**ANNA UNIVERSITY : : CHENNAI : 600 025.**

**UNIVERSITY DEPARTMENTS**

**B.TECH. LEATHER TECHNOLOGY**

**REGULATIONS – 2015**

**CHOICE BASED CREDIT SYSTEM**

**VISION:**

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

**MISSION:**

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

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

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

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

## 1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) :

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

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

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

## 2. PROGRAMME OUTCOMES (POs):

| | Graduate Attribute | Programme Outcome |
|---|---|---|
| PO1 | Engineering knowledge | Apply knowledge of mathematics, basic science and engineering science. |
| PO2 | Problem analysis | Identify, formulate and solve engineering problems. |

| | | |
|---|---|---|
| PO3 | Design/development of solutions | Design a system or process to improve its performance, satisfying its constraints. |
| PO4 | Conduct investigations of complex problems | Conduct experiments and collect, analyze and interpret the data. |
| PO5 | Modern tool usage | Apply various tools and techniques to improve the efficiency of the system. |
| PO6 | The Engineer and society | Conduct themselves to uphold the professional and social obligations. |
| PO7 | Environment and sustainability | Design the system with environment consciousness and sustainable development. |
| PO8 | Ethics | Interacting industry, business and society in a professional and ethical manner. |
| PO9 | Individual and team work | Function in a multidisciplinary team. |
| PO10 | Communication | Proficiency in oral and written Communication. |
| PO11 | Project management and finance | Implement cost effective and improved system. |
| PO12 | Life-long learning | Continue professional development and learning as a life-long activity. |

## 3. PROGRAM SPECIFIC OUTCOMES (PSOs):

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

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

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

## 4. MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVE WITH PROGRAMME OUTCOMES

| **Programme Educational Objectives** | **Programme Outcomes** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **I** | 3 | 3 | 2 | 2 | 2 | 1 | - | 1 | 2 | 1 | 1 | 1 |
| **II** | 2 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 1 | 3 |
| **III** | - | - | 1 | - | 1 | 3 | 3 | 3 | 3 | 1 | 3 | 1 |

**ANNA UNIVERSITY : : CHENNAI : 600 025.**

**UNIVERSITY DEPARTMENTS**

**B.TECH. LEATHER TECHNOLOGY**

**REGULATIONS – 2015**

**CHOICE BASED CREDIT SYSTEM**

**CURRICULA AND SYLLABI I – VIII SEMESTERS**

**SEMESTER I**

| S.No | COURSE CODE | COURSE TITLE | CATE GORY | CONTACT PERIODS | L | T | P | C |
|---|---|---|---|---|---|---|---|---|
| **THEORY** | | | | | | | | |
| 1. | HS7151 | Foundational English | HS | 4 | 4 | 0 | 0 | 4 |
| 2. | MA7151 | Mathematics – I | BS | 4 | 4 | 0 | 0 | 4 |
| 3. | PH7151 | Engineering Physics | BS | 3 | 3 | 0 | 0 | 3 |
| 4. | CY7151 | Engineering Chemistry | BS | 3 | 3 | 0 | 0 | 3 |
| 5. | GE7151 | Computing Techniques | ES | 3 | 3 | 0 | 0 | 3 |
| **PRACTICALS** | | | | | | | | |
| 6. | BS7161 | Basic Sciences Laboratory | BS | 4 | 0 | 0 | 4 | 2 |
| 7. | GE7161 | Computer Practices Laboratory | ES | 4 | 0 | 0 | 4 | 2 |
| | | | **TOTAL** | **25** | **17** | **0** | **8** | **21** |

**SEMESTER II**

| S.No | COURSE CODE | COURSE TITLE | CATEG ORY | CONTACT PERIODS | L | T | P | C |
|---|---|---|---|---|---|---|---|---|
| **THEORY** | | | | | | | | |
| 1. | HS7251 | Technical English | HS | 4 | 4 | 0 | 0 | 4 |
| 2. | MA7251 | Mathematics II | BS | 4 | 4 | 0 | 0 | 4 |
| 3. | PH7257 | Physics of Materials | ES | 3 | 3 | 0 | 0 | 3 |
| 4. | CY7255 | Chemistry for Technologists | ES | 3 | 3 | 0 | 0 | 3 |
| 5. | GE7153 | Engineering Mechanics | ES | 4 | 4 | 0 | 0 | 4 |
| 6. | GE7152 | Engineering Graphics | ES | 5 | 3 | 2 | 0 | 4 |
| **PRACTICALS** | | | | | | | | |
| 7. | GE7162 | Engineering Practices Laboratory | ES | 4 | 0 | 0 | 4 | 2 |
| | | | **TOTAL** | **27** | **21** | **2** | **4** | **24** |

## SEMESTER III

| S.No | COURSE CODE | COURSE TITLE | CATE GORY | CONTACT PERIODS | L | T | P | C |
|---|---|---|---|---|---|---|---|---|
| **THEORY** | | | | | | | | |
| 1. | EE7254 | Principles of Electrical and Electronics Engineering | ES | 3 | 3 | 0 | 0 | 3 |
| 2. | LT7301 | Chemistry for Leather Technologists | BS | 3 | 3 | 0 | 0 | 3 |
| 3. | LT7302 | Introduction to Leather Manufacture | PC | 3 | 3 | 0 | 0 | 3 |
| 4. | LT7303 | Principles of Unit Operations and Processes in Leather and Leather Chemicals Manufacture | PC | 3 | 3 | 0 | 0 | 3 |
| 5. | LT7304 | Theory of Skin Proteins and Pre-tanning Processes | PC | 3 | 3 | 0 | 0 | 3 |
| 6. | MA7356 | Probability and Random Processes | BS | 4 | 4 | 0 | 0 | 4 |
| **PRACTICALS** | | | | | | | | |
| 7. | EE7261 | Electrical and Electronics Engineering Laboratory | ES | 4 | 0 | 0 | 4 | 2 |
| 8. | LT7311 | Practice in Tanning | PC | 4 | 0 | 0 | 4 | 2 |
| | | | **TOTAL** | **27** | **19** | **0** | **8** | **23** |

## SEMESTER IV

| S.No | COURSE CODE | COURSE TITLE | CATE GORY | CONTACT PERIODS | L | T | P | C |
|---|---|---|---|---|---|---|---|---|
| **THEORY** | | | | | | | | |
| 1. | LT7401 | Bovine Leather Manufacturing Technologies | PC | 3 | 3 | 0 | 0 | 3 |
| 2. | LT7402 | Instrumental Methods of Analysis for Leather Technologists | PC | 3 | 3 | 0 | 0 | 3 |
| 3. | LT7403 | Leather Biotechnology and its Application in Leather | PC | 3 | 3 | 0 | 0 | 3 |
| 4. | LT7404 | Theory of Material Testing of Leathers | PC | 3 | 3 | 0 | 0 | 3 |
| 5. | LT7405 | Theory of Organic and Inorganic Tannages | PC | 4 | 4 | 0 | 0 | 4 |
| 6. | MA7354 | Numerical Methods | BS | 4 | 4 | 0 | 0 | 4 |
| **PRACTICALS** | | | | | | | | |
| 7. | LT7411 | Leather Manufacture from Hides | PC | 6 | 0 | 0 | 6 | 3 |
| 8. | LT7412 | Material Testing Laboratory – I | PC | 4 | 0 | 0 | 4 | 2 |
| | | | **TOTAL** | **30** | **20** | **0** | **10** | **25** |

## SEMESTER V

| S.No | COURSE CODE | COURSE TITLE | CATE GORY | CONTACT PERIODS | L | T | P | C |
|---|---|---|---|---|---|---|---|---|
| **THEORY** | | | | | | | | |
| 1. | HS7551 | Employability Skills | HS | 3 | 3 | 0 | 0 | 3 |
| 2. | LT7501 | Technology of Light Leather Manufacture from Skins | PC | 3 | 3 | 0 | 0 | 3 |
| 3. | LT7502 | Theory and Practice of Post Tanning Process | PC | 3 | 3 | 0 | 0 | 3 |
| 4. | | Professional Elective - I | PE | 3 | 3 | 0 | 0 | 3 |
| 5. | | Professional Elective – II | PE | 3 | 3 | 0 | 0 | 3 |
| 6. | | Professional Elective – III | PE | 3 | 3 | 0 | 0 | 3 |
| **PRACTICALS** | | | | | | | | |
| 7. | LT7511 | Industrial Internship – I* | EEC | 4* | 0 | 0 | 4* | 2 |
| 8. | LT7512 | Leather Manufacture from Skins | PC | 6 | 0 | 0 | 6 | 3 |
| 9. | LT7513 | Material Testing Laboratory – II | PC | 4 | 0 | 0 | 4 | 2 |
| | | | **TOTAL** | **32** | **18** | **0** | **14** | **25** |

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

*Course from the curriculum of other UG Programmes

## SEMESTER VI

| S.No | COURSE CODE | COURSE TITLE | CATE GORY | CONTACT PERIODS | L | T | P | C |
|---|---|---|---|---|---|---|---|---|
| **THEORY** | | | | | | | | |
| 1. | LT7601 | Environmental Science and Engineering for Leather Sector | PC | 3 | 3 | 0 | 0 | 3 |
| 2. | LT7602 | Leather Goods and Garments Technology | PC | 3 | 3 | 0 | 0 | 3 |
| 3. | LT7603 | Leather Machineries | ES | 5 | 3 | 2 | 0 | 4 |
| 4. | LT7604 | Theory and Practice of Leather Finishing | PC | 3 | 3 | 0 | 0 | 3 |
| 5. | | Professional Elective IV | PE | 3 | 3 | 0 | 0 | 3 |
| 6. | | Open Elective I** | OE | 3 | 3 | 0 | 0 | 3 |
| **PRACTICALS** | | | | | | | | |
| 7. | LT7611 | Finishing Practice Laboratory | PC | 4 | 0 | 0 | 4 | 2 |
| 8. | LT7612 | Leather Goods and Garments – Design and Fabrication Laboratory | PC | 6 | 0 | 0 | 6 | 3 |
| | | | **TOTAL** | **30** | **18** | **2** | **10** | **24** |

## SEMESTER VII

| S.No | COURSE CODE | COURSE TITLE | CATE GORY | CONTACT PERIODS | L | T | P | C |
|---|---|---|---|---|---|---|---|---|
| **THEORY** | | | | | | | | |
| 1. | GE7652 | Total Quality Management | HS | 3 | 3 | 0 | 0 | 3 |
| 2. | LT7701 | Footwear Technology | PC | 3 | 3 | 0 | 0 | 3 |
| 3. | LT7702 | Science and Technology of Leather Auxiliaries | PC | 3 | 3 | 0 | 0 | 3 |
| 4. | | Professional Elective V | PE | 3 | 3 | 0 | 0 | 3 |
| 5. | | Professional Elective VI | PE | 3 | 3 | 0 | 0 | 3 |
| 6. | | Open Elective II** | OE | 3 | 3 | 0 | 0 | 3 |
| **PRACTICALS** | | | | | | | | |
| 7. | LT7711 | Leather Footwear – Design and Fabrication Laboratory | PC | 6 | 0 | 0 | 6 | 3 |
| 8. | LT7712 | Industrial Internship – II* | EEC | 4* | 0 | 0 | 4* | 2 |
| 9. | LT7713 | Mini Project | EEC | 4 | 0 | 0 | 4 | 2 |
| | | | **TOTAL** | **32** | **18** | **0** | **14** | **25** |

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

*Course from the curriculum of other UG Programmes

## SEMESTER VIII

| S.No | COURSE CODE | COURSE TITLE | CATE GORY | CONTACT PERIODS | L | T | P | C |
|---|---|---|---|---|---|---|---|---|
| **PRACTICALS** | | | | | | | | |
| 1. | LT7811 | Project Work | EEC | 20 | 0 | 0 | 20 | 10 |
| | | | **TOTAL** | **20** | **0** | **0** | **20** | **10** |

**TOTAL NO. OF CREDITS: 177**

## PROFESSIONAL ELECTIVES (PE)

| S.No | COURSE CODE | COURSE TITLE | CATE GORY | CONTACT PERIODS | L | T | P | C |
|---|---|---|---|---|---|---|---|---|
| 1. | GE7071 | Disaster Management | PE | 3 | 3 | 0 | 0 | 3 |
| 2. | GE7074 | Human Rights | PE | 3 | 3 | 0 | 0 | 3 |
| 3. | LT7001 | Advanced Physics and Chemistry of Leather I (APCL I) | PE | 3 | 3 | 0 | 0 | 3 |
| 4. | LT7002 | Advanced Physics and Chemistry of Leather II (APCL II) | PE | 3 | 3 | 0 | 0 | 3 |
| 5. | LT7003 | CAD/CAM for Leather Products Design and Manufacture | PE | 3 | 3 | 0 | 0 | 3 |
| 6. | LT7004 | Computer Applications for Leather and Leather Products | PE | 3 | 3 | 0 | 0 | 3 |
| 7. | LT7005 | Consumer Behavior and Business Orientation | PE | 3 | 3 | 0 | 0 | 3 |
| 8. | LT7006 | Eco-benign Options for Leather Processing | PE | 3 | 3 | 0 | 0 | 3 |
| 9. | LT7007 | Engineering Economics and Finance Management | PE | 3 | 3 | 0 | 0 | 3 |
| 10. | LT7008 | Enterprise Resource Planning for Leather Sector | PE | 3 | 3 | 0 | 0 | 3 |
| 11. | LT7009 | Entrepreneurship for Leather Sector | PE | 3 | 3 | 0 | 0 | 3 |
| 12. | LT7010 | Fashion Forecasting for Leather and Leather Products | PE | 3 | 3 | 0 | 0 | 3 |
| 13. | LT7011 | Human Resources Development | PE | 3 | 3 | 0 | 0 | 3 |
| 14. | LT7012 | International Marketing and Foreign Trade | PE | 3 | 3 | 0 | 0 | 3 |
| 15. | LT7013 | Leather and Leather Products Costing | PE | 3 | 3 | 0 | 0 | 3 |
| 16. | LT7014 | Leather and Product Merchandising | PE | 3 | 3 | 0 | 0 | 3 |
| 17. | LT7015 | Leather Products Machinery | PE | 3 | 3 | 0 | 0 | 3 |
| 18. | LT7016 | Organisation and Management of Leather Manufacture | PE | 3 | 3 | 0 | 0 | 3 |
| 19. | LT7017 | Polymer Science | PE | 3 | 3 | 0 | 0 | 3 |
| 20. | LT7018 | Safety in Leather Industries | PE | 3 | 3 | 0 | 0 | 3 |
| 21. | LT7019 | Science and Technology of Leather Supplements and Synthetics | PE | 3 | 3 | 0 | 0 | 3 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 22. | LT7020 | Technology of Animal and Tannery By products Utilisation | PE | 3 | 3 | 0 | 0 | 3 |
| 23. | LT7021 | Value Engineering in Leather Sector | PE | 3 | 3 | 0 | 0 | 3 |
| 24. | GE7072 | Foundation Skills in Integrated Product Development | PE | 3 | 3 | 0 | 0 | 3 |

| **Humanities and Social Sciences (HS)** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **S. NO** | **COURSE CODE** | **COURSE TITLE** | **CATEGORY** | **CONTACT PERIODS** | **L** | **T** | **P** | **C** |
| 1. | HS7151 | Foundational English | HS | 4 | 4 | 0 | 0 | 4 |
| 2. | HS7251 | Technical English | HS | 4 | 4 | 0 | 0 | 4 |
| 3. | HS7551 | Employability Skills | HS | 3 | 3 | 0 | 0 | 3 |
| 4. | GE7652 | Total Quality Management | HS | 3 | 3 | 0 | 0 | 3 |

| **Basic Sciences (BS)** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **S. No** | **Course Code** | **Course Title** | **CATEGORY** | **CONTACT PERIODS** | **L** | **T** | **P** | **C** |
| 1. | MA7151 | Mathematics – I | BS | 4 | 4 | 0 | 0 | 4 |
| 2. | PH7151 | Engineering Physics | BS | 4 | 4 | 0 | 0 | 4 |
| 3. | CY7151 | Engineering Chemistry | BS | 4 | 4 | 0 | 0 | 4 |
| 4. | BS7161 | Basic Science Laboratory | BS | 4 | 0 | 0 | 4 | 2 |
| 5. | MA7251 | Mathematics II | BS | 4 | 4 | 0 | 0 | 4 |
| 6. | MA7356 | Probability and Random Processes | BS | 4 | 4 | 0 | 0 | 4 |
| 7. | LT7301 | Chemistry for Leather Technologists | BS | 3 | 3 | 0 | 0 | 3 |
| 8. | MA7354 | Numerical Methods | BS | 4 | 4 | 0 | 0 | 4 |

| **Engineering Sciences (ES)** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **S. No** | **Course Code** | **Course Title** | **CATEGORY** | **CONTACT PERIODS** | **L** | **T** | **P** | **C** |
| 1. | GE7152 | Engineering Graphics | ES | 4 | 2 | 2 | 0 | 3 |
| 2. | GE7162 | Engineering Practices Laboratory | ES | 4 | 0 | 0 | 4 | 2 |
| 3. | GE7151 | Computing Techniques | ES | 4 | 2 | 2 | 0 | 3 |
| 4. | GE7161 | Computer Practices Laboratory | ES | 4 | 0 | 0 | 4 | 2 |
| 5. | GE7153 | Engineering Mechanics | ES | 3 | 3 | 0 | 0 | 3 |
| 6. | EE7254 | Principles of Electrical and Electronics Engineering | ES | 3 | 3 | 0 | 0 | 3 |
| 7. | PH7257 | Physics of Materials | ES | 3 | 3 | 0 | 0 | 3 |
| 8. | CY7255 | Chemistry for Technologists | ES | 3 | 3 | 0 | 0 | 3 |
| 9. | LT7603 | Leather Machineries | ES | 5 | 3 | 2 | 0 | 4 |
| 10. | EE 7261 | Electrical and Electronics Engineering Laboratory | ES | 4 | 0 | 0 | 4 | 2 |
| 11. | LT7603 | Leather Machineries | ES | 5 | 3 | 2 | 0 | 4 |

| Professional Core (PC) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **S. No** | **Course Code** | **Course Title** | **CATE GORY** | **CONTACT PERIODS** | **L** | **T** | **P** | **C** |
| 1. | LT7302 | Introduction to Leather Manufacture | PC | 3 | 3 | 0 | 0 | 3 |
| 2. | LT7303 | Principles of Unit Operations and Processes in Leather and Leather Chemicals Manufacture | PC | 3 | 3 | 0 | 0 | 3 |
| 3. | LT7402 | Instrumental Methods of Analysis for Leather Technologists | PC | 3 | 3 | 0 | 0 | 3 |
| 4. | LT7304 | Theory of Skin Proteins and Pre-tanning Processes | PC | 3 | 3 | 0 | 0 | 3 |
| 5. | LT7311 | Practice in Tanning | PC | 4 | 0 | 0 | 4 | 2 |
| 6. | LT7401 | Bovine Leather Manufacturing Technologies | PC | 3 | 3 | 0 | 0 | 3 |
| 7. | LT7405 | Theory of Organic and Inorganic Tannages | PC | 4 | 4 | 0 | 0 | 4 |
| 8. | LT7404 | Theory of Material Testing of Leathers | PC | 3 | 3 | 0 | 0 | 3 |
| 9. | LT7403 | Leather Bio Technology and its Application in Leather | PC | 3 | 3 | 0 | 0 | 3 |
| 10. | LT7412 | Material Testing Laboratory – I | PC | 4 | 0 | 0 | 4 | 2 |
| 11. | LT7411 | Leather Manufacture from Hides | PC | 6 | 0 | 0 | 6 | 3 |
| 12. | LT7501 | Technology of Leather Manufacture from Skins | PC | 3 | 3 | 0 | 0 | 3 |
| 13. | LT7502 | Theory and Practice of Post Tanning Processes | PC | 3 | 3 | 0 | 0 | 3 |
| 14. | LT7513 | Material Testing Laboratory – II | PC | 4 | 0 | 0 | 4 | 2 |
| 15. | LT7512 | Leather Manufacture from skins | PC | 6 | 0 | 0 | 6 | 3 |
| 16. | LT7601 | Environmental Science and Engineering for Leather Sector | PC | 3 | 3 | 0 | 0 | 3 |
| 17. | LT7602 | Leather Goods and Garments Technology | PC | 3 | 3 | 0 | 0 | 3 |
| 18. | LT7604 | Theory and Practice of Leather Finishing | PC | 3 | 3 | 0 | 0 | 3 |
| 19. | LT7612 | Leather Goods and Garments – Design and Fabrication Laboratory | PC | 6 | 0 | 0 | 6 | 3 |
| 20. | LT7611 | Finishing Practice Laboratory | PC | 4 | 0 | 0 | 4 | 2 |
| 21. | LT7701 | Footwear Technology | PC | 3 | 3 | 0 | 0 | 3 |
| 22. | LT7702 | Science and Technology of Leather Auxiliaries | PC | 3 | 3 | 0 | 0 | 3 |
| 23. | LT7711 | Leather Footwear – Design and Fabrication laboratory | PC | 6 | 0 | 0 | 6 | 3 |

