sexuality, and rights and their impact on development through a number of discussions, exercises and reflective activities.

Objectives
- To familiarize students with the concepts of sex and gender through literary and media texts.
- To help students ask critical questions regarding gender roles in society.
- To provide students with the material to discuss gender issues such as gender based discrimination, violence and development.
- To help students think critically about gender based problems and solutions.

Learning Outcomes
- Students will be able to critically read literary and media texts and understand the underlying gender perspectives in them.
- Students will be able to analyse current social events in the light of gender perspectives.
- Students will be able to discuss, analyse and argue about issues related to gender and their impact on society, culture and development.

UNIT I: Introduction to Gender
- Definition of Gender
- Basic Gender Concepts and Terminology
- Exploring Attitudes towards Gender
- Social Construction of Gender

Texts:
1. Sukhu and Dukhu (Amar Chitra Katha)
2. The Cat who Became a Queen (Folk tale, J. Hinton Knowles, Folk-Tales of Kashmir. London: Kegan Paul, Trench, Trübner, and Company, 1893, pp. 8-10.)

UNIT II: Gender Roles and Relations
- Types of Gender Roles
- Gender Roles and Relationships Matrix
- Gender-based Division and Valuation of Labour

Texts:
1. Muniyakka (Short Story, Lakshmi Kannan, Nandanvan and Other Stories, Hyderabad: Orient Blackswan, 2011)

UNIT III: Gender Development Issues
- Identifying Gender Issues
- Gender Sensitive Language
- Gender, Governance and Sustainable Development
- Gender and Human Rights
- Gender and Mainstreaming

Texts:
2. Tell Us Marx (Poem, Mallika Sengupta, Translated by Sanjukta Dasgupta)

UNIT IV: Gender-based Violence
- The concept of violence
- Types of Gender-based violence
• The relationship between gender, development and violence
• Gender-based violence from a human rights perspective

Texts:
1. Lights Out (Play, Manjula Padmanabhan)
2. Lights Out (Video of play enacted)

UNIT V: Gender and Culture
• Gender and Film
• Gender, Media and Advertisement

Texts:
1. Mahanagar (Movie: Satyajit Ray)
2. Beti Bachao Beti Padhao Advertisements

READINGS: Relevant additional texts for readings will be announced in the class. Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments.

ASSESSMENT AND GRADING:
Discussion & Classroom Participation: 20%
Project/Assignment: 30%
End Term Exam: 50%

HU5272 ETHICS AND HOLISTIC LIFE

OBJECTIVES:
• To emphasize the meaning and nature of ethics, human values and holistic life for leading a good, successful and happy life through continuous examination of thoughts and conduct in day to day life.
• To understand the status and responsible role of individual in abatement of value crisis in contemporary world in order to develop a civilized and human society. Understanding the process of ethical decision making through critical assessment of incidents/cases of ethical dilemmas in personal, professional and social life.
• To view the place of Ethics and Human Values in the development of individual and society through identification and cross examination of life values and world view of his/her role models in society.

UNIT I HUMAN LIFE, ITS AIM AND SIGNIFICANCE
The concept of a successful life, happy life and a meaningful life, Ethical and decision making capability and its development: Meaning of Ethical dilemma, sharing real life experiences.

UNIT II CREATIVE AND LEADERSHIP ABILITY AND THEIR DEVELOPMENT
Intellectual, Emotional, Creative, Ethico - spiritual development, Aesthetic sense, Self-dependency, Activeness, Development of positive attitude.

UNIT III HARMONY IN PERSONAL AND SOCIAL LIFE:
Concept of personal and group Ethics; Balance between - rights and duties-welfare of self and welfare of all, Creating a value based work culture in hostel, classroom and other places in the campus and society.