## EMPLOYABILITY ENHANCEMENT COURSES (EEC)

| S.No | COURSE CODE | COURSE TITLE | CATEGORY | CONTACT PERIODS | L | T | P | C |
|---|---|---|---|---|---|---|---|---|
| 1. | LT 7511 | Industrial Internship - I | EEC | 4 | 0 | 0 | 4 | 2 |
| 2. | LT 7712 | Industrial Internship - II | EEC | 4 | 0 | 0 | 4 | 2 |
| 3. | LT7713 | Mini Project | EEC | 4 | 0 | 0 | 4 | 2 |
| 4. | LT7811 | Project Work | EEC | 20 | 0 | 0 | 20 | 10 |

**SUMMARY**

| S.NO | SUBJECT AREA | CREDITS PER SEMESTER | | | | | | | | CREDITS TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI | VII | VIII | |
| 1 | HS | 4 | 4 | 0 | 0 | 3 | 0 | 3 | 0 | **11** |
| 2 | BS | 15 | 10 | 7 | 4 | 0 | 0 | 0 | 0 | **36** |
| 3 | ES | 5 | 10 | 5 | 0 | 0 | 4 | 0 | 0 | **24** |
| 4 | PC | 0 | 0 | 11 | 21 | 11 | 14 | 9 | 0 | **66** |
| 5 | PE | 0 | 0 | 0 | 0 | 9 | 3 | 6 | 0 | **18** |
| 6 | OE | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | **6** |
| 7 | EEC | 0 | 0 | 0 | 0 | 2 | 0 | 4 | 10 | **16** |
| | Total | **21** | **24** | **23** | **25** | **25** | **24** | **25** | **10** | **177** |
| 8 | Non-Credit/ Mandatory | | | | | | | | | |

**HS7151 FOUNDATIONAL ENGLISH L T P C**
**4 0 0 4**

**COURSE DESCRIPTION:**

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

**OBJECTIVES:**

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

**CONTENTS**

**UNIT I GREETING AND INTRODUCING ONESELF 12**

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

**UNIT II GIVING INSTRUCTIONS AND DIRECTIONS 12**

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

**UNIT III READING AND UNDERSTANDING VISUAL MATERIAL 12**

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

**UNIT IV CRITICAL READING AND WRITING 12**

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

**UNIT V LETTER WRITING AND SENDING E-MAILS 12**

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

**TEACHING METHODS:**

Interactive sessions for the speaking module.
Use of audio – visual aids for the various listening activities.
Contextual Grammar Teaching.

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

**TOTAL : 60 PERIODS**

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

**TEXTBOOK:**
1. Richards, Jack.C with Jonathan Hull and Susan Proctor **New Interchange : English for International Communication. (level2, Student's Book)** Cambridge University Press,New Delhi: 2010.

**REFERENCES:**
1. Bailey, Stephen. **Academic Writing: A practical guide for students**. New York: Rutledge,2011.
2. Morgan, David and Nicholas Regan. **Take-Off: Technical English for Engineering**. London: Garnet Publishing Limited, 2008.
3. Redston, Chris & Gillies Cunningham **Face2Face** (Pre-intermediate Student's Book& Workbook) Cambridge University Press, New Delhi: 2005
4. Comfort, Jeremy, et al. **Speaking Effectively : Developing Speaking Skillsfor Business English.** Cambridge University Press, Cambridge: Reprint 2011.

| MA7151 | MATHEMATICS – I | L | T | P | C |
|---|---|---|---|---|---|
| | | 4 | 0 | 0 | 4 |

**(Common to all branches of B.E. /B.Tech. Programmes in I Semester)**

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

**UNIT I DIFFERENTIAL CALCULUS 12**

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

**UNIT II FUNCTIONS OF SEVERAL VARIABLES 12**

Partial derivatives – Homogeneous functions and Euler's theorem – Total derivative – Differentiation of implicit functions – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Errors and approximations –

Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

**UNIT III INTEGRAL CALCULUS 12**

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

**UNIT IV MULTIPLE INTEGRALS 12**

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

**UNIT V DIFFERENTIAL EQUATIONS 12**

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

**TOTAL : 60 PERIODS**

**COURSE OUTCOMES**

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

**TEXT BOOKS**


1. James Stewart, "Calculus with Early Transcendental Functions", Cengage Learning, New Delhi, 2008.
2. Narayanan S. and Manicavachagom Pillai T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, New Delhi, 2014.
4. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.


**REFERENCE BOOKS**


1. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
4. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education, New Delhi, 2nd Edition, 5th Reprint, 2009.
5. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.

**PH7151** **ENGINEERING PHYSICS** **L T P C**

(Common to all branches of B.E / B.Tech programmes) **3 0 0 3**

**OBJECTIVE:**

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

**UNIT I PROPERTIES OF MATTER 9**

Elasticity – Poisson's ratio and relationship between moduli (qualitative) - stress-strain diagram for ductile and brittle materials, uses - factors affecting elastic modulus and tensile strength - bending of beams - cantilever - bending moment - Young's modulus determination - theory and experiment - uniform and non-uniform bending - I shaped girders - twisting couple - hollow cylinder - shaft - torsion pendulum - determination of rigidity modulus- moment of inertia of a body (regular and irregular).

**UNIT II ACOUSTICS AND ULTRASONICS 9**

Classification of sound - loudness and intensity - Weber-Fechner Law - standard intensity and intensity level - decibel - reverberation - reverberation time - calculation of reverberation time for different types of buildings – sound absorbing materials - factors affecting acoustics of buildings : focussing, interference, echo, echelon effect, resonance - noise and their remedies. Ultrasonics: production - magnetostriction and piezoelectric methods - detection of ultrasound - acoustic grating – ultrasonic interferometer - industrial applications – Non-destructive testing - ultrasonic method: scan modes and practice.

**UNIT III THERMAL AND MODERN PHYSICS 9**

Thermal expansion - thermal stress - expansion joints - bimetallic strips - thermal conductivity- heat conductions in solids – flow of heat through compound media - Forbe's and Lee's disc method: theory and experiment- Black body radiation – Planck's theory (derivation) – Compton effect – wave model of radiation and matter – Schrödinger's wave equation – time dependent and independent equations – Physical significance of wave function – particle in a one dimensional box.

**UNIT IV APPLIED OPTICS 9**

Interference - Michelson interferometer: construction, working, determination of wave length and thickness - anti-reflection coating - air wedge and its applications - Lasers – principle and applications – Einstein's coefficients – $CO_2$ and Nd:YAG laser - semiconductor lasers: homo junction and hetro junction - construction and working – applications. Optical fibres - classification (index & mode based) - principle and propagation of light in optical fibres - acceptance angle and numerical aperture - fibre optic communication system - active and passive sensors.

**UNIT V CRYSTAL PHYSICS 9**

Single crystalline, polycrystalline and amorphous materials – Single crystals: unit cell, crystal systems, Bravais lattices, ditections and planes in a crystal, Miller indices - interplanar distance for a cubic crystal - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - structure and significance of NaCl, CsCl, ZnS and graphite - crystal imperfections: point defects, line defects – Burger vectors, dislocations and stacking faults – Growth of single crystals: Bridgman and Czochralski methods.

**TOTAL: 45 PERIODS**

**OUTCOME:**

- The students will understand different moduli of elasticity, their determination and applications.
- The students will gain knowledge on the properties of sound, noise cancellation, and production, detection and applications of ultrasonics
- The students will acquire sound knowledge on thermal expansion and thermal conductivity of materials. Further they will gain an idea of quantum physics.
- The students will gain knowledge on interferometers, lasers and fiber optics
- The students will secure knowledge on the basics of crystal structures and their significance. Further they gain basic ideas of growing single crystals.

**TEXTBOOKS:**


1. Gaur R.K. and Gupta S.L., "Engineering Physics", Dhanpat Rai Publications (2013)
2. Palanisamy P.K., "Engineering Physics", Scitech Publications (P) Ltd. (2006).
2. Arumugam M., "Engineering Physics", Anuradha Publications (2000)


**REFERENCES:**


1. Serway R.A. and Jewett, J.W. "Physics for Scientists and Engineers with Modern Physics". Brooks/cole Publishing Co. (2010).
2. Tipler P.A. and Mosca, G.P., "Physics for Scientists and Engineers with Modern Physics". W.H.Freeman, (2007).
3. Markert J.T.,Ohanian, H. and Ohanian, M. "Physics for Engineers and Scientists". W.W.Norton & Co. (2007).


**CY7151 ENGINEERING CHEMISTRY**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**OBJECTIVES**

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

**UNIT I POLYMER CHEMISTRY 9**

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

**UNIT II SURFACE CHEMISTRYAND CATALYSIS 9**

Adsorption-Types of adsorption-adsorption of gases on solids- adsorption from solutions- Types of isotherms–Frendlich adsorption isotherm,Langmuir adsorption isotherm.Industrial applications of adsorption. Catalysis: Characteristics and types of catalysts-homogeneous and heterogeneous, auto catalysis. Enzyme catalysis -factors affecting enzyme catalysis, Michaelis-Menton equation.Industrial applications of catalysts.

**UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY 9**

Photochemistry: Laws of photochemistry-Grotthuss-Draper law, Stark-Einstein law and Lambert-Beer Law. Photo processes-internal conversion, inter-system crossing, fluorescence, phosphorescence, chemiluminescence and photo-sensitization. Spectroscopy: Electromagnetic spectrum-absorption of radiation-electronic, vibrational and rotational transitions. Width and intensities of spectral lines.Spectrophotometric estimation of iron.UV-Vis and IR spectroscopy-

principles, instrumentation (Block diagram) and applications.

**UNIT IV CHEMICAL THERMODYNAMICS 9**

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

**UNIT V NANOCHEMISTRY 9**

Basics-distinction between molecules, nanoparticles and bulk materials; size-dependent properties.Preparation of nanoparticles – sol-gel and solvothermal.Preparation of carbon nanotube by chemical vapour deposition and laser ablation.Preparation of nanowires by VLS growth, electrochemical deposition and electro spinning.Properties and uses of nanoparticles, nanoclusters, nanorods, nanotubes and nanowires.

**TOTAL : 45 PERIODS**

**OUTCOMES**

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

**TEXT BOOKS**

1. Jain P. C. & Monica Jain., "Engineering Chemistry", DhanpatRai Publishing Company (P) Ltd, New Delhi, 2014.
2. Kannan P., Ravikrishnan A., "Engineering Chemistry", Sri Krishna Hitech Publishing Company Pvt. Ltd. Chennai, 2014

**REFERENCE BOOKS**

1. Pahari A., Chauhan B., "Engineering Chemistry", Firewall Media, New Delhi, 2012.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012.
3. AshimaSrivastava. Janhavi N N, Concepts of Engineering Chemistry", ACME Learning Private Limited., New Delhi., 2010.
4. Vairam S., Kalyani P., Suba Ramesh., "Engineering Chemistry", Wiley India Pvt Ltd., New Delhi., 2011.

| GE7151 | COMPUTING TECHNIQUES | L | T | P | C |
|---|---|---|---|---|---|
| | **(Common to all branches of Engineering and Technology)** | **3** | **0** | **0** | **3** |

**OBJECTIVES:**

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

**UNIT I INTRODUCTION 9**

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

**UNIT II C PROGRAMMING BASICS 9**

Introduction to C programming – Fundamentals – Structure of a C program – Compilation and linking processes - Constants, Variables – Data Types – Expressions - Operators –Decision Making and Branching – Looping statements – Solving Simple Scientific and Statistical Problems.

**UNIT III ARRAYS AND STRINGS 9**

Arrays – Initialization – Declaration – One dimensional and two dimensional arrays - Strings- String operations – String Arrays - simple programs- sorting- searching – matrix operations.

**UNIT IV POINTERS 9**

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

**UNIT V FUNCTIONS AND USER DEFINED DATA TYPES 9**

Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion –Enumerators – Structures - Unions

**TOTAL : 45 PERIODS**

**OUTCOMES**

**At the end of the course, the student should be able to:**

- Write C program for simple applications
- Formulate algorithm for simple problems
- Analyze different data types and arrays
- Perform simple search and sort**.**
- Use programming language to solve problems.

**TEXTBOOKS:**


1. Pradip Dey, Manas Ghosh, “Computer Fundamentals and Programming in C”, Second Edition, Oxford University Press, 2013
2. Ashok N. Kamthane, “Computer programming”, Pearson Education, 2007.
3. Yashavant P. Kanetkar. “Let Us C”, BPB Publications, 2011.


**REFERENCES:**


1. Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006
2. Byron S Gottfried, “Programming with C”, Schaums Outlines, Second Edition, Tata McGraw-Hill, 2006.
3. R.G. Dromey, “How to Solve it by Computer”, Pearson Education, Fourth Reprint, 2007


**BS7161 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, band gap determination and viscosity of liquids.

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young’s modulus
3. Uniform bending – Determination of young’s modulus
4. Lee’s disc Determination of thermal conductivity of a bad conductor

5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
9. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Post office box -Determination of Band gap of a semiconductor.
12. Spectrometer- Determination of wavelength using gating.
13. Viscosity of liquids - Determination of co-efficient of viscosity of a liquid by Poiseuille's flow

**TOTAL: 30 PERIODS**

**OUTCOME:**

Upon completion of the course, the students will be able

- To determine various moduli of elasticity and also various thermal and optical properties of materials.
- To determine the velocity of ultrasonic waves, band gap determination and viscosity of liquids.

**CHEMISTRY LABORATORY:**

**(Minimum of 8 experiments to be conducted)**

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

**TOTAL: 30 PERIODS**

**TEXTBOOKS**

1. Vogel's Textbook of Quantitative Chemical Analysis ($8^{TH}$ edition, 2014)
2. Laboratory Manual- Department of Chemistry, CEGC, Anna University (2014).

| GE7161 | COMPUTER PRACTICES LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 4 | 2 |

**OBJECTIVES**

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

- To learn to use user defined data structures.

**LIST OF EXPERIMENTS**

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

**TOTAL: 60 PERIODS**

**OUTCOMES**

**At the end of the course, the student should be able to:**

- Write and compile programs using C programs.
- Write program with the concept of Structured Programming
- Identify suitable data structure for solving a problem
- Demonstrate the use of conditional statement.

**LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS**

30 Systems with C compiler

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

**OBJECTIVES**

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

**CONTENTS**

**UNIT I ANALYTICAL READING 12**

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

**UNIT II SUMMARISING 12**

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

**UNIT III DESCRIBING VISUAL MATERIAL 12**

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

**UNIT IV WRITING/ E-MAILING THE JOB APPLICATION 12**

**Listening**- Listening to/ Viewing model interviews; **Speaking** –Speaking at different types of interviews – Role play practice ( mock interview); **Reading** – Reading job advertisements and profile of the company concerned;**Writing**- job application – cover letter –Résumé preparation.

**UNIT V REPORT WRITING 12**

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

**TEACHING METHODS:**

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

**EVALUATION PATTERN:**

Internals – 50%
End Semester – 50%

**TOTAL:60 PERIODS**

**LEARNING OUTCOMES**

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

**TEXTBOOK:**

1. Craig,Thaine**. Cambridge Academic English: An integrated skills course for EAP(Student's Book)Level: Intermediate** Cambridge University Press, New Delhi: 2012

**REFERENCES:**

1. Laws, Anne. **Presentations.** Hyderabad: Orient Blackswan, 2011.
2. Ibbotson, Mark. **Cambridge English for Engieering**. Cambridge University Press, Cambridge,New Delhi: 2008
3. Naterop, Jean B. and Rod Revell. **Telephoning in English**. Cambridge: Cambridge University Press, 2004.
4. Rutherford, Andrea J. **Basic Communication Skills for Technology**. New Delhi: Pearson Education, 2001.
5. Bailey, Stephen. **Academic Writing A practical Guide for Students**. Routledge, London: 2004.
6. Hewings, Martin**. Cambridge Academic English: An integrated skills course for EAP(Student's Book)Level: Intermediate** Cambridge University Press, New Delhi: 2012.

| **MA7251** | **MATHEMATICS – II** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | | **4** | **0** | **0** | **4** |

**(Common to all branches of B.E. /B.Tech. Programmes in II Semester)**

**COURSE OBJECTIVES**

- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such

as heat conduction, elasticity, fluid dynamics and flow the of electric current.

- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

**UNIT I MATRICES 12**

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

**UNIT II VECTOR CALCULUS 12**

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

**UNIT III ANALYTIC FUNCTION 12**

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

**UNIT IV COMPLEX INTEGRATION 12**

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

**UNIT V LAPLACE TRANSFORMS 12**

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

**TOTAL : 60 PERIODS**

**COURSE OUTCOMES**

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

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

**TEXT BOOKS**


1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, New Delhi, 2014.
2. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.

**REFERENCE BOOKS**


1. Ramana, B.V. "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi, 2010.
2. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, New Delhi, 2007.
3. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
4. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
5. Peter V. O'Neil , "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.


**PH7257 PHYSICS OF MATERIALS L T P C**

(Common to Chemical, Ceramic, Food, Leather, Textile, Apparel, Industrial Biotechnology, Pharmaceutical and PET) **3 0 0 3**

**OBJECTIVE:**

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

**UNIT I PREPARATION OF MATERIALS 9**

Phases - phase rule – binary systems – tie line rule – lever rule – phase diagram – invariant reactions - nucleation – homogeneous and heterogeneous nucleation – free energy of formation of a critical nucleus – Thin films – preparation: PVD, CVD method – Nanomaterials Preparation: wet chemical, solvothermal, sol-gel method.

**UNIT II ELECTRICAL AND SUPERCONDUCTING MATERIALS 9**

Classical free electron theory - expression for electrical conductivity – thermal conductivity, - Wiedemann-Franz law - Quantum free electron theory – applications of Schrodinger wave equation: particle in a finite potential well – particle in a three-dimensional box- degenerate states – Fermi-Dirac statistics – density of energy states – electron in periodic potential – electron effective mass – concept of hole. Superconducting phenomena, properties of superconductors – Meissner effect and isotope effect. Type I and Type II superconductors, High $T_c$ superconductors – Magnetic levitation and SQUIDS.

**UNIT III SEMICONDUCTING MATERIALS 9**

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

**UNIT IV DIELECTRIC AND MAGNETIC MATERIALS 9**

Dielectric, Paraelectric and ferroelectric materials - Electronic, Ionic, Orientational and space charge polarization – Internal field and deduction of Clausius Mosotti equation – dielectric loss – different types of dielectric breakdown – classification of insulating materials and their applications - Ferroelectric materials - Introduction to magnetic materials - Domain theory of ferromagnetism,

Hysteresis, Soft and Hard magnetic materials – Anti-ferromagnetic materials – Ferrites, Giant Magneto Resistance materials.

**UNIT V NEW MATERIALS AND APPLICATIONS 9**

Ceramics – types and applications – Composites: classification, role of matrix and reinforcement – processing of fibre reinforced plastics and fibre reinforced metals – Metallic glasses – Shape memory alloys – Copper, Nickel and Titanium based alloys – grapheme and its properties – Relaxor ferroelectrics - Bio materials – hydroxyapatite – PMMA – Silicone - Sensors: Chemical Sensors - Bio-sensors – Polymer semiconductors – Photoconducting polymers.

**TOTAL: 45 PERIODS**

**OUTCOME:**

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

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

.

**REFERENCES:**


1. Callister W. D. and Rethwisch, D. G., “Materials Science and Engineering”, 9th Edition, Wiley (2014).
2. Raghavan V., “Materials Science and Engineering”, Prentice Hall of India (2004).
3. Askeland D.R. and Wright, W.J., “Essentials of Materials Science and Engineering”, 3rd Edition, Cengage Learning (2014).
4. Pillai, S.O., “Solid State Physics”, New Age International, 7th Edition (2015).
5. Viswanathan, B., “Nanomaterials”, Narosa Book Distributors Pvt Ltd. (2011).


| CY7255 | CHEMISTRY FOR TECHNOLOGISTS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**OBJECTIVE**

- The students should be conversant with
- boiler feed water requirements, water treatment techniques,
- Applications of oil and its properties, principles of different chemical analysis.
- Different kinds of preparations of important chemicals.

**UNIT I WATER TECHNOLOGY 9**

Water quality parameters- hardness -definition - units of hardness - determination of hardness (EDTA method).Alkalinity - definition - determination of alkalinity.TDS, BOD, COD and iron and their significance. Softening – zeolite and demineralization processes. Boiler troubles (scale, sludge, boiler corrosion, caustic embrittlement and carry over) and remedies – removal of oils and silica, internal conditioning.Desalination by electro-dialysis and reverse osmosis.

**UNIT II OILS, FATS, SOAPS & LUBRICANTS 9**

Chemical constitution, chemical analysis of oils and fats – free acid, saponification and iodine values, definitions, determinations and significance.Soaps and detergents - cleaning action of soap. Lubricants - definition, characteristics, types and properties – viscosity, viscosity index, carbon residue, oxidation stability, flash and fire points, cloud and pour points, aniline point. Solid lubricants – graphite and molybdenum disulphide.

**UNIT III CHEMICAL ANALYSIS – AN ANALYTICAL INSIGHT 9**

Gravimetric analysis – principles – method – applications.redox titrations – principle – method – applications. Thin layer chromatography – principles – techniques – applications. Principles underlying the estimations of nitrogen in nitrogeneous fertilizers, phenol and aniline.

**UNIT IV DYE CHEMISTRY 9**

Witt's theory and modern theory of colors – synthesis of methyl red, methyl orange, congo red, malachite green, p-rosaniline, phenolphthalein, fluorescence, eosin dyes.

**UNIT V CHEMICALS AND AUXILIARIES 9**

Preparations of bleaching powder, sodium hypochlorite, hydrogen peroxide, chlorine dioxide – estimation of available chlorine in hypochlorite – determination of strength of hydrogen peroxide.

**TOTAL: 45 PERIODS**

**OUTCOME**

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

**TEXT BOOKS**


1. Jain & Jain, "Engineering Chemistry", 16th Edition, 2014,DhanpatRai Publishing Company, New Delhi.
2. Sharma B.K, "Industrial Chemistry", 16th Edition, 2014, GOEL Publishing House, Meerut.


**REFERENCES**


1. Dara SS, Umare SS, "A Textbook of Engineering Chemistry", S. Chand & Company Ltd., New Delhi, 2010.
2. Puri BR, Sharma LR, Pathania S, "Principles of Physical Chemistry", 42nd Edition, 2008, Vishal Publishing Co., Jalandhar.
3. Morrison RT, Boyd RN, Bhattacharjee SK, "Organic Chemistry", 7th Edition, Pearson India, 2011.


**GE7153 ENGINEERING MECHANICS L T P C**
**4 0 0 4**

**OBJECTIVE :**

The objective of this course is to inculcate in the student the ability to analyze any problem in a simple and logical manner and to predict the physical phenomena and thus lay the foundation for engineering applications.

**UNIT I STATICS OF PARTICLES 12**

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles -Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors.

Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

**UNIT II EQUILIBRIUM OF RIGID BODIES 12**

Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force about a Point ,Varignon's Theorem, Rectangular Components of the Moment of a Force, Scalar Product of Two Vectors, Mixed Triple Product of Three Vectors, Moment of a Force about an Axis, Couple - Moment of a Couple, Equivalent Couples, Addition of Couples,

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

**UNIT III DISTRIBUTED FORCES 16**

Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration , Theorems of Pappus-Guldinus, Distributed Loads on Beams, Center of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies , Determination of Centroids of Volumes by Integration.

Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration , Polar Moment of Inertia , Radius of Gyration of an Area , Parallel-Axis Theorem , Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates , Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

**UNIT IV FRICTION 8**

The Laws of Dry Friction. Coefficients of Friction, Angles of Friction, Wedges, Wheel Friction. Rolling Resistance , Ladder friction.

**UNIT V DYNAMICS OF PARTICLES 12**

Kinematics - Rectilinear Motion and Curvilinear Motion of Particles.

Kinetics- Newton's Second Law of Motion -Equations of Motions , Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force , Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact, Method of Virtual Work - Work of a Force, Potential Energy, Potential Energy and Equilibrium.

**L – 45 + T – 15 TOTAL: 60 PERIODS**

**OUTCOMES:**

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

**TEXT BOOK**

1. Beer,F.P and Johnson Jr. E.R, "Vector Mechanics for Engineers", McGraw-Hill Education (India) Pvt. Ltd. 10th Edition, 2013.

**REFERENCES**


1. Hibbeller, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013.
2. J.L. Meriam & L.G. Karige, Engineering Mechanics: Statics (Volume I) and Engineering Mechanics: Dynamics, 7th edition, Wiley student edition, 2013.
3. P. Boresi & J. Schmidt, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.
4. Irving H. Shames, G. Krishna Mohana Rao, Engineering Mechanics - Statics and Dynamics, Fourth Edition – PHI / Pearson Education Asia Pvt. Ltd., 2006.
5. Vela Murali, "Engineering Mechanics", Oxford University Press (2010)


| GE7152 | ENGINEERING GRAPHICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 2 | 0 | 4 |

**OBJECTIVES**

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

**CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION)** **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.

**14**

**UNIT I PLANE CURVES AND FREE HANDSKETCHING**

Basic Geometrical constructions, Curves used in engineering practices-Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

**UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES** **14**

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

**UNIT III PROJECTION OF SOLIDS** **14**

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

**UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES** **14**

Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section.

Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

**UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS** **15**

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.

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

**OUTCOMES:**

On Completion of the course the student will be able to

- Perform free hand sketching of basic geometrical shapes and multiple views of objects.
- Draw orthographic projections of lines, Planes and Solids
- Obtain development of surfaces.
- Prepare isometric and perspective views of simple solids.

**TEXT BOOK:**

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

**REFERENCES:**


1. K.R.Gopalakrishna., "Engineering Drawing" (Vol I&II combined) SubhasStores, Bangalore, 2007
2. Luzzader, Warren.J., and Duff,John M.,'' Fundamentals of Engineering Drawingwith an introduction to Interactive Computer Graphics for Design and Production",Eastern Economy Edition, Prentice Hall of India Pvt Ltd, New Delhi, 2005
3. M.B.Shah and B.C.Rana, "Engineering Drawing", Pearson, 2nd Edition, 2009
4. K.Venugopal and V.Prabhu Raja, "Engineering Graphics", New Age International (P)Limited ,2008.
5. K. V.Natarajan, "A text book of Engineering Graphics", 28th Edition, Dhanalakshmi Publishers, Chennai, 2015.
6. BasantAgarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
7. N.S Parthasarathy and Vela Murali, " Engineering Drawing", Oxford University Press, 2015


**Publication of Bureau of Indian Standards:**

1. IS 10711 – 2001: Technical products Documentation – Size and lay out ofdrawing sheets
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

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

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

**GE7162 ENGINEERING PRACTICES LABORATORY**

**(Common to all Branches of B.E. / B.Tech. Programmes)** **L T P C**

**0 0 4 2**

**COURSE OBJECTIVES**

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

**GROUP – A (CIVIL & ELECTRICAL)**

**CIVIL ENGINEERING PRACTICES** 15

**PLUMBING**

- Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.
- Laying pipe connection to the suction side of a pump.
- Laying pipe connection to the delivery side of a pump.
- Practice in connecting pipes of different materials: Metal, plastic and flexible pipes used in householdappliances.

**WOOD WORK**

- Sawing, planing and making joints like T-Joint, Mortise and Tenon joint and Dovetail joint.

**STUDY**

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

**ELECTRICAL ENGINEERING PRACTICES** 15

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

**GROUP – B (MECHANICAL AND ELECTRONICS)**

15

**MECHANICAL ENGINEERING PRACTICES**

**WELDING**

- Arc welding of Butt Joints, Lap Joints, and Tee Joints
- Gas welding Practice.
- Basic Machining - Simple turning, drilling and tapping operations..
- Study and assembling of the following:

a. Centrifugal pump
b. Mixie
c. Air Conditioner.

**DEMONSTRATION ON FOUNDRY OPERATIONS.**

15

**ELECTRONIC ENGINEERING PRACTICES**

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

**TOTAL: 60PERIODS**

**COURSE OUTCOMES**

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

**MA7356 PROBABILITY AND RANDOM PROCESSES L T P C**
**4 0 0 4**

**OBJECTIVES:**

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

**UNIT I RANDOM VARIABLES 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 RANDOM PROCESSES 12**

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

**UNIT IV CORRELATION AND SPECTRAL DENSITIES 12**

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

**UNIT V LINEAR SYSTEMS WITH RANDOM INPUTS 12**

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

**TOTAL : 60 PERIODS**

**OUTCOMES:**

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

**TEXTBOOKS:**


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


**REFERENCES:**


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


**LT7302 INTRODUCTION TO LEATHER MANUFACTURE L T P C**

**3 0 0 3**

**OBJECTIVES**

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

**UNIT I HIDES/SKINS AND PRESERVATION 10**

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

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

**UNIT II PRE-TANNING PROCESSES 12**

Principles and objectives of pre-tanning processes viz., soaking, liming, deliming, bating, pickling, depickling, degreasing and depickling.

**UNIT III TANNING PROCESSES 10**

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

**UNIT IV POST TANNING PROCESSES 7**

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

**UNIT V FINISHING TECHNIQUES 6**

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

**TOTAL : 45 PERIODS**

**OUTCOMES**

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

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

**TEXT BOOKS**


1. Sarkar, K.T., Theory and Practice of Leather Manufacture, Ajoy Sorcor, Madras, 4th Rev.Ed 1995.
2. Dutta, S.S., An Introduction to the Principles of Leather Manufacture, 4th Edition, Indian Leather Technologists Association, Calcutta, 4th Edition 1999.
3. Sharphouse, J.H., “Leather Technicians Handbook”, Leather Producers Association, Northampton NN3 1JD, Reprinted 1995.
4. Fred O Flaherty, Roddy, T.W. and Lollar, R.M. `The Chemistry and Technology of Leather', Vol.I & II, Type of tannages, Rober E. Krieger Publishing Co., New York, 1978.
5. Thorstensen, T.C., Practical Leather Technology, Krieger Publications, 1993

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Understand the application and alternatives to leather in current global scenario. | 3 | 3 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 1 | 2 | 2 | 3 | 3 |
| CO-2 | Have knowledge on pretanning, tanning and post tanning processes | 3 | 3 | 1 | 2 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 2 | 2 | 3 | 3 |
| CO-3 | Comprehend the process rational for making specific leather | 3 | 3 | 2 | - | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 2 | - | 3 | 3 |
| CO-4 | Have understanding about the characteristic features of the skin/hides | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | - | 3 | 3 |
| CO-5 | Aware of various preservation techniques of the skin/hides | 3 | 3 | - | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 2 | 1 | 3 | 3 |

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

**EE7254 PRINCIPLES OF ELECTRICAL AND ELECTRONICS ENGINEERING L T P C**
**3 0 0 3**

**OBJECTIVES:**

To impart knowledge on

- Electric circuit laws , single and three phase circuits and wiring
- Working principles of Electrical Machines
- Various electronic devices and measuring instruments

**UNIT I ELECTRICAL CIRCUITS 9**

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

**UNIT II AC CIRCUITS 9**

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

**UNIT III ELECTRICAL MACHINES 9**

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

**UNIT IV ELECTRONIC DEVICES & CIRCUITS 9**

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

**UNIT V MEASUREMENTS & INSTRUMENTATION 9**

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

**TOTAL : 45 PERIODS**

**OUTCOMES:**

Ability to

- Understand electric circuits and working principles of electrical machines
- Understand the concepts of various electronic devices
- Choose appropriate instruments for electrical measurement for a specific application

**REFERENCES**


1. Del Toro, "Electrical Engineering Fundamentals", Pearson Education, New Delhi, 2007
2. John Bird, "Electrical Circuit Theory and Technology", Elsevier, First Indian Edition, 2006
3. Allan S Moris, "Measurement and Instrumentation Principles", Elseveir, First Indian Edition, 2006
4. Rajendra Prasad, "Fundamentals of Electrical Engineering", Prentice Hall of India, 2006
5. Thereja .B.L., "Fundamentals of Electrical Engineering and Electronics", S. Chand & Co. Ltd., 2008
6. V.K Mehta and Rohit Mehta, "Principle of Electrical Engineering", S. Chand & Company, 2008

**LT7301 CHEMISTRY FOR LEATHER TECHNOLOGISTS**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**OBJECTIVES**

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

**UNIT I INTRODUCTION TO INORGANIC COMPOUNDS 10**

A brief survey of the 's' block - binary compounds, complexes, alkalides and electrides. Features of the 'p' block and its elements - expansion of the octet, Lewis structures; 'd' and 'f' orbitals and transition metals; Coordination compounds –nomenclature, Theories - Coordination theory, Werner's theory; Ligand field theory; Introduction to inorganic tanning materials

**UNIT II MOLECULAR BONDING 9**

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

**UNIT III ORGANIC TANNIN CHEMISTRY 10**

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

**UNIT IV COLLOIDS & SURFACTANTS 10**

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

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

**UNIT V APPLICATION TO LEATHER TECHNOLOGY 6**

Use of inorganic and organic materials in leather manufacture; Wetting theory, Cohesion & Adhesion.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

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

CO-1 Have the basic knowledge on inorganic compounds

CO-2 Comprehend the knowledge on organic compounds and reaction mechanism

CO-3 Understand the concept of various molecular bonding

CO-4 Interpret the characteristic of organic compounds and its relevance in tanning.

CO-5 Perceive the concepts of colloids and surfactants.

**TEXT BOOKS**


1. J W Huheey, E A Keiter and R L Keiter, 'Inorganic Chemistry' 4th edn, Harper Collins,
2. M J Winter, 'Chemical Bonding' Oxford Primer Series, Oxford University Press, 1994
3. N C Norman, 'Periodicity and the p-block Elements' Oxford Primer Series, Oxford University Press, 1994
4. R.T. Morrison and R.N.Boyd "Organic Chemistry" VI Ediition Prentice Hall Inc (1996) USA
5. K.S.Tiwari, N.K.Vishnoi and S.N.Malhotra "A text book of Organic Chemistry" Second Edition, Vikas Publishing House Pvt. Ltd. (1998) New Delhi.
6. Puri B.H. Sharma L.R and M.S.Prathama, Principles of Physical Chemistry, S. Chand and Company, Delhi (2001).
7. Gordon M. Barrow, Physical Chemistry, Sixth edition, Tata McGraw Hill (1998).
8. Introduction to Colloid and Surface Chemistry, Duncan J. Shaw, Butternorth, Hewemann, (1992)

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Have the basic knowledge on inorganic compounds | 3 | 3 | 1 | 1 | 1 | 1 | 2 | 3 | 1 | 1 | 1 | 2 | 3 | 1 | - |
| CO-2 | Comprehend the knowledge on organic compounds and reaction mechanism | 3 | 3 | 2 | 1 | 1 | - | 2 | 2 | 1 | 1 | 1 | 2 | 3 | - | 2 |
| CO-3 | Understand the concept of various molecular bonding | 3 | 3 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 2 | 3 | 2 | 1 |
| CO-4 | Interpret the characteristic of organic compounds and its relevance in tanning. | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 3 | 1 | 1 |
| CO-5 | Perceive the concepts of colloids and surfactants | 3 | 3 | - | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 2 | 3 | 1 | 1 |

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

**LT7304 THEORY OF SKIN PROTEINS AND PRE-TANNING PROCESSES L T P C**
**3 0 0 3**

**OBJECTIVES**

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

**UNIT I COMPONENTS, FUNCTIONS AND COMPOSITION OF SKIN 9**

Organization of skin components in different animals; Structure and function of epidermis, dermis, cutaneous and subcutaneous tissues; hair; fat tissue; nerve; erectorpilli muscle; sweat glands; Functions and properties of hides and skins; Chemical constituents of hides and skins; Fibrous and non-fibrous proteins in skin; Structure and properties of complex carbohydrates and proteoglycons; Structure and properties of fatty acids,; Structure, function and properties of amino acids.

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

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

**UNIT III PRESERVATION AND PRE-TANNING PROCESSES 10**

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 7**

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

**UNIT V PRACTICE AND QUALITY CONTROL 7**

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

**TOTAL : 45 PERIODS**

**OUTCOMES**

The students will be able to understand

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

**TEXT BOOKS**


1. Lehninger A.L., Nelson D.L., Cox M.M., “Principles of Biochemistry", CBS Publications,1993.
2. Gustavson, K.H., `The Chemistry & Reactivity of Collagen', Academic Press, New York, 1958.
3. Flaherty, O., William Roddy, T. Robert, M. Lollar, `The Chemistry and Technology of Leather', Vol.1 Preparation for Tannage, E Robert Krieger Publishing Company, New York, 1978.
4. Bienkiewicz, K., "Physical Chemistry of Leather Manufacture", Krieger, Florida, 1982.


**REFERENCES**


1. Voet D., Voet G., “Biochemistry ", Second Edition, John Wiley and Sons, 1994.
2. Stryer L., “Biochemistry ", Fourth Edition, 1994.
3. Darnell J., Lodish H., Baltimore D., “Molecular Cell Biology ", Freeman W.H., 1990.
4. “R. Puvanakrishnan, S. Sivasubramanian and T Hemalatha. Microbes and Enzymes – Basics and Applied, MJP Publishers, Chennai, 2015, PP517.

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | To know about various structural components and functions of skin/hide | 3 | 2 | 1 | - | 1 | - | 1 | - | - | 1 | - | 2 | - | 3 | 1 |
| CO-2 | To understand the molecular structure of collagen and its supramolecular assemblies and their characteristics | 3 | 2 | 1 | - | - | - | - | - | - | 1 | - | 2 | - | 3 | 1 |
| CO-3 | To gain fundamental knowledge on preservation and pre-tanning process | 3 | 2 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | - | 2 | 1 | 3 | 2 |
| CO-4 | Aware of various cleaner pre-tanning processes | 3 | 2 | 1 | 2 | 1 | 3 | 3 | 2 | 2 | 1 | - | 2 | 2 | 3 | 3 |
| CO-5 | To determine the quality control requirements of pre-tanning process. | 3 | 2 | 1 | 2 | 1 | 1 | 3 | 2 | 2 | 1 | - | 2 | 2 | 3 | 3 |

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

**LT7303 PRINCIPLES OF UNIT OPERATIONS AND PROCESSES IN LEATHER AND LEATHER CHEMICALS MANUFACTURE**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**OBJECTIVES**

To impart knowledge on basic concepts of chemical engineering unit operations and processes and application in leather and leather chemicals manufacture

**UNIT I CONCEPTS & METERING OF FLUIDS 4**

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

**UNIT II HEAT TRANSFER AND MASS TRANSFER 16**

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

**Diffusion:** Binary diffusion, concept of mass transfer coefficients and interface mass transfer and stage wise contact.

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

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

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

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

**UNIT III MECHANICAL SEPARATIONS 3**

**Size reduction :** Theory and equipment ; application in leather chemical processing

**Clarification :** Principles of clarification, Liquid-Liquid, Liquid-solid and Liquid-gas separations, Application in leather processing and effluent treatment Mixing : Basic theory and application in leather and leather chemical processing.

**UNIT IV PRINCIPLES OF UNIT PROCESSES 17**

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

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

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

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

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

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

**UNIT V WATER AND INORGANIC CHEMICALS 5**

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

**TOTAL: 45 PERIODS**

**OUTCOMES**

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

**REFERENCES**


1. McCabe .W.L and Smith, J.C., Unit Operations in Chemical Engineering, McGraw Hill, Fourth Ed., 1993.
2. Treybal, R.E., Mass Transfer Operations, McGraw Hill Book Company, Third Ed. 1981.
3. Coulson, J.M., and Richardson, J.F., Chemical Engineering, Vol.I and II Third Ed. Pergamon press, 1978.
4. Welty, J.R., Wilson, R.E., and Wicks, C.E. Fundamentals of momentum, Heat and Mass Transfer, Third Ed., John Wiley, 1984.
5. Perry, J.H., Chemical Engineers Handbook, McGraw Hill, New York, Sixth Ed., 1984.
6. Shreve, R.N., Austin, G.T., Shreve's Chemical Process Industries, McGraw-Hill Book company, 1984.
7. Groggins, P.H., Unit Processes in Organic synthesis, McGraw-Hill Book company, 5th Edition, 2004.
8. Dutta, S.S., An introduction to the principles of leather manufacture, ILTA.