UNIT IV CHARACTER, RIGHTEOUSNESS AND VIRTUES FOR A MEANINGFUL LIFE
Egolessness, Humility, Righteousness, Purity, Truthfulness, Integrity, Self-restraint, Self-control, Sense of responsibility, Empathy, Love, Compassion, Maitri / Comradeship, Cooperation, Tolerance.

UNIT V DILEMMA BETWEEN MATERIALISTIC DEVELOPMENT AND HUMAN WELFARE

TOTAL: 45 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Enable students to understand the concept of contemporary ethics at different levels: Individual, local and Global and enable them to cross examine the ethical and social consequences of the
decisions of their life-view and world view.

2. Develop the ability of students to create a balance between their individual freedom and social responsibilities and enable them to identify the personal, professional and social values and integrate them in their personality after cross examination.

3. Enable students to cross examine their earlier decisions taken in life and understand the meaning of ethical dilemma to overcome the ethical dilemmas and engage in critical reflection.

4. Develop positive habits of thought and conduct and work cohesively with fellow beings who have variety of strengths, experiences, shortcomings and challenges, hence to enable them to handle diverse type of personalities.

5. Enable students to develop a method for making ethically sound decisions for themselves, within hostels, classrooms, university campus and society.

HU5273 LAW AND ENGINEERING LT P C 3 0 0 3

UNIT I THE LEGAL SYSTEM: SOURCES OF LAW AND THE COURT STRUCTURE 9
Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law- Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courtiers. (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court) Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration.

UNIT II LAWS 9
Basic principles of contract law, sale of goods law, laws relating to industrial pollution, accident, environmental protection, health and safety at work, patent law, constitutional law: the supreme law of the land, Information technology law and cyber crimes.

UNIT III BUSINESS ORGANISATIONS 9
Sole traders (Business has no separate identity from you, all business property belongs to you).

UNIT IV LAW AND SOCIETY 9
Interdisciplinary nature of law, legal ideologies/philosophy/ schools of jurisprudence.

UNIT V CASE STUDIES 9
Important legal disputes and judicial litigations

TOTAL: 45 PERIODS

HU5274 FILM APPRECIATION LT P C 3 0 0 3

COURSE DESCRIPTION
This is an intensive course designed to promote comprehensive understanding and insights into the nature of cinema and other related forms and practices. Movies, though at times are used more as escapism, they are also a true art form and expressive tool used by writers, directors and actors. This course will explore the aesthetics of cinema, the concepts behind storytelling and various other elements of a film. It will also explore the impact of movies in our society and in our lives. It also encourages students to use films as a medium to analyse visual texts and read underlying messages.

OBJECTIVES:
- To help learners understand the various movie genres and its types.
- To understand various elements that contributes to film making.
- To make them realize the impact of film in society.
- To analyse the visual media and interpret the underlying messages.

UNIT I THE COMPONENTS OF FILMS 9
UNIT II EVOLUTION OF FILM

UNIT III FILMS ACROSS THE WORLD

UNIT IV INDIAN FILMS

UNIT V INTERPRETING FILMS
Film Criticism & Appreciation – Censorship in Movies – Cultural Representation in Movies – Television – New Media & Online Media – Films Beyond Entertainment.

OUTCOMES
On completion of the course, the students will be able to:
- Recognize types of films, their impact on society and their roles in our lives.
- Have an understanding of the concepts of storytelling, Mise en Scene, and other elements of film making.
- Interpret the underlying messages in the movies.

Teaching Methods
- Each unit consists of reading materials, learning activities videos, websites. Students are expected to watch movies sometimes in class and at times at home and discuss in class.

Evaluation
- As this is course is critical appreciation course on films, there is no written end semester examination. The course is more on learning how to critically analyse a movie and appreciate its finer elements. Therefore evaluation can be based on assignments and discussions. Internals marks can be taken for the total marks.