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Know the basic concepts of unit operations, material and energy balances. | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 3 | 1 |
| CO-2 | Understand the fluid dynamics mass and heat transfer in various unit operations such as distillation, extraction, drying and humidification | 3 | 2 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 2 | 2 | 3 | 1 |
| CO-3 | The size reduction and separation and mixing techniques technology of organic and inorganic chemicals involved in the processing of leather and leather chemicals | 3 | - | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 2 | 3 | 2 |
| CO-4 | Have knowledge of various chemical processing | 3 | 1 | 1 | 1 | 1 | - | 1 | 2 | 1 | 1 | 1 | 2 | - | 3 | 3 |
| CO-5 | Have understanding on the water and chemical treatments | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | - | 3 | 3 |

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

| EE7261 | ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY | L T P C<br>0 0 4 2 |
|---|---|---|

**OBJECTIVE:**

- To train the students in performing various tests on electrical drives, sensors and circuits.

**LIST OF EXPERIMENTS:**

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

**TOTAL : 60 PERIODS**

| LT7311 | PRACTICE IN TANNING | L T P C<br>0 0 4 2 |
|---|---|---|

**OBJECTIVES**

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

**LIST OF EXPERIMENTS**

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

**OUTCOMES**

To train the students to gain an exposure to leather manufacture.

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

**TOTAL : 60 PERIODS**

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Pursue knowledge on assortment of hides and skins. | 1 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 3 | 2 |
| CO-2 | Trained to manufacture wet blues, E.I. and vegetable tanned leathers. | 1 | 3 | 2 | 1 | 1 | - | 2 | 1 | 2 | 1 | 1 | 2 | 1 | 3 | 1 |
| CO-3 | Acquire knowledge on post-tanning and finishing processes | 1 | 3 | - | 1 | 1 | 1 | 2 | 1 | 2 | 1 | - | 2 | 1 | 3 | 3 |

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

**MA7354** **NUMERICAL METHODS** **L T P C**
**4 0 0 4**

**OBJECTIVES:**

- To provide the mathematical foundations of numerical techniques for solving linear system, eigenvalue problems, interpolation, numerical differentiation and integration and the errors associated with them;
- To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.

**UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 12**

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

**UNIT II INTERPOLATION AND APPROXIMATION 12**

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

**UNIT III NUMERICAL DIFFERENTATION AND INTEGRATION 12**

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

**UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12**

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

**UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 12**

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

**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

**TEXT BOOKS:**

1. Grewal, B.S. and Grewal,J.S., "Numerical methods in Engineering and Science", Khanna Publishers, New Delhi, 9th Edition, 2007.

2. Sankara Rao . K, " Numerical Methods for Scientists and Engineers" PHI Learning Pvt Ltd. New Delhi, 2007.

**REFERENCES:**

1. Brian Bradie, “A Friendly Introduction to Numerical Analysis”, Pearson Education Asia, New Delhi, 1st Edition, 2007.
2. Gerald, C.F. and Wheatley, P.O., “Applied Numerical Analysis”, Pearson Education Asia, New Delhi, 6th Edition, 2006.
3. Laurene V. Fausett, “Applied Numerical Analysis using MATLAB”, Pearson Education, New Delhi, 1st print, 2nd Edition, 2009.
4. S. R. K. Iyengar, R. K. Jain, Mahinder Kumar Jain, "Numerical Methods for Scientific and Engineering Computation", 6th Edition, New Age International Publishers, New Delhi, 2012.

**LT7402 INSTRUMENTAL METHODS OF ANALYSIS FOR LEATHER TECHNOLOGISTS**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**OBJECTIVES**

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

**UNIT I INTRODUCTION TO SPECTROSCOPICAL METHODS OF ANALYSIS 13**

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

**UNIT II MOLECULAR SPECTROSCOPY 9**

Various transitions in organic and inorganic compounds effected by UV, visible and infrared radiations, various energy level diagrams of saturated, unsaturated and carbonyl compounds, excitation by UV and Visible radiations, Effects of auxochromes and effects of conjugation on the absorption maxima, Applications of UV-Visible and IR spectroscopy.

QUANTITATIVE SPECTROSCOPY: Beer-Lambert’s Law, Limitations, Deviations (Real, Chemical, Instrumental) Nesslerimetry. Estimation of dyes, Cr and Fe using Beer-Lambert’s Law

**UNIT III ATOMIC SPECTROSCOPY 6**

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

**UNIT IV POLARIMETRY AND REFRACTOMETRY 4**

Polarimetry and refractometry Principle, instrumentation and Applications

**UNIT V THERMAL ANALYSIS 7**

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

**UNIT VI CHROMATOGRAPHIC METHODS 6**

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

**TOTAL : 45 PERIODS**

**OUTCOMES**

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

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

**TEXT BOOK**

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

**REFERENCES**

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

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Gain fundamental knowledge on various physico-chemical analytical methods. | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | - | 1 | 1 | 3 | 1 |
| CO-2 | Understand the underpinning science behind various instrumental techniques. | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | - | 1 | 2 | 3 | 2 |
| CO-3 | Understand the fundamentals of the molecular interaction with electromagnetic radiations | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | - | 1 | 1 | 3 | 3 |
| CO-4 | Understand the theoretical knowledge about handing of instruments | 3 | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | - | 1 | - | 3 | 2 |
| CO-5 | Aware of various chromatographic techniques | 3 | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | - | 1 | 1 | 3 | 2 |

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

**LT7401 BOVINE LEATHER MANUFACTURING TECHNOLOGIES L T P C**
**3 0 0 3**

**OBJECTIVES**

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

**UNIT I PRODUCT BRIEF OF LEATHERS FROM HIDES 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 understand the property requirements of different kinds of heavy leathers and process aspects for the same.

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

**TEXT BOOKS**

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

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | To understand the basic product brief of light and heavy leather manufacture from hides. | 1 | - | - | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 3 | 2 |
| CO-2 | To gain knowledge in property requirement and process design of heavy leather | 3 | 2 | 1 | 1 | 2 | - | 2 | 1 | - | 1 | 1 | 2 | - | 3 | 2 |
| CO-3 | To gain knowledge in property requirement and process design of light leather | 3 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | - | 1 | 2 | 1 | 2 | 1 |
| CO-4 | Articulate indepth knowledge in process technology for leather from hides | 3 | - | 1 | - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 2 |
| CO-5 | Understand the physical and chemical properties of raw materials used in sports goods leathers | 3 | 2 | - | - | 2 | - | 1 | 1 | - | 1 | - | 1 | 1 | - | 2 |

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

**LT7405 THEORY OF ORGANIC AND INORGANIC TANNAGES L T P C**
**4 0 0 4**

**OBJECTIVES**

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

**UNIT I CHROMIUM CHEMISTRY 14**

Definition of ligands, nucleophilicity of ligands and electronegativity of donor atoms, chelation and masking, and introduction of factors controlling molecular stability of transition metal complexes. Historical overview of mineral tanning.

Electronic configuration and its implications, common oxidation states of chromium, redox stabilities of chromium (VI) and chromium (III) salts, redox potentials and their interconversion, protolysis, kinetic inertness of chromium (III), basicity, oxolation and polymerisation, Stiasny's series, McClandish precipitation point.

**UNIT II FACTORS CONTROLLING CHROME TANNING 8**

Preparation of basic chromium sulphate (BCS) salt, reaction parameters influencing composition of BCS, kinetics of chrome tanning, diffusion and complexation, effects of float volume, pH, basicity, masking, temperature, drum speed, ageing chrome tanned substrates.

**UNIT III MECHANISM OF INORGANIC TANNAGES 14**

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

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

**UNIT IV VEGETABLE TANNIN CHEMISTRY 12**

Vegetable tannins - definition and classification, Occurrence; Chemistry of hydrolysable tannins - gallotannins, ellagi tannins - their structural aspects including tannin dimers, trimers.

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

**UNIT V MECHANISM OF VEGETABLE AND OTHER ORGANIC TANNAGES 12**

Mechanism of reaction of vegetable tannins with collagen. Electrolytic equilibria, diffusion equilibria, fixation and absorption equilibria. Principles in pit, drum and E.I. tanning.

Mechanism of tanning with aldehydes, oil, oxazolidine and other organic tanning agents; Synthetic tannins - Classification - properties, uses in leather industry.

**TOTAL: 60 PERIODS**

**OUTCOMES**

Students will gain knowledge of inorganic and organic tannages and their mechanism of interaction with emphasis on chromium and vegetable tanning.

CO-1 Understand the chemistry of chromium and factors controlling chrome tanning.
CO-2 Understand the mechanism of inorganic tannages.
CO-3 Comprehend the chemistry of vegetable tannins and mechanism vegetable and organic tanning
CO-4 Have knowledge on mechanism of oil and aldehyde tanning
CO-5 Understand the parameters influence on tanning

**TEXT BOOKS**


1. Fred O Flaherty, Roddy, T.W. andLollar, R.M. `The Chemistry and Technology of Leather', Vol.III, Type of tannages, RoberE.Krieger Publishing Co.,New York, 1978.
2. Gustavson, K.H. `Chemistry of Tanning Processes' Academic Press, New York, 1958.
3. Bienkiewicz, K., `Physical Chemistry of Leather Manufacture', Krieger, Florida 1982.
4. Covington A D, 'Tanning Chemistry' RSC Publishing, Cambridge, UK, 2009.
5. Howes, F.N. "Vegetable tanning materials", Butterworth. London, 1953.
6. Haslam, E. "The biochemistry of Plants", Vol.7. Academic Press, 1981, Chapter 18, "Vegetable tannins". "A survey of modern vegetable tannages". Tanning extracts Producers Federation, Switzerland, 1975.
7. Humphreyes, G.H.W. and Jones, C.R. "The manufacture of sole and other heavy leathers". Pergamon Press, 1966. Chapter 5, "Vegetable tannin materials and syntans".
8. Vegetable and Synthetic Tanning agents, Sundara Rao, V.S., et al – The Leather Industry, (ed. by Sadulla, S) Kothari Desk book series, H.C. Kothari Group (Publications Division), Madras, p.71, 1995.

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Understand the chemistry of chromium and factors controlling chrome tanning. | 3 | 1 | - | - | 1 | - | 1 | 1 | - | 1 | - | 1 | 1 | 3 | 1 |
| CO-2 | Understand the mechanism of inorganic tannages. | 3 | 3 | 1 | - | 1 | 1 | 3 | 1 | 2 | 1 | - | 1 | 1 | 2 | 2 |
| CO-3 | Comprehend the chemistry of vegetable tannins and mechanism vegetable and organic tanning | 3 | 2 | 1 | - | 1 | 2 | 2 | 1 | 1 | 1 | - | 1 | 1 | 3 | 2 |
| CO-4 | Have knowledge on mechanism of oil and aldehyde tanning | 3 | 1 | - | - | 1 | - | 2 | 1 | - | 1 | - | 1 | 1 | 3 | 2 |
| CO-5 | Understand the parameters influence on tanning | 3 | 3 | 3 | - | 1 | 2 | 2 | 1 | 2 | 1 | - | 1 | 1 | 2 | 1 |

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

**LT7404 THEORY OF MATERIAL TESTING OF LEATHERS**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**OBJECTIVES**

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

**UNIT I ANALYSIS OF LEATHER CHEMICALS 12**

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

**UNIT II ANALYSIS OF PROCESS LIQUORS AND EMISSIONS 8**

Principles of analytical and instrumental methods employed in analysis of exhaustion liquors of pretanning, tanning and post tanning processes. Analysis of emissions - air pollutants from leather processing; Specifications recommended by standards organizations.

**UNIT III ANALYSIS OF LEATHERS 8**

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

**UNIT IV MICROBIOLOGY FOR LEATHER 8**

Testing of bacterial action on raw hides and skins and in the different stages of Leather Manufacture. Effect of mould growth during processing of skins/hides, finished leathers, leather goods and during transportation. Testing and prevention of mould growth during processing, storage of finished goods and transportation.

**UNIT V PHYSICAL TESTING OF LEATHERS 9**

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

**TOTAL : 45 PERIODS**

**OUTCOMES**

At the end of the course, the student would understand

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

**TEXT BOOKS**


1. Sarkar, P.K., `Analytical Chemistry of Leather Manufacture', Indian Leather Technologists Association, Calcutta, 1982.
2. `Official methods of Analysis', Society of Leather Technologists and Chemists, U.K., 1981.
3. Fred O Flaherty, Roddy, T.W. and Lollar, R.M. `The Chemistry and Technology of Leather', Vol.IV, Evaluation of leather, Rober E. Krieger Publishing Co., New York, 1978.
4. Dutta, S.S. "An introduction to the principles of physical testing of leather", Indian Leather Technologist's Association, Calcutta, 1991.
5. `Methods of chemical testing of leathers', IS: 582 - 1970, Bureau of Indian Standards, New Delhi, 1977.
6. "Methods of Physical testing of leathers, IS: 5914-1970, Bureau of Indian Standards, New Delhi, 1971

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | The analytical chemistry behind the testing of leather chemicals and leathers | 3 | 3 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | - | 1 | 1 | 3 | 2 |
| CO-2 | Various techniques for analyzing leather chemicals, spent process liquors, and pelts/ leathers. | 3 | 1 | 1 | 1 | 2 | 1 | 1 | - | 1 | 1 | - | 1 | 1 | 2 | 1 |
| CO-3 | Quality Standards of various leather chemicals and leather end products | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | - | 1 | 1 | 2 | 1 |
| CO-4 | Gain experience on microbiology testing techniques of leathers | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | - | 1 | 1 | 3 | 2 |
| CO-5 | Have knowledge on various physical testing methods of leathers | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | - | 1 | 1 | 3 | 2 |

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

**LT7403 LEATHER BIOTECHNOLOGY AND ITS APPLICATION IN LEATHER L T P C**
**3 0 0 3**

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

**UNIT I PROTEINS AND NUCLEIC ACID & ENZYMOLOGY 10**
Chemistry of DNA and RNA: Structure, Conformation and function Proteins - Chemistry, structure and Function, Separation Principles in proteins. Classification, assay, characterization, mechanism of action, enzyme kinetics, immobilized enzymes.

**UNIT II GENETIC ENGINEERING (RECOMBINANT DNA TECHNOLOGY) 10**
Principles and methods: Essentials of biotechnology - products of biotechnology, Restriction enzymes, vectors, DNA cloning strategies.

**UNIT III BIOTECHNOLOGY FOR HIDES/SKINS IMPROVEMENT 13**
Applications in Animal nutrition and animal production: embryo transfer, gene transfer, transgenic animals. Cleaner Leather Processing: Use of enzyme options in beam house operations - Soaking, unhairing, bating, degreasing, offal treatment: Types of enzymes - proteases, lipases - properties, assay systems and production. Types of fermentation, Preparation of media, preparation of inoculum, separation and purification of products.

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

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

**TOTAL : 45 PERIODS**

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

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

**REFERENCES**


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

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Understand basic biotechnology conceptsand its relevance for application in leather processing. | 3 | 1 | 1 | 1 | 3 | 1 | 3 | 3 | 1 | 1 | - | 1 | 2 | 3 | 1 |
| CO-2 | Principles of genetic engineering | 3 | - | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | - | 1 | - | 3 | 3 |
| CO-3 | Have knowledge in enzyme for leather processing. | 3 | 2 | 1 | 1 | 2 | 1 | 3 | 2 | 1 | 1 | - | 1 | 1 | 3 | 2 |
| CO-4 | Manage the waste generated from leather industries. | 3 | 1 | 1 | 1 | 2 | 1 | 3 | 2 | 1 | 1 | - | 1 | 1 | 3 | 2 |
| CO-5 | Application of collagen in other fields | 3 | 1 | 1 | 1 | 2 | 1 | 3 | 2 | 1 | 1 | - | 1 | 1 | 3 | 2 |

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

| LT7412 | MATERIAL TESTING LABORATORY – I | L T P C<br>0 0 4 2 |
|---|---|---|

**OBJECTIVES**

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

**Analysis of Lime**

a. Purity of lime
b. Total bases

**Analysis of Sodium Sulphide**

**Analysis of Deliming Agents**

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

**Analysis of Bate**

**Analysis of Vegetable Tanning Materials**

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

**Analysis of Chrome tanning agents**

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

**Analysis of Syntans**

Quantification of phenolic content& free formaldehyde

**Analysis of Oils and fatliquors**

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

**Analysis of pretanned pelts and tanned leathers**

**Analysis of process liquors**

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

**OUTCOMES**

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

CO-1 Have practical experience and understanding the analysis of various leather chemicals

CO-2 Understand the challenges of eco- sensitive substances and their qualitative and quantitative analytical methods.

CO-3 Gain experience in analyzing chrome & vegetable tanning agents

**TOTAL : 60 PERIODS**

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Have practical experience and understanding the analysis of various leather chemicals | 2 | 3 | 1 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | - | 1 | 2 | 3 | 3 |
| CO-2 | Have practical knowledge of pelt/leather analysis | 2 | 3 | 1 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | - | 1 | - | 3 | 1 |
| CO-3 | Understand the challenges of eco-sensitive substances and their qualitative and quantitative analytical methods. | 2 | 3 | 1 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | - | 1 | 1 | 3 | 2 |

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

| LT7411 | LEATHER MANUFACTURE FROM HIDES | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 6 | 3 |

**OBJECTIVES**

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

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

1.Manufacture of vegetable tanned and chrome sole leathers;
2.Processing of belting leathers, harness and saddle leathers; (minimum one)
3.Manufacture of following leathers (minimum four) from different raw materials and tannages:

- Upholstery leathers
- Upper leathers
- Nappa leathers
- Patent leathers
- Shrunken grain leathers
- Nubuck /Suede upper leathers
- Burnishable upper leathers
- Oil-pull up leathers

**OUTCOMES**

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

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

**TOTAL : 90 PERIODS**

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Develop different kinds of leathers from hides. | 3 | 3 | 1 | 3 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 2 | 3 | 1 |
| CO-2 | Comprehend the processing aspects for making leathers from hides. | 3 | 3 | 1 | 3 | 3 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 |
| CO-3 | Understand the process – property correlation for making various types of heavy leathers. | 3 | 3 | 2 | 3 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | - | 3 | 2 |

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

**LT7502 THEORY AND PRACTICE OF POST TANNING PROCESSES L T P C**
**3 0 0 3**

**OBJECTIVES**

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

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

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

**UNIT II FATLIQUORS AND FATLIQUORING OF LEATHER 10**

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

**UNIT III SYNTANS AND RETANNING OF LEATHER 10**

Classification of syntans, auxiliary, intermediate, replacement syntans and resin tanning agents Sulphonation of naphthalene, napthols, 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**

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

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

**TEXT BOOKS**


1. Venkataraman, K. `Chemistry of Synthetic Dyes', Academic Press, New York and Lond, 1971.
2. Fred O Flaherty, Roddy, T.W. and Lollar, R.M. `The Chemistry and Technology of Leather', Vol.III, , Rober E. Krieger Publishing Co., New York, 1978.
3. Billmeyer and Saltzman's, `Principles of Color Technology', Wiley–Inter Sciences Publication.
4. Dutta, S.S., Introduction to the Principles of Leather Manufacture, Indian Leather Technologists Association, Calcutta, 1980.
5. Gustavson, K.H., `Chemistry of Tanning Processes' Academic Press, New York, 1958.

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Have knowledge on different dyes and its principles and its color theory for leather applications | 3 | 3 | 1 | - | 1 | - | 2 | 1 | - | 1 | - | 1 | - | 3 | - |
| CO-2 | Have knowledge on different fatliquors used in leather manufacture | 3 | 3 | 1 | - | 1 | - | 2 | 1 | - | 1 | - | 1 | - | 3 | 1 |
| CO-3 | Have knowledge on different types of syntans used in leather manufacture | 3 | 3 | 1 | - | 1 | 2 | 2 | 1 | 2 | 1 | - | 1 | 2 | 3 | 3 |
| CO-4 | Articulation on use of dyes syntans and fatliquors for different leather end products | 3 | 3 | 3 | - | 3 | 2 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 3 | 3 |
| CO-5 | Understanding the application of different post tanning machineries towards manufacture of different leathers | 3 | 3 | 3 | - | 3 | 2 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 3 | 3 |

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

**LT7501 TECHNOLOGY OF LIGHT LEATHER MANUFACTURE FROM SKINS L T P C**
**3 0 0 3**

**OBJECTIVES**

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 understand the property variations of different leathers and suitable processing variations that are required in their manufacture from skins.

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

**TEXT BOOKS**

1. Briggs, P.S. `Gloving, clothing and special leathers', Tropical Products Institute, London, 1981.
2. Kartheiz, Fuchs, H.P. `The Chemistry and technology of Novelty Leathers' FAO, United Nations, Rome.
3. CLRI Process Bulletins.

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Understand the property variations of different leathers | 3 | 3 | 1 | 1 | - | - | - | 2 | - | 1 | - | 1 | 0 | 3 | 2 |
| CO-2 | Design suitable processing variations that are required to manufacture leather from skin | 3 | 3 | 1 | 1 | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 0 | 3 | 3 |
| CO-3 | Develop speciality leathers from skin | 3 | 3 | 1 | 1 | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 3 | 1 |
| CO-4 | Correlate and understand the leather property and process parameter. | 3 | 3 | 1 | 1 | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 3 | 3 |
| CO-5 | Comprehend the quality control aspects of light leather | 3 | 3 | 1 | 1 | 3 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 1 | 3 | 1 |

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

| HS7551 | EMPLOYABILITY SKILLS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE DESCRIPTION**

This course aims to help the students acquire the employability skills necessary for the workplace situations. It also attempts to meet the expectations of the employers by giving special attention to language skills, presentation skills, group discussion skills and soft skills. This will be achieved through expert guidance and teaching activities focusing on employability skills.

**COURSE OBJECTIVES**

- To enhance the employability skills of students with a special focus on presentation skills, group discussion skills and interview skills
- To help them improve their reading skills, writing skills, and soft skills necessary for the workplace situations
- To make them employable graduates

**CONTENTS**

**UNIT I READING AND WRITING SKILLS 9**

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

**UNIT II SOFT SKILLS 9**

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

**UNIT III PRESENTATION SKILLS 9**

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

**UNIT IV GROUP DISCUSSION SKILLS 9**

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

**UNIT V INTERVIEW SKILLS 9**

Interview etiquette – dress code – body language – mock interview -–attending job interviews – answering questions confidently – technical interview – telephone/Skype interview - practice in different types of questions – one to one interview &panel interview – FAQs related to job interview-Emotional and cultural intelligence.

**LEARNING OUTCOMES**

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

**TOTAL : 45 PERIODS**

**REFERENCES:**


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


**EXTENSIVE READING**


1. Covey, Stephen R. The 7 Habits of Highly Effective People. New York: Free Press, 2013.
2. Bagchi, Subroto. The Professional. New Delhi: Penguin Books India, 2009.


**WEB RESOURCES**

1. www.humanresources.about.com
2. www.careerride.com
3. https://bemycareercoach.com/softskills

**LT7513 MATERIAL TESTING LABORATORY - II**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

**OBJECTIVES**

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

**MICROSCOPY LAB**

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

**MICROBIOLOGY LAB**

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

**PHYSICAL TESTING LAB**

Strength Properties

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

**Wear and Comfort Properties**

a. Static/dynamic water absorption
b. Water vapour permeability
c. Abrasion resistance

d. Perspiration resistance

**Fastness Properties**

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

**TOTAL : 60 PERIODS**

**OUTCOMES**

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

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

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Microscopical analysis/identification of leathers | 2 | 3 | 1 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 3 | 1 |
| CO-2 | Microbiological testing of raw skins/hides, pelts and leathers and various process liquors | 2 | 3 | 1 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 3 | 3 |
| CO-3 | Performing various physical testing methods for assessing leathers. | 2 | 3 | 1 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | - | 3 | 2 |

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

**LT7512 LEATHER MANUFACTURE FROM SKINS**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 6 | 3 |

**OBJECTIVES**

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

Practical training (minimum 6 leathers) on the manufacture of

White Leather from wet white tanning (compulsory)
Resin and protein upper leathers
Nappa leathers
Glazed kid leathers
Nubuck leathers
Dress glove
Utility glove leathers
Crushed kid leathers
Suede upper leathers
Suede garment leathers
Mesh leathers
Hair-on/Fur-on leathers
Chamois leathers

**TOTAL : 90 PERIODS**

**OUTCOMES**

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

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

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Processing different types of leathers from skin | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 2 | 2 | 3 | 1 |
| CO-2 | Practice in making specialty leathers from different skins | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 2 | 1 | 3 | 3 |
| CO-3 | Knowledge on process recipe for making different leather | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 2 | - | 3 | 2 |

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

| LT7511 | INDUSTRIAL INTERNSHIP - I | L T P C<br>0 0 4 2 |
|---|---|---|

Each student during should undertake 1 month practical training on aspects associated with leather manufacture in Tanneries and or Leather Chemical supplier units as a part of Industrial Internship – I during the summer vacation after fourth semester. However evaluation for this course will be done in fifth semester. During fifth semester the student should submit (to assigned faculty) an industrial training report on practical internship undertaken by/assigned to him/her by the Department. The report should be based on the practical experience gained at the industry duly certified by the issuing authority at the training centre of leather industry. The objective of the training is to enhance the practical knowledge of the students on various aspects associated with leather manufacture. Faculty in his/her assessment should judge the level of proficiency, originality and capacity for application of the practical knowledge attained by the student during the training period.

**OUTCOMES**

At the end of the course students will gain confidence in

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

**TOTAL DURATION: 4 WEEKS**

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Provide opportunity to explore students' interest | 2 | 2 | 2 | - | 2 | 2 | 2 | 2 | 3 | 2 | 1 | 3 | 2 | 3 | 3 |
| CO-2 | Recognize the real working environment | 2 | 2 | 2 | - | 2 | 2 | 2 | 2 | 3 | 2 | 1 | 3 | - | 3 | 3 |
| CO-3 | Builds balance between classroom knowledge with practical application | 2 | 2 | 2 | - | 2 | 2 | 2 | 2 | 3 | 3 | 1 | 3 | 1 | 3 | 3 |

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

**LT7604 THEORY AND PRACTICE OF LEATHER FINISHING**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**OBJECTIVES**

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

**UNIT I SURFACE COATING** **9**

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

**UNIT II PIGMENTS** **9**

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

**UNIT III POLYMERIC MATERIALS AND THEIR DISPERSION FORMS** **9**

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

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

**Impregnation:** Terminology, types of impregnating binders, characteristics, selection of systems for corrected and full grain impregnation, formulations, application methods and precautions

**Finishing:** Definition, aims, film formation mechanisms, properties of films such as glass transition temperature / minimum film forming temperature, transparency, gloss and resistance to heat, light and solvent. Pigment volume concentration, plasticizer, wetting agents, role in dispersion and stability - requirements in multiple coat technique – such as clearing coat, sealer coat, base coat, top and feel coat. Single coat composition methods like spraying, curtain coating, roller coating etc. Cationic finishes and their relative merits. Foam finish; Eco- friendly finishing - Volatile Organic Compounds (VOC) reductions. Finish formulation for various types of leathers.

**UNIT V VARIOUS FINISHING METHODS AND TECHNIQUES** **9**

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

**TOTAL : 45 PERIODS**

**OUTCOMES**

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

CO-1 Appreciate the role of various finishing agents and auxiliaries used in leather finishing
CO-2 Formulate strategies for finishing different types of leathers
CO-3 Upgradation technologies for enhancing value to low grade substrates
CO-4 Knowledge on different machineries used in leather finishing
CO-5 Understand the principles of finishing mechanisms

**REFERENCES**


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

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Appreciate the role of various finishing agents and auxiliaries used in leather finishing | 3 | 1 | - | - | 2 | 1 | - | 1 | 1 | 1 | - | 2 | 2 | 3 | 2 |
| CO-2 | Formulate strategies for finishing different types of leathers | 3 | 1 | - | - | - | - | - | 1 | 1 | 1 | - | 2 | 1 | 3 | 2 |
| CO-3 | Upgradation technologies for enhancing value to low grade substrates | 3 | 2 | 1 | - | 2 | - | 1 | 1 | 1 | 1 | - | 2 | - | 3 | 2 |
| CO-4 | Knowledge on different machineries used in leather finishing | 3 | 3 | 2 | - | 3 | 2 | 2 | 1 | 1 | 1 | - | 2 | 1 | 3 | 1 |
| CO-5 | Understand the principles of finishing mechanisms | 3 | 3 | 2 | - | 3 | 2 | 2 | 1 | 1 | 1 | - | 2 | 1 | 3 | 3 |

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

**LT7601 ENVIRONMENTAL SCIENCE AND ENGINEERING FOR LEATHER SECTOR**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**OBJECTIVE**

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

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

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

**UNIT II ENVIRONMENTAL POLLUTION AND CHEMISTRY 14**

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

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

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

**UNIT III TREATMENT OF TANNERY WASTEWATER 10**

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

**UNIT IV ENVIRONMENTAL IMPACT & RISK ASSESSMENT 9**

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

**UNIT V ENVIRONMENTAL POLICIES AND LEGISLATION 4**

Environmental legislations in India- environment protection act – air (prevention and control of pollution) act – water (prevention and control of pollution) act – wildlife protection act – forest conservation act – solid and hazardous waste management rules - biomedical waste rules – responsibilities of generators- role and responsibility of pollution control boards.

**TOTAL : 45 PERIODS**

**OUTCOMES**

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

CO-1 Appreciate the importance of environmental science and technology.

CO-2 Understand the ecosystem, biodiversity and sustainable development.

CO-3 Exposure on various wastewater treatment methods.

CO-4 Broad spectrum knowledge on environmental pollution.

CO-5 Understanding Environmental policies and acts.

**REFERENCES**


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

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Appreciate the importance of environmental science and technology. | 2 | - | 1 | - | 2 | 2 | 3 | 2 | 1 | 1 | 1 | 2 | 2 | 3 | 1 |
| CO-2 | Understand the ecosystem, biodiversity and sustainable development. | 2 | - | 1 | - | 2 | 2 | 3 | 2 | 1 | 1 | - | 2 | 1 | 3 | 3 |
| CO-3 | Exposure on various wastewater treatment methods. | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 2 | 1 | 3 | 3 | - | 3 | 2 |
| CO-4 | Broad spectrum knowledge on environmental pollution. | 2 | 2 | 1 | 2 | 2 | 2 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | 3 | 2 |
| CO-5 | Understanding Environmental policies and Acts. | 1 | - | - | - | - | 2 | 3 | 1 | - | 1 | - | 1 | 1 | 3 | 2 |

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

**LT7602 LEATHER GOODS AND GARMENTS TECHNOLOGY L T P C**
**3 0 0 3**

**OBJECTIVES**

To impart knowledge on making leather goods and garments

**UNIT I OVERVIEW 8**

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

**UNIT II 12**

**i) Production planning -** Nomenclature used for component identification in various leather garments skirts, jackets, trousers etc and various leather goods – Wallet, hand bags, Executive bags etc. Process scheduling and line balancing.

**ii) Cutting and clicking** - Hand & machine cutting, Knives & tools – Preparation and handling. Pattern interlocking/nesting for material optimization. Factors influencing cutting value. Dieless cutting.

**iii) Assembling**- Pre assembly and assembly operations – skiving, splitting, folding, sewing etc. Various types of assembly techniques for leather goods and garments.

**iv) Quality** - Quality control measures in leather products manufacture.

**UNIT III MACHINERY 9**

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

**UNIT IV DESIGN & DEVELOPMENT 9**

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

**UNIT V ORGANISATION & MANAGEMENT 7**

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

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

**TOTAL : 45 PERIODS**

**OUTCOMES**

Through this course students will be able to know

CO-1 To understand various components associated with the manufacture of leather good and garments

CO-2 To understand various processing steps involved in the making of leather goods and garments

CO-3 To be aware of machineries involved in the leather goods/garments manufacture

CO-4 To design leather goods and garments

CO-5 To determine the requirements for the establishment of leather goods and garments manufacturing unit

**REFERENCES**


1. Pattern Making Manual - Womens Garments, ESMOD, Paris, 1991.
2. Fashion Drawing Method, ESMOD, Paris, 1992.
3. Metric Pattern cutting for Menswear, Winifred Aldrich, BSP Professional Books, London, 1990.
4. Grading Manual, ESMOD, Paris, 1994.
5. Skiving Manual, First Edition, 1994 CLRI, Madras.
6. A course manual on leather garment pattern designing.
7. Leather garments making, NIMI publication, 2012.
8. Leather and sports goods – Pattern and Template marker, NIMI Publications, 2011

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | To understand various components associated with the manufacture of leather good and garments | 1 | 3 | 1 | - | 2 | 1 | 2 | 1 | 0 | 1 | 0 | 2 | 2 | 3 | 2 |
| CO-2 | To understand various processing steps involved in the making of leather goods and garments | 1 | 3 | 1 | - | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 3 | 2 |
| CO-3 | To be aware of machineries involved in the leather goods/garments manufacture | 1 | 3 | 1 | - | 2 | 1 | - | 1 | 1 | 1 | 1 | 2 | - | 3 | 2 |
| CO-4 | To design leather goods and garments | 1 | 3 | 1 | - | 2 | 1 | - | 1 | 1 | 1 | 0 | 2 | 1 | 3 | 1 |
| CO-5 | To determine the requirements for the establishment of leather goods and garments manufacturing unit | 1 | 3 | 1 | - | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 3 | 3 |

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

**LT7603 LEATHER MACHINERIES**

| L | T | P | C |
|---|---|---|---|
| 3 | 2 | 0 | 4 |

**AIM**

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

**OBJECTIVES**

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

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

**UNIT I PRINCIPLES AND MECHANISM OF LEATHER MACHINERY 20**

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

**UNIT II DESIGN, SELECTION AND CONSTRUCTION OF EQUIPMENT 21**

Basic design, material selection and construction of pits, drums and paddles. Pneumatic steering mechanism and control as applied to dust control equipment, air compressor, auto spray, etc. Hydraulic steering mechanism in case of shaving, staking, embossing machines, etc.

**UNIT III MECHANICAL FEATURES OF LEATHER MACHINERY 24**

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

Tutorial/practical sessions on adjustment of machinery parts of above machines for proper functioning in leather processing.

**UNIT IV TANNERY LAYOUT 5**

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

**UNIT V PREVENTIVE MAINTENANCE AND SAFETY 5**

Preventive maintenance and safety in the use of leather machinery

**TOTAL : 75 PERIODS**

**OUTCOMES**

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

CO-1 Have knowledge of mechanical power transmission and fluid power systems

CO-2 Understand the working principles of leather processing machineries

CO-3 Understand the working principles of leather product machineries

CO-4 Have knowledge on transport systems and automation in leather product manufacture

CO-5 Aware of layout and maintenance of tannery and leather product unit

**REFERENCES**

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

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Have knowledge of mechanical power transmission and fluid power systems | 2 | 2 | 1 | - | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 3 | 2 |
| CO-2 | Understand the working principles of leather processing machineries | 3 | 2 | 1 | - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | - | 3 | 2 |
| CO-3 | Understand the working principles of leather product machineries | 2 | 2 | 1 | - | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 1 |
| CO-4 | Have knowledge on transport systems and automation in leather product manufacture | 1 | 2 | 1 | - | 2 | 1 | 1 | 1 | 1 | - | 1 | 1 | 1 | 3 | 3 |
| CO-5 | Aware of layout and maintenance of tannery and leather product unit | 2 | 2 | 1 | - | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 2 |

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

**LT7612 LEATHER GOODS AND GARMENTS – DESIGN AND FABRICATION LABORATORY**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 6 | 3 |

**AIM**

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

1. Free hand object drawing practice
2. Leather goods and garments working sketch practice
3. Fashion illustration and color application
4. Good's & garment's leather assortment
5. Physical observation of goods & garments accessories and reinforcement materials
6. Practice in various kinds of tools and machineries operation and its function
7. Goods and garments pattern preparation and pattern laying on leather
8. Goods and garments leather and reinforcement material cutting and lining material cutting
9. Pre-assembly and stitching operations
10. Pattern design for leather goods and garments
11. Practice in goods and garments making
12. Goods and garments quality control checking
13. Pattern grading and practice in CAD/CAM

**TOTAL : 90 PERIODS**

**OUTCOMES**

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

CO-1 Have practical experience in designing leather goods and garments.

CO-2 Have practical knowledge in fabrication of leather goods and garments.

CO-3 Aware of computer applications involved in developing leather goods and garments.

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Have practical experience in designing leather goods and garments. | 2 | 3 | 2 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 3 | 1 |
| CO-2 | Have practical knowledge in fabrication of leather goods and garments. | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 3 | 3 |
| CO-3 | Aware of computer applications involved in developing leather goods and garments. | 2 | 3 | 2 | 1 | 2 | - | - | 1 | 2 | 1 | - | 2 | 1 | 3 | 2 |

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

| LT7611 | FINISHING PRACTICE LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 4 | 2 |

**AIM**

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

**OBJECTIVES**

To train the students gain practical experience in:

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

**TOTAL : 60 PERIODS**

**OUTCOMES**

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

CO-1 Have practical experience in finishing of various types of leathers

CO-2 Understand recent technology involved in leather finishing

CO-3 Aware of various machinery operation involving in leather finishing

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Have practical experience in finishing of various types of leathers | 3 | 3 | 1 | 2 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 3 | 3 |
| CO-2 | Understand recent technology involved in leather finishing | 3 | 3 | 1 | 2 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 3 | 1 |
| CO-3 | Aware of various machinery operation involving in leather finishing | 3 | 3 | 1 | 2 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | - | 3 | 2 |

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

**LT7701 FOOTWEAR TECHNOLOGY L T P C**
**3 0 0 3**

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

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

**UNIT I FOOTWEAR MATERIALS AND COMPONENTS 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 & designs; Preparation of standards and section for men, ladies & children; Classic and other types of shoes and boots.

**UNIT III CUTTING, PRE-CLOSING AND CLOSING 13**
Principles of cutting – Hand, machine; Clicking room design and management. Checking incoming work, stitchmaking, skiving, punching and gimping, heat embossing, flow moulding, toe puff attachment, attaching linings and scrims, trimming linings, finishing off closed seams. Top line and other edge treatments, local reinforcements, attaching fastners and trims.

**UNIT IV PRELASTING AND LASTING 10**
Principles and methods of pre-lasting and lasting for different types of construction; Sole attaching; Lasted margin; Upper preparation; Sole preparation; Sole cementing; Upper cementing; Bottom fillers and shanks; Adhesive drying, Heat activation, Spotting, Pressing, Last slipping, Health and safety, Quality control and fault finding problems- solving.

**UNIT V METHODS OF SHOE CONSTRUCTION 4**
Various methods of shoe construction; shoe room techniques.

**TOTAL : 45 PERIODS**

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

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

**REFERENCES**

1. Cott, N.F., “American Shoe Making”, Shoe Trades Publishing Co., Cambridge.1993.
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:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Understand the construction of a shoe and its components | 2 | 3 | - | - | 2 | 1 | 1 | 0 | 2 | 1 | 1 | 2 | 1 | 3 | 1 |
| CO-2 | Understand the design and pattern development | 2 | 3 | 3 | - | 3 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 3 | 1 |
| CO-3 | Have knowledge on cutting, pre closing and closing | 2 | 3 | 1 | - | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 2 | 1 | 3 | 2 |
| CO-4 | Have knowledge on prelasting and lasting | 2 | 3 | 1 | - | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 3 | 3 |
| CO-5 | Knowledge of various shoe construction | 2 | 3 | - | - | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 3 | 3 |

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

**GE7652 TOTAL QUALITY MANAGEMENT L T P C**
**3 0 0 3**

**AIM**

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

**OBJECTIVES**

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

**UNIT I INTRODUCTION 9**

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

**UNIT II TQM PRINCIPLES 9**

Leadership--The Deming Philosophy, Quality council, Quality statements and Strategic planning--Customer Satisfaction –Customer Perception of Quality, Feedback, Customer complaints, Service Quality, Kano Model and Customer retention – Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition & Reward and Performance Appraisal--Continuous process improvement –Juran Trilogy, PDSA cycle, 5s and Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating and Relationship development.

**UNIT III TQM TOOLS & TECHNIQUES I 9**

The seven traditional tools of quality – New management tools – Six-sigma Process Capability– Bench marking – Reasons to bench mark, Bench marking process, What to Bench Mark, Understanding Current Performance, Planning, Studying Others, Learning from the data, Using the findings, Pitfalls and Criticisms of Bench Marking – FMEA – Intent of FMEA, FMEA Documentation, Stages, Design FMEA and Process FMEA.