Internal (100 % weightage)
- Assignment 1: Write a movie review with critical analysis (20 marks).
- Assignment 2: Write a script for a scene taken from a short story / novella (20 marks).
- Presentation: Students choose any one topic related to films and present it to the audience. (25 marks)
- Group discussion: Students discuss in groups on the various aspects of movies and its impact on society. (25 marks)
- Blog entry: Making weekly blog posts in Class Blog on the topics related to the course posted by the instructor and commenting on others’ posts. (10 marks)

REFERENCES
1. A Biographical Dictionary of Film by David Thomson, Secker & Warburg, 1975
2. Signs and Meaning in the Cinema by Peter Wollen, Secker & Warburg, 1969
3. The World Viewed by Stanley Cavell 1971
4. Film Style and Technology: History and Analysis by Barry Salt, Starword, 1983

HU5275 FUNDAMENTALS OF LANGUAGE AND LINGUISTICS

OBJECTIVES
- To broadly introduce students to the formal and theoretical aspects of linguistics.
- To enable learners to understand the various practical applications of language and recent findings in the field of applied linguistics.
CONTENTS:

UNIT I  LANGUAGE AND LINGUISTICS: AN OVERVIEW  

UNIT II  MORPHOLOGY - WORDS OF LANGUAGE  

UNIT III  SYNTAX- THE SENTENCE PATTERNS OF LANGUAGE AND SEMANTICS-THE MEANING OF LANGUAGE  

UNIT IV  PHONETICS – THE SOUNDS OF LANGUAGE  

UNIT V  APPLIED LINGUISTICS - THE PRACTICAL APPLICATIONS OF LANGUAGE  
Language learning and teaching (ELT)- lexicography-translation studies-computational linguistics-neurolinguistics (speech pathology and language disorders)- forensic linguistics – sociolinguistics.

Teaching Methods:
Lectures, discussion.

Evaluation Internal and External:
Internal: 2 written tests + assignments, seminars, project (50+15+15+20).
External: A 3 hour written exam (50 marks)

REFERENCES:

HU5276  UNDERSTANDING SOCIETY AND CULTURE THROUGH LITERATURE  

OBJECTIVES

- To internalize the importance of language by understanding its role in the transformation of man.
- To look at language, literature and culture as locus of identity and change.
- To extract meaning from existing literatures and cultures.
- To identify meanings in modern life by reconnecting with lost cultures.

Unit 1  Introduction
Why study literature? Tracing the origin – pictures. Tokens as precursors of writing. Movement from three dimensions to two dimensions- Pictography. From visual to oral -Logography. Reading out literature to young children- Edmund J Farrell.

Unit 2.  Reading Culture
Reading culture through language, signs and consumables- Roland Barthes. Culture through poems- Nissim Ezekiel’s ‘The night of the Scorpion’. ‘Nothing’s Changed’- Tatamkhulu Afrika- Apartheid. Ruskin Bond- ‘Night train at Deoli’- How real life is different from movies.

Unit 3.  Identifying Meaning
Searching and locating meaning through literature. Looking for order in a chaotic world. The Myth of Sisyphus (Albert Camus) and Adi Shankar’s ‘Jagat Mithya’- the world as an illusion. The Indian version as ‘meaningless meaning’.

Unit 4.  Post Modernism
‘If on a winter’s night a traveler’- Italo Calvino. The book about the reader- the experience of reading as reading. Metafiction. Selfie Culture. Visual Culture as purpose of modern life.
Unit 5. Returning to Pictures


Reading list
1. Bond, Ruskin: ‘Night train at Deoli’
2. Ezekiel, Nissim: ‘The Night of the Scorpion’
3. Afrika,Tatamkhulu: ‘Nothing’s Changed’
4. Barthes, Roland: Mythologies
5. Shankaracharya: Viveka Chudamani
6. Camus, Albert- The Myth of Sisyphus
7. Calvino, Italo: If on a winter’s night a traveler

Outcome
- Can identify the connections among language, literature and culture.
- Is able to relate between seemingly different aspects of life.
- Understands the fractions in modern life and can assimilate meanings.