**UNIT IV TQM TOOLS & TECHNIQUES II 9**

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

**UNIT V QUALITY MANAGEMENT SYSTEM 9**

Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific Standards—AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements—Implementation—Documentation—Internal Audits—Registration--**ENVIRONMENTAL MANAGEMENT SYSTEM:** Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001—Benefits of EMS.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

CO-1 Ability to apply TQM concepts in a selected enterprise

CO-2 Ability to apply TQM principles in a selected enterprise

CO-3 Ability to understand Six Sigma and apply Traditional tools, New tools,

Benchmarking and FMEA.

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

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

**TEXT BOOK:**

1. Dale H.Besterfiled, Carol B.Michna,Glen H. Besterfield,Mary B.Sacre,Hemant Urdhwareshe and Rashmi Urdhwareshe, “Total Quality Management”, Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression,2013.

**REFERENCE BOOKS:**

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

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Ability to apply TQM concepts in a selected enterprise | - | - | - | - | 3 | 3 | 3 | - | 3 | - | 2 | 1 | 1 | 1 | 3 |
| CO-2 | Ability to apply TQM principles in a selected enterprise | - | - | - | - | 1 | 3 | 3 | - | 3 | - | 1 | 3 | 1 | 1 | 3 |
| CO-3 | Ability to understand Six Sigma and apply Traditional tools, New tools, Benchmarking and FMEA. | - | - | - | - | 2 | 3 | 3 | - | 3 | - | - | 2 | 1 | 2 | 3 |
| CO-4 | Ability to understand Taguchi's Quality Loss Function, Performance Measures and apply QFD, TPM, COQ and BPR. | - | - | - | - | 2 | 3 | 3 | - | 3 | - | 1 | 2 | 1 | 3 | 3 |
| CO-5 | Ability to apply QMS and EMS in any organization | - | - | - | - | 2 | 3 | 3 | - | 3 | - | 1 | 2 | 1 | 3 | 3 |

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

**LT7702 SCIENCE AND TECHNOLOGY OF LEATHER AUXILIARIES L T P C**
**3 0 0 3**

**AIM**

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

**UNIT I** **9**

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

**UNIT II** **9**

Introduction to chemical classification of syntans, sulphonation of naphthalene, phenols, Napthols, Phenol formaldehyde condensation reactions, chemistry of light fast syntans, chemistry of amino resins and PU.

Unit operations in syntan manufacture.

**UNIT III** **13**

Introduction to composition of fatliquors; Functionalisation of oils for surface active function, chemical classification natural and synthetic oils, sulphation, sulphonation, sulphitation reactions of oils.

Role of double bonds and iodine value in functionalisation of oils, sulphochlorination, sulphoamidation, transesterification, phosphorylation reactions for fatliquor preparation. Stability of emulsions, grain and particle sizes of emulsions, factors controlling grain sizes of emulsions.

Fatliquor manufacturing technology.

Introduction to theory of colors, chromphoric groups, structural features of dyes; acid, basic and reactive dye classification.

Chemistry and technology of dye manufacture.

**UNIT IV** **9**

Introduction to definition of pigments, groups of polymer bases for colour. Classification, formulations of pigments, particle size, refractive index, density, opacity criteria for the choice of pigment bases,

Different techniques in particle size reduction and importance of particle size on functional properties of pigment formulation.

Introduction to definition of binders, chemical classification of binders, acrylic, protein, polyurethane.

Manufacturing of binder formulations.

**UNIT V** **5**

Different types of top coat formulations, choice of polymers for surface protection, role of plasticizers, internal and external plasticizers.

Principles of feel modification of polymer surfaces, types of feel modifiers and matting agents.

Manufacturing techniques.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

The students will be able to understand the structure and properties of various leather auxiliaries and its application in leather proceeding.

CO-1 To gain knowledge on different leather auxiliaries used in leather manufacturing

CO-2 Have knowledge in the preparation of different types of tanning agents

CO-3 Understand the chemistry of oil and oil modification for the leather lubrication

CO-4 Understand chemistry and application of different dyes and pigments used in leather manufacturing

CO-5 Have knowledge on the chemistry of finishing chemicals

**TEXT BOOKS AND REFERENCES**


1. Fred O Flaherty, Roddy, T.W. and Lollar, R.M. `The Chemistry and Technology of Leather', Vol.II, Type of tannages, Rober E. Krieger Publishing Co., New York, 1978.
2. Gustavson, K.H. `Chemistry of Tanning Processes' Academic Press, New York, 1958.
3. Venkataraman , K. `Chemistry of Synthetic Dyes', Academic Press, New York and Lond, 1971.
4. Myers, R.R., and Lond, J.S. `Treatise on Coatings', Marcel Dekker, New York, 1975.

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | To gain knowledge on different leather auxiliaries used in leather manufacturing | 3 | 1 | 1 | - | 2 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | - | 3 | 2 |
| CO-2 | Have knowledge in the preparation of different types of tanning agents | 3 | 1 | 1 | - | 3 | - | 2 | 1 | 1 | 1 | 2 | 1 | - | 3 | 2 |
| CO-3 | Understand the chemistry of oil and oil modification for the leather lubrication | 3 | 1 | 1 | - | 1 | 2 | 1 | 1 | 1 | 1 | - | 1 | 2 | 3 | 2 |
| CO-4 | Understand chemistry and application of different dyes and pigments used in leather manufacturing | 3 | 1 | 1 | - | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 2 |
| CO-5 | Have knowledge on the chemistry of finishing chemicals | 3 | 1 | 1 | - | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 2 |

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

## LT7711 LEATHER FOOTWEAR – DESIGN AND FABRICATION LABORATORY

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 6 | 3 |

**AIM**

To provide practical training in fabrication of leather footwear.

Leather Assortment
Layout preparation
Preparation and cutting
Upper preparation
Pre Assemble operation
Closing Operation
Bottom Stock Preparation
Lasting and Finishing
Practice in CAD/CAM and pattern grading using machine.
Practice in classic shoe making; moccasin construction; practice in shoe finishing

**TOTAL : 90 PERIODS**

**OUTCOMES**

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

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

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Have practical experience in the design and fabrication of footwear. | 2 | 3 | 2 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 3 | 2 |
| CO-2 | Have practical knowledge of cutting and clicking process. | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 3 | 2 |
| CO-3 | Have practical knowledge on lasting and finishing process. | 2 | 3 | 2 | 1 | 2 | - | - | 1 | 2 | 1 | - | 2 | - | 3 | 2 |

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

**LT7712 INDUSTRIAL INTERNSHIP - II**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

Each student during should undertake 1 month practical training in leather and or leather products manufacturing unit as a part of Industrial Internship – II during the summer vacation after sixth semester. However evaluation for this course will be done in seventh semester. During seventh semester the student should submit (to assigned faculty) an industrial training report on practical internship undertaken by/assigned to him/her by the Department. The report should be based on the practical experience gained at the industry duly certified by the issuing authority at the training centre of leather industry. The objective of the training is to enhance the practical knowledge of the students on various aspects associated with leather and or leather products manufacture. Faculty in his/her assessment should judge the level of proficiency, originality and capacity for application of the practical knowledge attained by the student during the training period.

**OUTCOMES**

CO-1 Provides real work experience

CO-2 Opportunity to explore students' interest

CO-3 Students will be able to integrate classroom knowledge and theory with practical application

CO-4 Provides a nice learning curve for students with little experience

CO-5 Develops professional skills and competencies

**TOTAL DURATION: 4 WEEKS**

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Provides real work experience | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 1 | 1 | 3 | 1 | 2 | 3 |
| CO-2 | Opportunity to explore students' interest | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 3 | 1 | 1 | 3 | 1 | 1 | 3 |
| CO-3 | Students will be able to integrate classroom knowledge and theory with practical application | 3 | 1 | 3 | 2 | 2 | - | 2 | 2 | 3 | 1 | 1 | 3 | 2 | 2 | 3 |
| CO-4 | Provides a nice learning curve for students with little experience | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 1 | 1 | 3 | 3 | 2 | 3 |
| CO-5 | Develops professional skills and competencies | 3 | 2 | - | 2 | 2 | 3 | 2 | 2 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |

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

**LT7713** **MINI PROJECT** **L T P C**
**0 0 4 2**

The objective of the project is to make use of the knowledge gained by the student at various stages of the degree programme. This helps to judge the level of proficiency, originality and capacity for application of the knowledge attained by the student at the end of the programme. Each student is required to submit a report on the project undertaken by and assigned to him by the Department. The report should be based on the information available in the literature, plan of work and/or preliminary data determined in the laboratory/industry.

**VIVA VOCE**

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

**OUTCOMES**

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

**TOTAL : 60 PERIODS**

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Apply the fundamental concept learnt during the theory courses | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 1 | 1 | 3 |
| CO-2 | Identification of industrial problems | 3 | 3 | 2 | 3 | 2 | 1 | 1 | 2 | 2 | 2 | - | 3 | 3 | 1 | 3 |
| CO-3 | Review of literature | 3 | 3 | 2 | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | 3 | 2 | 2 | 3 |
| CO-4 | Identify the Knowledge gap | 3 | 3 | 2 | 3 | 2 | - | - | 2 | 2 | 2 | 1 | 3 | 2 | 3 | 3 |
| CO-5 | Ability to plan and design process for the current problem | 3 | 3 | 2 | 3 | 2 | - | - | 2 | 2 | 2 | - | 3 | 2 | 3 | 3 |

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

| LT7811 | PROJECT WORK | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 20 | 10 |

The objective of the project is to make use of the knowledge gained by the student at various stages of the degree programme. This helps to judge the level of proficiency, originality and capacity for application of the knowledge attained by the student at the end of the programme. Each student is required to submit a report on the project undertaken by and assigned to him by the Department. The report should be based on the information available in the literature, plan of work, experimental details, data determined in the laboratory/industry, results, discussion of the data presented, conclusion and future work. Proper bibliographic details are necessary in the report.

**VIVA VOCE**

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

**OUTCOMES**

CO-1 Ability to identify a problem and define project objectives

CO-2 Ability to plan and execute work

CO-3 Ability to collect data and compile results

CO-4 Ability to analyse the results

CO-5 Ability to present and communicate the findings effectively

**TOTAL : 280 PERIODS**

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Ability to identify a problem and define project objectives | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 1 | 2 | 3 |
| CO-2 | Ability to plan and execute work | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 3 | 3 | 3 | 3 | 1 | 1 | 3 |
| CO-3 | Ability to collect data and compile results | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 3 |
| CO-4 | Ability to analyse the results | 3 | 3 | 3 | 3 | 2 | 2 | - | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| CO-5 | Ability to present and communicate the findings effectively | 3 | 3 | 3 | 3 | 2 | 2 | - | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

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

**LT7001 ADVANCED PHYSICS AND CHEMISTRY OF LEATHER – I (APCL–I)** **L T P C**
**3 0 0 3**

**AIM**

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

**OBJECTIVES**

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

**UNIT I** **10**

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

**UNIT II** **10**

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

**UNIT III** **7**

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

**UNIT IV** **9**

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

**UNIT V** **9**

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

**TOTAL : 45 PERIODS**

**OUTCOMES**

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

**TEXT BOOKS AND REFERENCES**


1. Flaherty, O. Roddy, T.W., Lollar, R.M., `The Chemistry & Technology of Leather', Vol.1, E. Robert Krieger Publishing Co., New York 1978.
2. Gustavson, K.H., `The Chemistry & Reactivity of Collagen', Academic Press, New York, 1958.
3. Ramachandran, G.N., `Treatise on the Biology of Collagen, Academic Press, New York, 1967.
4. Krishnan, V, Ed. 'Trends in Collagen', Proceedings of the Indian Academy of Sciences (Chemical Sciences), Vol. 111, No. 1, Indian Academy of Sciences, Bangalore, 1999.

**Course Articulation Matrix:**

| CO | **Statement** | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Have comprehensive knowledge on the chemistry and physics of Skin. | 3 | 3 | 1 | 1 | 1 | 1 | 2 | 3 | 1 | 1 | 1 | 2 | 3 | 1 | 1 |
| CO-2 | Understand the molecular architecture, hydration, swelling, phase transitions, dimensional stability, relaxation, shrinkage. | 3 | 3 | 2 | 1 | 1 | - | 2 | 2 | 1 | 1 | 1 | 2 | 3 | 1 | 1 |
| CO-3 | Have knowledge on cross-linking phenomena of collagen/processed collagen/leather. | 3 | 3 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 2 | 3 | 2 | 1 |
| CO-4 | Ability to analyze the various thermo-mechanical properties of collagen | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 1 |
| CO-5 | Comprehend the electromagnetic and high energy radiation on collagen | 3 | 3 | - | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 2 | 3 | 3 | 1 |

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

**LT7002 ADVANCED PHYSICS AND CHEMISTRY OF LEATHER - II L T P C**
**(Prerequisite: Elective APCL-II) 3 0 0 3**

**AIM**

To attempt micro-level understanding of leather making

**OBJECTIVES**

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

**UNIT I** **6**

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

**UNIT II** **9**

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

**UNIT III** **15**

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

**UNIT IV** **6**

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

**UNIT V** **9**

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

**TOTAL : 45 PERIODS**

**OUTCOMES**

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

**TEXT BOOKS AND REFERENCES**


1. Fred O, Flaherty, Roddy, T.W Roddy and Robert M. Lollar Ed., `The Chemistry of Technology of Leather', Robert E. Krieger Publishing Co., New York 1978.
2. Bienkiewicz, `Physical Chemistry of Leather Manufacture' Krieger, Floridaa, 1982.
3. Gustavson, K.H., `Chemistry of Tanning Processes', Academic Press, New York, 1958.
4. Krishnan, V, Ed. 'Trends in Collagen', Proceedings of the Indian Academy of Sciences (Chemical Sciences), Vol. 111, No. 1, Indian Academy of Sciences, Bangalore, 1999.

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Have an appreciation and understanding on the underpinning scientific concept on skin and leather | 3 | 3 | 1 | 1 | 1 | 1 | 2 | 3 | 1 | 1 | 1 | 2 | 3 | 1 | 1 |
| CO-2 | Understand the diffusion and transport phenomena | 3 | 3 | 2 | 1 | 1 | - | 2 | 2 | 1 | 1 | 1 | 2 | 3 | 1 | 1 |
| CO-3 | Have knowledge on molecular behavior of collagen | 3 | 3 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 2 | 3 | 2 | 1 |
| CO-4 | Acquire knowledge on molecular level changes and dimensional changes in leather making | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 1 |
| CO-5 | Obtaining coherent knowledge on surface science applications with leather making | 3 | 3 | - | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 2 | 3 | 3 | 1 |

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

**LT7005 CONSUMER BEHAVIOUR AND BUSINESS ORIENTATION L T P C**
**3 0 0 3**

**AIM**

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

**OBJECTIVE**

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

**UNIT I**

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

**UNIT II**

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

**UNIT III**

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

**UNIT IV**

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

**UNIT V**

Advertising Promotion – Consumer impact on marketing, marketing impact on consumer, impact of communication on changing consumer attitude. Shopping environment – social, physical and environ. Fashion – behavioural perspective, cycles of fashion adoption,. Segmentation, Target and positioning (STP). Consumer behaviour and Marketing Mix – 4 P. Creating and sustaining brand personality. Subliminal messaging and persuasion of consumers. Creating "Buzz" to influence consumer behaviour.

**TOTAL : 45 PERIODS**

**OUTCOMES**

CO-1 To acquire knowledge on consumer behavior
CO-2 Ability to empathize social impact on consumer
CO-3 To acquire knowledge on marketing strategy
CO-4 Comprehensive understanding psychological impact on consumer
CO-5 Ability to Interpret data analysis and research opportunity

**REFERENCES**


1. Consumer Behavior 9th Edition Leon and Schiffman and Leslie Lazar Knuk, Pearson Education Blackwell: Consumer Behaviour, 10e, Thomson 2007
2. Consumer Behaviour- Suja Nair - Himalaya Publishers. Assael: Consumer Behaviour, 6e Thomson 2006
3. Research for Marketing decisions- Paul, Donald, Herald- Prentice Hall (India) Zikmund: Exploring Marketing Research, 8e, Thomson 2006
4. Naresh K.Malhotra, Marketing Research, An applied Orientation, Pearson Education Asia. Panda, Shiba Charan, Entrepreneurship Development, New Delhi, Anmol Publications.
5. Patel, V.G., The Seven Business Crises and How to Beat Them, Tata-Mcgraw,New Delhi, 1995.
6. Verma, J.C.., and Gurpal Singh, Small Business and Industry-A Handbook for Entrepreneurs, Sage, New Delhi, 2002

**Course Articulation Matrix:**

| CO | **Statement** | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Acquire knowledge on consumer behavior | - | - | - | - | 2 | - | 2 | 3 | 3 | 3 | - | - | 3 | - | 3 |
| CO-2 | Understand social impact on consumer | - | - | - | - | 2 | - | 2 | 3 | 3 | 3 | - | - | 3 | - | 3 |
| CO-3 | Acquire knowledge on marketing strategy | - | - | - | - | 2 | - | 2 | 3 | 3 | 3 | - | - | 3 | - | 3 |
| CO-4 | Understand psychological impact on consumer | - | - | - | - | 2 | - | 2 | 3 | 3 | 3 | - | - | 3 | - | 3 |
| CO-5 | Interpret data analysis and research opportunity | - | - | - | - | 2 | - | 2 | 3 | 3 | 3 | - | - | 3 | - | 3 |

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

**LT7006 ECO-BENIGN OPTIONS FOR LEATHER PROCESSING L T P C**
**3 0 0 3**

**AIM**

To impart knowledge on ecofriendly options for leather processing.

**OBJECTIVE**

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

**UNIT I CLEANER PROCESSING - BEAMHOUSE 12**

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

**UNIT II CLEANER PROCESSING: TANNING 10**

Less chrome and chrome-free tanning systems. Latest concepts and trends in leather processing.

**UNIT III CLEANER PROCESSING: POST TANNING 8**

Formaldehyde, Phenol, AOX free post tanning systems; Latest concepts and trends in leather processing.

**UNIT IV INTEGRATED CLEANER PROCESSING 8**

Cleaner processing based on Eco-labelling. Integrated strategies to achieve permissible BOD, COD and TDS standards of tannery effluents.

**UNIT V ADVANCED CLEANER FINISHING TECHNIQUES 7**

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

**TOTAL : 45 PERIODS**

**OUTCOMES**

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

**REFERENCES**

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

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Have knowledge on the cleaner process technology in the leather processing. | 1 | 2 | 2 | 1 | 3 | 1 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 3 | - |
| CO-2 | Understand the cleaner tanning, post tanning and finishing systems. | 1 | 2 | 2 | 1 | 3 | 1 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 3 | - |
| CO-3 | Have knowledge on the fundamentals of bio beam house processing. | 1 | 2 | 2 | 1 | 3 | 1 | 3 | 2 | 1 | 1 | 1 | 1 | 0 | 3 | 2 |
| CO-4 | Acquire knowledge on latest trends in leather processing | 2 | 2 | 3 | 1 | 3 | 1 | 3 | 2 | 1 | 1 | 1 | 1 | 0 | 3 | 3 |
| CO-5 | To understand the finishing techniques for better utilization | 1 | 2 | 2 | 1 | 3 | 1 | 3 | 2 | 1 | 1 | 1 | 1 | 3 | 3 | 3 |

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

**LT7007 ENGINEERING ECONOMICS AND FINANCE MANAGEMENT L T P C**
**3 0 0 3**

**AIM**

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

**UNIT I FINANCIAL ACCOUNTING 13**

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

**UNIT II PROFIT VALUE ANALYSIS 10**

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

**UNIT III WORKING CAPITAL MANAGEMENT 8**

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

**UNIT IV CAPITAL BUDGETING 8**

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

**UNIT V ENGINEERING ECONOMICS 7**

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

**TOTAL : 45 PERIODS**

**OUTCOMES**

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

**TEXT BOOKS**

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

**REFERENCES**

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

**Course Articulation Matrix:**

| CO | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Understand the financial management and economics. | - | - | 2 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | 3 | - | 3 |
| CO-2 | Understand the profit value analysis | - | - | 2 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | 3 | - | 3 |
| CO-3 | Have knowledge in capital management and engineering economics | - | - | 2 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | 3 | - | 3 |
| CO-4 | Ability to identify the accounting rate of return method | - | - | 2 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | 3 | - | 3 |
| CO-5 | To analyse demand laws | - | - | 2 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | 3 | - | 3 |

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

**LT7008 ENTERPRISE RESOURCE PLANNING FOR LEATHER SECTOR L T P C**
**3 0 0 3**

**AIM**

To introduce enterprise resource planning principles to leather technologists.

**OBJECTIVE**

- The objective of this course is to teach the principles of ERP technologists involved in enterprise resource and various 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 & VENDORS 10**

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

**UNIT IV ERP IMPLEMENTATION LIFE CYCLES 10**

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

**UNIT V ERP CASE STUDIES 6**

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

**TOTAL : 45 PERIODS**

**OUTCOMES**

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

**REFERENCES**

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

**Course Articulation Matrix:**

| CO | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Have knowledge on ERP and related technologies | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 2 | 1 | 2 | 1 | - | 3 | 3 |
| CO-2 | Understand the ERP implementation life cycles | 1 | 1 | 1 | 1 | - | 3 | 1 | 1 | 2 | 1 | 1 | - | - | 3 | 3 |
| CO-3 | Understand the ERP case studies | - | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 2 | 1 | 3 | 2 | 1 | 3 | 3 |
| CO-4 | Have thorough knowledge on Quality management and ERP market | 1 | 1 | 1 | 1 | 2 | 3 | 1 | 1 | 2 | 1 | 2 | - | 2 | 3 | 3 |
| CO-5 | Understand the growth and advantages of ERP | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 2 | 1 | 2 | 2 | 2 | 3 | 3 |

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

**LT7009 ENTREPRENEURSHIP FOR LEATHER SECTOR L T P C**
**3 0 0 3**

**AIM**

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

**OBJECTIVE**

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

**UNIT I** **8**

Entrepreneurs – Mindset, character, motivation. Competencies - creativity, innovation, risk taking, leadership, communication. Negotiation and networking skill. Myths about entrepreneurs; benefits and drawbacks of entrepreneurship. Reasons for a venture failure. Successful first generation entrepreneurs in leather sectors – case study.

**UNIT II** **8**

Business Plan - Generating idea; converting an idea into business venture. Conducting feasibility analysis – Financial, Commercial, Technical, Environmental and Legal. Developing a business plan for leather and leathers products. Presenting a business plan to investors to pitch for funds.

**UNIT III** **10**

Business Finance – Forms of ownership, Financial projections and pro- forma of profit and loss account, cash flow statements; production and marketing budgets. Capital budgeting and investment analysis, breakeven point and sensitivity analysis to decide on a tannery proposal. Source of funds – own funds, banks , long term development financial institutions, Angel investors, Venture Capitalist, Public issue (IPO). Taxes - VAT, Service Taxes, Excise and Customs duties, CST, GST (proposed), tax exemptions for exports and SEZ. Controlling business - working capital control and cost control; inventory, procurement and receivables control. Quality control. Sales and marketing expenses control. SCM for leather sector.

**UNIT IV** **9**

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

**UNIT V** **10**

Building Business – Market plan, market research, competitive analysis, formulating competitive marketing strategy – Segmenting, Targeting and Positioning of the brand.. Formulating marketing mix – 4 P. Personal selling, managing a sales team. Distribution and CRM Strategy. New Product development. E-commerce fundamentals; strategy for expansion. Franchising - benefits and drawbacks of franchising. Global marketing – overseas marketing strategies; export documentation. Mergers and Acquisitions – synergy and valuation. Intellectual Property - patterns, trademarks, copy rights and trade secrets to grow the business in leather sector.

**TOTAL : 45 PERIODS**

**OUTCOMES**

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

**REFERENCES**


1. Entrepreneurship - D.F. Kuratko and T.V.Rao – Cengage Learning -2012 ; ISBN – 978-81-315-1716-1
2. Entrepreneurial Development – Dr. S.S. Khanna - S. Chand -2012 ISBN – 81- 219-1801-4
3. Handbook for New Entrepreneurs – P.C. Jain – Entrepreneurship Development Institute of India – 2010; ISBN:13 : 978-0-19-565224-6
4. Essentials of Entrepreneurship and Small Business Management – Thomas W. Zimmerer, Norman M. Scarborough – PHI Learning Ltd New Delhi. ISBN : 978 – 81- 203-3911-8
5. http://smallb.in/entrepreneurship - A SIDBI initiative
6. http://business.gov.in/ - Business Knowledge Resources for SMEs
7. http://www.dcmsme.gov.in/ - Development Commissionaire (MSME) Ministry of Small Micro Medium Industries

**Course Articulation Matrix:**

| CO | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Have knowledge on entrepreneurial tasks such as, generating idea, planning business | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 3 | 1 | 1 | 2 | - | - | 3 |
| CO-2 | Have knowledge on financial management | - | 1 | 2 | 1 | - | 2 | 1 | 2 | 3 | 1 | 1 | 3 | - | 2 | 3 |
| CO-3 | Understand the organizational management and business development strategies | 1 | 1 | 2 | 1 | 3 | 2 | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 2 | 3 |
| CO-4 | Acquire knowledge to enhance the productivity | 1 | 1 | 2 | 1 | 2 | 2 | 1 | 2 | 3 | 1 | 1 | 2 | 2 | 3 | 3 |
| CO-5 | Have knowledge on Intellectual property | 1 | 1 | 2 | 1 | 2 | 2 | 1 | 2 | 3 | 1 | 1 | 2 | 2 | 3 | 3 |

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

**LT7010 FASHION FORCASTING FOR LEATHER AND LEATHER PRODUCTS L T P C**
**3 0 0 3**

**AIM**

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

**OBJECTIVES**

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

**UNIT I HISTORICAL EVALUATION & INTERNATIONAL TRENDS 10**

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

**UNIT II FASHION CONSIDERATIONS 9**

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

**UNIT III PRODUCT DEVELOPMENT 9**

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

**UNIT IV PRESENTATION TECHNIQUES 9**

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

**UNIT V FASHION FORECAST 8**

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

**TOTAL : 45 PERIODS**

**OUTCOMES**

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

**REFERENCES**


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

**Course Articulation Matrix:**

| CO | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Have knowledge on international trends and fashion considerations in leather | - | - | - | - | 3 | 3 | - | 3 | - | - | - | 3 | - | 3 | 3 |
| CO-2 | Understand the leather products styling. | - | - | - | - | 3 | 3 | - | 3 | - | - | - | 3 | - | 3 | 3 |
| CO-3 | Have knowledge on fashion forecast | - | - | - | - | 3 | 3 | - | 3 | - | - | - | 3 | - | 3 | 3 |
| CO-4 | Thorough knowledge on promotional activities | - | - | - | - | 3 | 3 | - | 3 | - | - | - | 3 | - | 3 | 3 |
| CO-5 | To impart market research and track record | - | - | - | - | 3 | 3 | - | 3 | - | - | - | 3 | - | 3 | 3 |

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

**LT7011 HUMAN RESOURCE DEVELOPMENT L T P C**
**3 0 0 3**

**AIM**

To impart human resource management skills to the students.

**OBJECTIVES**

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

**UNIT I MANAGEMENT AND GENERAL EMPLOYMENT PRACTICES 15**

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

**UNIT II STAFFING 6**

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

**UNIT III HUMAN RESOURCE DEVELOPMENT 7**

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

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

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

**UNIT IV COMPENSATION AND BENEFITS 5**

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

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

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

**TOTAL : 45 PERIODS**

**OUTCOMES**

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

**TEXT BOOKS AND REFERENCES**

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

**Course Articulation Matrix:**

| CO | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Have knowledge on management and employment practices | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 3 | 1 | 1 | 2 | - | - | 3 |
| CO-2 | Aware of fundamentals of human resource development | - | 1 | 2 | 1 | - | 2 | 1 | 2 | 3 | 1 | 1 | 3 | - | 2 | 3 |
| CO-3 | Understand the management concepts and relate them to contemporary issues | 1 | 1 | 2 | 1 | 3 | 2 | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 2 | 3 |
| CO-4 | Understand competency and various contemporary issues | 1 | 1 | 2 | 1 | 2 | 2 | 1 | 2 | 3 | 1 | 1 | 2 | 2 | 3 | 3 |
| CO-5 | Vast knowledge on occupational safety and labour laws | 1 | 1 | 2 | 1 | 2 | 2 | 1 | 2 | 3 | 1 | 1 | 2 | 2 | 3 | 3 |

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

**LT7012 INTERNATIONAL MARKETING AND FOREIGN TRADE L T P C**
**3 0 0 3**

**AIM**

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

**OBJECTIVE**

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

**UNIT I** **9**

Basics of International trade - India's trade policy, International trade and Monetary Systems-Marketing Services in International trade Pricing and trade cycles-Precautionary measures to prevent fraud in International trade - International trade Multimodal Transport Operations-Consumer Behavior and Role of international Marketing- Indian market Analysis.

**UNIT II** **11**

Introduction-Import to India-An over view, Import and the Customs in India-Importation of Goods, Customs Duty and Exemptions-Valuation of Goods under Customs, Clearance of Imported Goods and Goods in Transit-Warehousing of Goods, Import into India.

India's new foreign trade Policy -Legal frame work of foreign trade Policy-Special focus - General provision on Import and Export-Promotional Measures- Duty exemption/ Duty remission scheme EPCG Scheme -EOU/ EHTP/ STP/ BTP- SEZs.

**UNIT III** **11**

Marketing concepts and Import-Forms of organization in Import and domestic Trade- Products, Sales forecasting and sales Management-pricing, Promotion, Branding and Advertising.

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

**UNIT IV** **5**

The Customs Tariff Act-Exemptions in Import-by UN and its agencies and their officials-Import by UN or international organizations for execution of projects in India-Imports by Government Diplomats, Trade representatives etc.-Customs Tariff

**UNIT V** **9**

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

**TOTAL : 45 PERIODS**

**OUTCOMES**

CO-1 Understand the basics of international trade, government policies in export
CO-2 Have knowledge on aspects of world trade related to leather sector and custom tariff
CO-3 Understand the international marketing
CO-4 Thorough knowledge on India's new foreign trade Policy
CO-5 Perceive marketing management and promotion decisions

**TEXT BOOKS**


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

**Course Articulation Matrix:**

| CO | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Understand the basics of international trade, government policies in export | - | - | 2 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | 3 | - | 3 |
| CO-2 | Have knowledge on aspects of world trade related to leather sector and custom tariff | - | - | 2 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | 3 | - | 3 |
| CO-3 | Understand the international marketing | - | - | 2 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | 3 | - | 3 |
| CO-4 | Thorough knowledge on India's new foreign trade Policy | - | - | 2 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | 3 | - | 3 |
| CO-5 | Perceive marketing management and promotion decisions. | - | - | 2 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | 3 | - | 3 |

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

**LT7013 LEATHER AND LEATHER PRODUCTS COSTING L T P C**
**3 0 0 3**

**UNIT I** **9**
Cost accounting, elements of cost, classification of cost elements – examples from textile industry, methods of costing

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

**UNIT III** **17**
Costing of leather and leather products – material, labour, power and overhead expenses

**UNIT IV** **9**
Foreign exchange mechanisms, exchange rates; foreign exchange exposure management – risks, strategies to reduce risk

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

**TOTAL : 45 PERIODS**

**OUTCOMES**

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

**REFERENCES**

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

**Course Articulation Matrix:**

| CO | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Manage the costing of leather and leather products. | 2 | 1 | - | - | 1 | 2 | 2 | 1 | 1 | 1 | - | 2 | 1 | 3 | - |
| CO-2 | Have knowledge on budget management | 2 | 2 | 3 | - | 3 | - | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 3 | - |
| CO-3 | Understand the risk analysis of foreign exchange. | 3 | 2 | - | - | 3 | 1 | - | 1 | 1 | 1 | - | 2 | - | 3 | 2 |
| CO-4 | Able to analyse costing | 2 | 3 | 2 | - | 2 | 1 | 1 | 1 | 1 | 1 | 3 | 2 | - | 3 | 3 |
| CO-5 | Perceive cost accounting and various methods of costing | 3 | 2 | 1 | - | 1 | 1 | 1 | 1 | 1 | 1 | - | 2 | 3 | 3 | 3 |

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

**LT7014 LEATHER AND PRODUCT MERCHANDISING L T P C**
**3 0 0 3**

**AIM**

To impart knowledge on leather products merchandising that relates to the domestic and global leather and leather product merchandising.

**OBJECTIVES**

To understand

- Fundamentals of purchasing
- Retail sector
- Global Market

**UNIT I PRINCIPLES OF MARKETING MANAGEMENT 9**

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

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

**UNIT II PURCHASING PRINCIPLES AND MANAGEMENT 9**

Purchasing scope and development - Strategic aspects of purchasing - Key purchasing -variables consideration - Purchasing negotiations & competitive – Bidding - Outsourcing -purchasing operation - Buying capital goods & services - Purchasing for resale - Purchasing systems and technology - Evaluation of purchasing performance - Purchasing ethics and legal issues

**UNIT III PRINCIPLES AND PRACTICE OF MERCHANDISING 9**

Merchandising concepts, technology, systems, planning - Merchandise pricing and budgeting, sample handling - Managing merchandise assortments - Developing and - presenting product lines - Introduction to shipping operation

**UNIT IV RETAIL SECTOR OF LEATHER 9**

Overview of retailing; Changing retail environment - Typology of retail buying - Understanding the consumer - Competitive strategies in the retail industry - Retail location strategy; Store layout & Design - Product planning and selection; Inventory management - Retail pricing; Retail communication - Customer Service

**UNIT V GLOBAL SOURCING OF LEATHER 9**

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

**TOTAL : 45 PERIODS**

**OUTCOMES**

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

**REFERENCES**


1. Apparel Product Design and Merchandising Strategies by Cynthia L. Regan. Publisher: Prentice Hall
2. Integrated Retail Management by James R. Ogden & Denise T. Ogden, 2007, Biztantra Retail Management – Levy & Weitz-TMH 5th Edition 2002
3. Charles W L Hill. And Arun Kumar Jain. International Business: competing in the global market place, Mc Graw-Hill, 2007.
4. John D. Daniels Lee H Radebaugh, International Business: Environments and Operations Addison Wesley, 2007.
5. Justin Paul – International Business – Prentice Hall of India, 2007 Oded Shenkar Yadong Luo : International Business – John Wiley & Co., 2006

**Course Articulation Matrix:**

| CO | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Understand the basic principles of marketing management | 3 | 1 | - | - | 1 | 1 | 2 | 1 | 1 | 1 | - | 2 | 1 | 3 | - |
| CO-2 | Understand the purchasing principles and management | 2 | 2 | 3 | - | 3 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 3 | - |
| CO-3 | Fundamentals of procurement and merchandising | 2 | 2 | - | - | 3 | 1 | - | 1 | 1 | 1 | - | 2 | - | 3 | 2 |
| CO-4 | Basic knowledge of Retail sector | 2 | 3 | 2 | - | 2 | 1 | 1 | 1 | 1 | 1 | 3 | 2 | - | 3 | 3 |
| CO-5 | Knowledge of Global Marketing and Global sourcing | 3 | 2 | 1 | - | 1 | 1 | 1 | 1 | 1 | 1 | - | 2 | 3 | 3 | 3 |

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

**LT7015 LEATHER PRODUCTS MACHINERY L T P C**
**3 0 0 3**

**AIM**

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

**OBJECTIVES**

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

**UNIT I HAND TOOLS AND MACHINES 8**

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

**UNIT II MACHINES FOR SHOE AND FOOTWEAR CONSTRUCTION 8**

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

**UNIT III TRANSPORT SYSTEM 5**

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

**UNIT IV AUTOMATION IN LEATHER PRODUCT MACHINES 11**

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

**UNIT V MODULAR MANUFACTURING AND LAYOUT 13**

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

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

**TOTAL : 45 PERIODS**

**OUTCOMES**

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

**REFERENCES**

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

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Understand the working principles of various machinery used in leather. | 2 | 1 | - | - | 1 | 1 | 1 | 1 | 1 | 1 | - | 2 | 1 | 3 | - |
| CO-2 | Understand the principles and operation of Leather Processing Machineries | 2 | 2 | 3 | - | 3 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 3 | - |
| CO-3 | Understand the principles and operation of Leather Products Machineries | 2 | 2 | - | - | 3 | 1 | 1 | 1 | 1 | 1 | - | 2 | - | 3 | 2 |
| CO-4 | Know about transport systems and automation in leather product manufacture | 2 | 3 | 2 | - | 2 | 1 | 1 | 1 | 1 | 1 | 3 | 2 | - | 3 | 3 |
| CO-5 | Aware of layout and maintenance of tannery and leather product unit. | 2 | 2 | 1 | - | 1 | 1 | 1 | 1 | 1 | 1 | - | 2 | 3 | 3 | 3 |

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

**LT7016 ORGANISATION AND MANAGEMENT OF LEATHER MANUFACTURE L T P C**
**3 0 0 3**

**UNIT I TRENDS IN LIVESTOCK POPULATION 5**

Social relevance and historical growth of leather sector. Categories of livestock, global distribution, India's share, distribution livestock in India, growth rates, trends and relative importance, projections.

**UNIT II AVAILABILITY AND MARKETING OF HIDES AND SKINS 10**

Concepts, global availability, India's share in the world, trends in meat production and consumption practices, fallen animal recovery systems, off-take rates (slaughter and mortality rates), availability of hides and skins, projections

Collection and mobilization of hides and skins, Origin and characteristics, Transportation, Grading systems, Pricing, major markets and sourcing of hides and skins, Broad features of marketing.

**UNIT III STRUCTURE OF TANNING INDUSTRY AND LEATHER PRODUCT INDUSTRIES IN INDIA 10**

Distribution of tanneries in India, scale of operation, type of ownership, line of specialization, capacity and production, employment pattern, industrial policy, environmental issues, leather complexes, Categories of products, distribution of footwear, leather garments, leather goods industries, scale of operation, ownership pattern, capacity and production, industrial policy, employment, exports and domestic market.

**UNIT IV INDIA'S FOREIGN TRADE AND POLICY 5**

Economic and social importance of leather sector, trade terms, trends in the exports, major importing countries, imports of India, review of trade policy and impact.

**UNIT V GLOBAL MARKET FOR LEATHER AND LEATHER PRODUCTS 15**

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

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

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

**TOTAL : 45 PERIODS**

**OUTCOMES**

CO-1 Have knowledge in raw material resource management
CO-2 Have knowledge about leather industry in India and world
CO-3 Understand the domestic trade management in leather
CO-4 Understand the international trade management in leather
CO-5 Have knowledge on industry, trade management and development strategy in leather

**TEXT BOOKS AND REFERENCES**


1. Report of All India Survey on Raw Hides and Skins, CLRI, 1987 and 2004
2. Report on Capacity Utilisation and Scope for modernization of Indian tanning industry , CLRI, 1990
3. Report of the Committee on The Development of Leather and Leather Manufactures for Exports (Seetharamaiah Committee Report) , Govt of India 1972
4. Report of the Nation wide Survey on Leather Product Units in India, CLRI, 1997.
5. Thyagarajan, G, Srinivasan, A.V. and Amudeswari, A., "Indian Leather 2010, A technology, Industry and Trade Forecast', CLRI, Madras 1994.
6. Bulletins of India's Foreign Trade in Leather and Leather Products , CLRI
7. Sadulla, S. The Leather Industry Kothari's Desk book Series, H.C. Kothari Group (Publications Division), Madras 1995.

**Course Articulation Matrix:**

| CO | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Have knowledge in raw material resource management | 2 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | - | 3 | 3 |
| CO-2 | Have knowledge about leather industry in India and world | 1 | 1 | 1 | - | 1 | 3 | 1 | 1 | 1 | 1 | 3 | 1 | - | 3 | 3 |
| CO-3 | Understand the domestic trade management in leather | 1 | 1 | 1 | 2 | 1 | 3 | 1 | 1 | 3 | 1 | 2 | 1 | 1 | 3 | 3 |
| CO-4 | Understand the international trade management in leather | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 3 | 3 |
| CO-5 | Have knowledge on industry, trade management and development strategy in leather | - | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 3 | 3 |

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

**LT7018 SAFETY IN LEATHER INDUSTRIES L T P C**
**3 0 0 3**

**AIM**

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

**OBJECTIVES**

To understand

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

**UNIT I SAFETY PHILOSOPHY, HAZARD IDENTIFICATION AND ASSESSMENT 10**

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

**UNIT II SAFETY IN USE OF HAZARDOUS SUBSTANCES AT WORK 8**

Chemical and biological hazards in the work place in the leather industry; Health effects of chemical and biological exposure Hazard information systems on hazardous substances (material safety data sheets, labelling) Workplace exposure monitoring and evaluation Hazard prevention and control measures (storage, handling and disposal) in the leather industry.

**UNIT III PRODUCTIVE MACHINE SAFETY IN THE LEATHER INDUSTRY, WORK ECOLOGY AND ERGONOMICS 17**

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

**UNIT IV EMERGENCY PREVENTION AND PREPAREDNESS 7**

Planning for emergencies; Control of fire and explosion; Dealing with medical emergencies

**UNIT V SAFETY & HEALTH MANAGEMENT AND PROMOTION 3**

Promoting safety & health practices at the workplace (training, safety and warning signs); Role and responsibilities of managers, supervisors and workers.

**TOTAL : 45 PERIODS**

**OUTCOMES**

CO-1 Acquire knowledge on legal framework of safety and health in India and international conventions

CO-2 To understand Hazard identification and assessment methods

CO-3 Have knowledge on machinery safety's in the leather industry

CO-4 Comprehensive knowledge on Work ecology and ergonomics

CO-5 Acquire familiarity on emergency prevention and preparedness safety and health management

**REFERENCES**


1. Jeannie Mager Stellmann, Encyclopaedia of Occupational Safety & Health, 4th edition, International Labour Office, Geneva 1999.
2. J. Buljan, A Sahasranaman, J Hannak, Occupational Safety and Health Aspects of Leather Manufacture, 1st edition, United Nations Industrial Development Organization, Chennai, 1998.
3. CLRI, Safety Manual on Leather Processing, 1st edition, Central Leather Research Institute, Chennai, 1999.

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Acquire knowledge on Legal framework of safety and health in India and international conventions | 1 | 3 | - | - | 2 | 1 | 2 | 2 | 1 | 1 | - | 2 | - | 3 | - |
| CO-2 | To understand Hazard identification and assessment methods | 1 | 3 | 1 | 1 | 2 | 1 | 2 | 2 | 1 | 1 | - | 2 | - | 3 | - |
| CO-3 | Have knowledge on machinery safety's in the leather industry | 1 | 3 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 1 | - | 2 | 1 | 3 | 2 |
| CO-4 | Comprehensive knowledge on Work ecology and ergonomics | 1 | 3 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 1 | - | 2 | 2 | 3 | 3 |
| CO-5 | Acquire familiarity on emergency prevention and preparedness safety and health management | 1 | 3 | - | - | 2 | 1 | 2 | 2 | 1 | 1 | - | 2 | 2 | 3 | 3 |

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

**LT7019 SCIENCE AND TECHNOLOGY OF LEATHER SUPPLEMENTS AND SYNTHETICS**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**AIM**

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

**OBJECTIVE**

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

**UNIT I** **6**

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

**UNIT II** **15**

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

**UNIT III** **6**

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

**UNIT IV** **8**

Testing of polymers. Mechanical and Thermal testing.

**UNIT V** **10**

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

**TOTAL : 45 PERIODS**

**OUTCOMES**

CO-1 Have knowledge on the chemistry of most common polymeric materials used in leather industry as supplements.

CO-2 Understand the fundamentals of polymerization of various polymers used

CO-3 Able to manufacture industrially important polymers

CO-4 Gain knowledge on analytical skills on testing of polymers.

CO-5 Knowledge on polymer modification

**REFERENCES**


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

**Course Articulation Matrix:**

| CO | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Have knowledge on the chemistry of most common polymeric materials used in leather industry as supplements. | 3 | 3 | - | - | - | - | 3 | - | - | - | - | 3 | - | 3 | - |
| CO-2 | Understand the fundamentals of polymerization of various polymers used | 3 | 3 | - | - | - | - | 3 | - | - | - | - | 3 | - | 3 | - |
| CO-3 | Able to manufacture industrially important polymers | 3 | 3 | - | - | - | - | 3 | - | - | - | - | 3 | 1 | 3 | 2 |
| CO-4 | Gain knowledge on analytical skills on testing of polymers. | 3 | 3 | - | - | - | - | 3 | - | - | - | - | 3 | 2 | 3 | 3 |
| CO-5 | Knowledge on polymer modification | 3 | 3 | - | - | - | - | 3 | - | - | - | - | 3 | 2 | 3 | 3 |

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

**LT7020 TECHNOLOGY OF ANIMAL AND TANNERY BY PRODUCTS UTILISATION**

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

**AIM**

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

**OBJECTIVE**

At the end of the course the students would have gained knowledge on the preparation of several by-products emerging out of the leather and leather products sector.

**UNIT I INTRODUCTION 9**

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

**UNIT II DIFFERENT METHODS OF RENDERING 9**

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

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

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

**UNIT IV UTILISATION OF ORGANS AND GLANDS FROM SLAUGHTERED ANIMALS 9**

Anaerobic digestion, its significance for the preparation of animal feed, fuel gas, fertilizer, etc. Quality control including microbiological aspects of products processed from animal by-products.

**UNIT V PRESENT STATUS OF VARIOUS BY-PRODUCTS IN INDIA 9**

Process studies on Glue making from tannery wastes - Bone glue and deproteinisation of bone - Horn and hoof meal - Protein meals by different methods

**TOTAL : 45 PERIODS**

**OUTCOMES**

CO-1 Knowledge of various animal byproducts and their significance

CO-2 To gain knowledge on the preparation of several by-products emerging from slaughter houses and tanneries

CO-3 Understand the utilization by products..

CO-4 Understand the characteristics of tannery byproducts

CO-5 Have knowledge in various methods of waste to wealth creation.

**REFERENCES**


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

**Course Articulation Matrix:**

| CO | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Knowledge of various animal byproducts and their significance | - | - | - | - | 3 | 3 | 3 | - | - | - | - | - | - | 3 | - |
| CO-2 | To gain knowledge on the preparation of several by-products emerging from slaughter houses and tanneries | - | - | - | - | 3 | 3 | 3 | - | - | - | - | - | - | 3 | - |
| CO-3 | Understand the utilization by products.. | - | - | - | - | 3 | 3 | 3 | - | - | - | - | - | 1 | 3 | 2 |
| CO-4 | Understand the characteristics of tannery byproducts | - | - | - | - | 3 | 3 | 3 | - | - | - | - | - | 2 | 3 | 3 |
| CO-5 | Have knowledge in various methods of waste to wealth creation. | - | - | - | - | 3 | 3 | 3 | - | - | - | - | - | 2 | 3 | 3 |

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

**LT7021 VALUE ENGINEERING IN LEATHER SECTOR L T P C**
**3 0 0 3**

**AIM**

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

**OBJECTIVE**

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

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

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

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

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

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

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

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

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

**UNIT V IMPLEMENTATION OF REENGINEERING IN LEATHER SECTOR 8**

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

**TOTAL : 45 PERIODS**

**OUTCOMES**

CO-1 Understand the concept of value engineering
CO-2 Application of Job plan in Leather industries
CO-3 Knowledge of worksheets and guidelines for leather and allied industries
CO-4 Have knowledge in reengineering in leather sector
CO-5 Apply the learned concepts in a case study/project.

**TEXT BOOKS**

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

**REFERENCE**

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

**Course Articulation Matrix:**

| CO | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Understand the concept of value engineering | - | - | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 3 | - |
| CO-2 | Application of Job plan in Leather industries | - | - | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 3 | - |
| CO-3 | Knowledge of worksheets and guidelines for leather and allied industries | - | - | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 1 | 3 | 2 |
| CO-4 | Have knowledge in reengineering in leather sector | - | - | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 3 | 3 |
| CO-5 | Apply the learned concepts in a case study/project. | - | - | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 3 | 3 |

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

**LT7004 COMPUTER APPLICATIONS FOR LEATHER AND LEATHER PRODUCTS** **L T P C**
**3 0 0 3**

**AIM**

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

**OBJECTIVES**

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

**UNIT I INTRODUCTION AND IT INFRASTRUCTURE** **7**

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

**UNIT II ROLE OF INFORMATION TECHNOLOGY IN LEATHER SECTOR** **8**

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** **7**

Fundamental Concepts of Database Technology & Data Organization; Database Model Concepts; Data Security; Data Integration; Retrieving, Manipulating, Updating tables; Databases relevant to Leather Sector.

**UNIT IV CONCEPTS FOR WEB BASED APPLICATIONS** **12**

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** **11**

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

**TOTAL: 45 PERIODS**

**OUTCOMES**

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

**TEXT BOOK**

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

**REFERENCES**

1. Efraim Turban, R. Kelly Rainer and Richard E. Potter, “Introduction to Information Technology”, John Wiley & Sons; 3rd Edition edition (24 May 2004)
2. Dorian Cougias, E. L. Heiberger, Karsten Koop, The Backup Book: Disaster Recovery from Desktop to Data Center.
3. Date C. J., “An Introduction to Database Systems”, 7th Ed., Narosa Publishing, 2004
4. Kendall & Kendall, Systems Analysis and Design (Prentice Hall India)
5. Achyut S. Gobbole, Data Communication and Networks (Tata McGraw Hill Publishing Company)
6. Understanding SQL (BPB Publications)
7. Hands-on HTML(BPB Publications)
8. Ann Navarro, Effective Web Designing (BPB Publications)
9. E-commerce Developer’s Guide to Building Community & using Promotional Tools (BPB Publications)
10. Reference Manuals for CAD systems for Footwear and Garments.

**Course Articulation Matrix:**

| CO | **Statement** | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Have knowledge on information technology and its infrastructure | 2 | 1 | 1 | - | 3 | 1 | - | 1 | 1 | 1 | - | 2 | 1 | 3 | 2 |
| CO-2 | To understand the role of information technology in leather sector | 2 | 2 | 2 | 1 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 0 | 3 | 1 |
| CO-3 | To comprehend the application aspects of DBMS, Data communication principles, Web Designing, ERP, MIS, E-Commerce | 2 | 3 | 3 | 2 | 3 | 1 | 1 | 1 | 1 | 3 | 1 | 2 | 1 | 3 | 1 |
| CO-4 | To apprehend the concepts of web based applications | 2 | 2 | 2 | 1 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 3 | 3 |
| CO-5 | Have knowledge on CAD applications in leather/leather products manufacture. | 2 | 2 | 2 | 1 | 3 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 |

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

**LT7003 CAD/CAM FOR LEATHER PRODUCTS DESIGN AND MANUFACTURE L T P C**
**3 0 0 3**

**AIM**

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

**OBJECTIVES**

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

**UNIT I COMPUTER APPLICATIONS IN LEATHER AND PRODUCT SECTOR 12**

Introduction to computer: Concepts of CAD/CAM. Capabilities and operation of graphical workstations, graphic terminals, input/output devices, interface and storage devices, net-working concepts of LAN and WAN, principles of digital and analog conversion.

**UNIT II HARDWARE IN CAD 12**

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

**UNIT III PATTERN ENGINEERING 8**

Computerized techniques for pattern creation, grading, pattern nesting, consumption calculations and costing, pattern conversion techniques for Leather products, standard DXF, AMMA DXF.

**UNIT IV LAST AND SOLE MODELLING FOR FOOTWEAR 7**

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

**UNIT V ADVANCED COMPUTATIONAL TECHNIQUES IN CAD, RAPID PROTOTYPING 6**

Principles and practice; simulation – concepts and applications.

**TOTAL : 45 PERIODS**

**OUTCOMES**

| CO | Statement |
|---|---|
| CO-1 | Understanding the concepts of computer applications in leather products sector. |
| CO-2 | Have knowledge in various Hardwares sued in CAD. |
| CO-3 | To have comprehensive knowledge in Pattern engineering techniques for leather and leather products |
| CO-4 | Ability to designing last and sole modelling for footwear using CAD. |
| CO-5 | Have knowledge in advanced computational techniques in CAD, rapid prototyping |

**REFERENCES**


1. MP Groover and EW Zinimers, “CAD/CAM, Computer Aided Design and Manufacturing”, Prentice Hall of India, 1984.
2. Newman & S P Sul.,” Introduction to Computer Graphics”, Published by Morgan Kaufmann,1995
3. S.Harrington, “Computer Graphics : A programming approach”, Edition 2, Published by Elsevier, 1997.
4. Zandi, “Computer Aided Design and drafting”, Published by Delmer,1985.
5. William Pratt., “Digital Image Processing”, 1978.
5. Desai and Abel, “Introduction to FEM”. “Step by Step guide to CAD for footwear”: CAD Centre, SDDC, CLRI.
6. Rapid prototyping ; AU – FRG publications, 1984.
7. Jorg Buchner, Simulation: “QUEST” manual: EDS Technologies, Published by Springer, 2003.

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Understanding the concepts of computer applications in leather products sector. | 3 | - | 3 | - | 3 | - | - | - | - | - | - | - | 3 | - | 3 |
| CO-2 | Have knowledge in various Hardwares sued in CAD. | 3 | - | 3 | - | 3 | - | - | - | - | - | - | - | 3 | - | 3 |
| CO-3 | To have comprehensive knowledge in Pattern engineering techniques for leather and leather products | 3 | - | 3 | - | 3 | - | - | - | - | - | - | - | 3 | - | 3 |
| CO-4 | Ability to designing last and sole modelling for footwear using CAD. | 3 | - | 3 | - | 3 | - | - | - | - | - | - | - | 3 | - | 3 |
| CO-5 | Have knowledge in advanced computational techniques in CAD, rapid prototyping | 3 | - | 3 | - | 3 | - | - | - | - | - | - | - | 3 | - | 3 |

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

**LT7017 POLYMER SCIENCE L T P C**
**3 0 0 3**

**UNIT I** **9**

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

**UNIT II** **9**

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

**UNIT III** **9**

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

**UNIT IV** **9**

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

**UNIT V** **9**

Recycling, remoulding, depolymerisation, incineration, biodegradable polymers.

**TOTAL : 45 PERIODS**

**OUTCOMES**

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

**REFERENCES**


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

**Course Articulation Matrix:**

| CO | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Knowledge of natural polymers and synthetic polymers | 3 | 1 | 1 | - | - | 1 | 1 | - | - | 1 | - | 1 | 3 | 1 | 1 |
| CO-2 | Have knowledge on polymer synthesis | 3 | - | - | - | 1 | 1 | - | 1 | - | 1 | - | 1 | 3 | 1 | 1 |
| CO-3 | Understanding characterization methods for polymers | 3 | - | - | 1 | 1 | 1 | - | - | 1 | 1 | - | 1 | 3 | 2 | 1 |
| CO-4 | Understand the application of polymers in leather. | 3 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 1 | - | 1 | 3 | 3 | 1 |
| CO-5 | Have knowledge in polymer recycling. | 3 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | - | 1 | 3 | 3 | 1 |

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

**GE7074** **HUMAN RIGHTS** **L T P C**
**3 0 0 3**

**OBJECTIVES :**

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

**UNIT I** **9**

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

**UNIT II** **9**

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

**UNIT III** **9**

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

**UNIT IV** **9**

Human Rights in India – Constitutional Provisions / Guarantees.

**UNIT V** **9**

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

**TOTAL : 45 PERIODS**

**OUTCOME :**

Engineering students will acquire the basic knowledge of human rights.

CO-1 Acquire the basic knowledge of human rights and classification
CO-2 Understand the Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864, Universal
Declaration of Human Rights, 1948 and Theories of Human Rights
CO-3 Understand the Theories and perspectives of UN Laws – UN Agencies to monitor and compliance
CO-4 To gain knowledge about the Human Rights in India – Constitutional Provisions / Guarantees
CO-5 Learn and understand the Human Rights of Disadvantaged People

**REFERENCES:**


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

**Course Articulation Matrix:**

| CO | **Statement** | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Acquire the basic knowledge of human rights and classification | - | - | 3 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | 2 | 3 | 3 |
| CO-2 | Understand the Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864, Universal Declaration of Human Rights, 1948 and Theories of Human Rights | - | - | 1 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | - | 1 | 3 |
| CO-3 | Understand the Theories and perspectives of UN Laws – UN Agencies to monitor and compliance | - | - | 1 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | 1 | 2 | 3 |
| CO-4 | To gain knowledge about the Human Rights in India – Constitutional Provisions / Guarantees | - | - | 3 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | 1 | 2 | 3 |
| CO-5 | Learn and understand the Human Rights of Disadvantaged People | - | - | 2 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | 1 | 2 | 3 |

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

**GE7071 DISASTER MANAGEMENT L T P C**
**3 0 0 3**

**OBJECTIVES:**

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

**UNIT I INTRODUCTION TO DISASTERS 9**

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

**UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9**

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

**UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9**

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

**UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9**

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

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

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

The students will be able to

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

**TEXTBOOKS:**


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


**REFERENCES**


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

**Course Articulation Matrix:**

| CO | **Statement** | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | To provide students an exposure to disasters, their significance and types. | - | - | 3 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | 2 | 3 | 3 |
| CO-2 | Differentiate the types of disasters, causes and their impact on environment and society | - | - | 1 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | - | 1 | 3 |
| CO-3 | To comprehend in vulnerability assessment and various methods of risk reduction measures as well as mitigation | - | - | 1 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | 1 | 2 | 3 |
| CO-4 | Ability to draw the hazard and vulnerability profile of India, Scenarios in the Indian context | - | - | 3 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | 1 | 2 | 3 |
| CO-5 | Have knowledge on Disaster damage assessment and management | - | - | 2 | 3 | 3 | 3 | - | 3 | - | - | - | 3 | 1 | 2 | 3 |

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

| GE7072 | FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**OBJECTIVES:**

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

**UNIT I FUNDAMENTALS OF PRODUCT DEVELOPMENT 9**

**Global Trends Analysis and Product decision -** Social Trends - Technical Trends- Economical Trends - Environmental Trends - Political/Policy Trends **- Introduction to Product Development Methodologies and Management -** Overview of Products and Services - Types of Product Development - Overview of Product Development methodologies **-** Product Life Cycle – Product Development Planning and Management.

**UNIT II REQUIREMENTS AND SYSTEM DESIGN 9**

**Requirement Engineering -** Types of Requirements - Requirement Engineering - traceability Matrix and Analysis - Requirement Management - **System Design & Modeling -** Introduction to System Modeling - System Optimization - System Specification - Sub-System Design - Interface Design.

**UNIT III DESIGN AND TESTING 9**

**Conceptualization -** Industrial Design and User Interface Design - Introduction to Concept generation Techniques – **Challenges in Integration of Engineering Disciplines** - Concept Screening & Evaluation - **Detailed Design -** Component Design and Verification – **Mechanical, Electronics and Software Subsystems** - High Level Design/Low Level Design of S/W Program **-** Types of Prototypes, S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing – **Prototyping -** Introduction to Rapid Prototyping and Rapid Manufacturing - **System Integration, Testing, Certification and Documentation**

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

Introduction to Product verification processes and stages - Introduction to Product Validation processes and stages - Product Testing Standards and Certification - Product Documentation - **Sustenance -**Maintenance and Repair – Enhancements - **Product EoL -** Obsolescence Management – Configuration Management - EoL Disposal

**UNIT V BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY 9**

**The Industry -** Engineering Services Industry - Product Development in Industry versus Academia –**The IPD Essentials -** Introduction to Vertical Specific Product Development processes -Manufacturing/Purchase and Assembly of Systems - Integration of Mechanical, Embedded and Software Systems – Product Development Trade-offs - Intellectual Property Rights and Confidentiality – Security and Configuration Management.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

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

**TEXTBOOKS:**


1. Book specially prepared by NASSCOM as per the MoU.
2. Karl T Ulrich and Stephen D Eppinger, "Product Design and Development", Tata McGraw Hill, Fifth Edition, 2011.
3. John W Newstorm and Keith Davis, "Organizational Behavior", Tata McGraw Hill, Eleventh Edition, 2005.


**REFERENCES:**


1. Hiriyappa B, “Corporate Strategy – Managing the Business”, Author House, 2013.
2. Peter F Drucker, “People and Performance”, Butterworth – Heinemann [Elsevier], Oxford, 2004.
3. Vinod Kumar Garg and Venkita Krishnan N K, “Enterprise Resource Planning – Concepts”, Second Edition, Prentice Hall, 2003.
4. Mark S Sanders and Ernest J McCormick, "Human Factors in Engineering and Design", McGraw Hill Education, Seventh Edition, 2013

**Course Articulation Matrix:**

| CO | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | Understand the Fundamentals of product development methodologies and Management | - | - | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 3 | - |
| CO-2 | Acquire knowledge in Requirement Engineering, System Design & Modeling | - | - | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 3 | - |
| CO-3 | Detailed Design and Testing study | - | - | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 1 | 3 | 2 |
| CO-4 | Underatand Sustenance Engineering And End-Of-Life (Eol) Support | - | - | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 3 | 3 |
| CO-5 | Gain knowledge of the Innovation & Product Development process in the Business Context | - | - | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 3 | 3 |

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