

Outcome-Based Curriculum

(Sustaining OBE Compliance)

Part A

1. Title of the Academic Program: B.Sc. in Leather Products Engineering

2. Name of the University: University of Dhaka

3. Vision of the University: To emerge as an institute of eminence in the fields of engineering, technology, business and management in serving the industry and the nation by empowering students with a high degree of technical, managerial and practical competence.

4. Mission of the University

M1: To strengthen the theoretical, practical and ethical dimensions of the learning process by fostering a culture of research and innovation among faculty members and students.

M2: To encourage long term interaction between the academia and industry through the involvement of the industry in the design of the curriculum and its hands-on implementation.

M3: To strengthen and mold students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extra-curricular activities.

5. Name of the Program Offering Entity: Institute of Leather Engineering and Technology

6. Vision of the Program Offering Entity

To enable a center of excellence by providing advance educational programs with innovative research, in the field of leather, footwear, leather products and allied sector to produce competent graduates.

7. Mission of the Program Offering Entity

- Provide a contemporary educational approach that integrates high-tech and modern methods, enhancing their learning experience through research conducted locally and internationally.
- Promote industry-academia collaboration for the better understanding and skill development in undergraduate programs in the fields of leather, footwear and leather products.
- Undertake actions to motivate students for life-long learning, students' personal development by fostering ethical and moral values.

8. Objectives of the Program Offering Entity

- To produce competent graduate in the field of leather, footwear and leather products sector;
- To initiate, organize and undertake research in the fields of leather, footwear and leather products engineering;
- To provide industry-oriented training programs in various fields of leather, footwear and leather products engineering;
- To ensure quality control and laboratory facilities for testing raw materials, consumable and finished products;

- To provide facilities for environmental pollution control, chemical management and occupational health and safety compliances;
- To organize seminars, conferences, workshops, exhibitions and other events to disseminate knowledge about state-of-the-art technologies for the relevant fields;
- To establish bridge-programs and research collaborations with various academic, research and industrial organizations both in home and abroad.

9. Name of the Degree: B.Sc. in Leather Products Engineering

10. Description of the Program

Institute is committed to providing students with the very best education and training opportunities to enable them utilizing their potentials towards the ambitions through B.Sc. in Leather Products Engineering. The program provides its undergraduate students with the opportunity to participate in industrial training, where they can relate theories, concepts and techniques learned from the academic courses with real-life experiences. At the end of the final year, students are involved in project work, report writing and oral presentation.

B.Sc. in Leather Products Engineering is a total 160.0 credits program, comprising 93.5 credits of core coursework (including field tour, capstone project, internship and comprehensive viva), 45.5 credits of general education coursework (basic science, mathematics and humanities) and 21.0 credits of allied engineering courses. With a rationalized course curriculum and advanced tools and teaching methods, the graduates will attain competency at the global standard and they will perform high level of professional activities.

11. Graduate Attributes: The process of achieving mission and vision of the program is divided into equal contributions, stated from responses given by the key stakeholders like employers and alumni. Employers happen to motivate graduates and know the performance of their traits in some key areas of graduate attributes such as knowledge, problem analysis skills, work skills, communication skills, digital literacy and interpersonal skills. Each of the key graduate attributes is further subdivided into subcategories (as shown in the list below) to provide an in-depth understanding of our graduate’s status in that specific field.

Attribute-1: Knowledge profile
K1: A systematic, theory-based understanding of the natural sciences applicable to the discipline
K2: Conceptually based mathematics, numerical analysis, statistics and formal aspects of computer and information science to support analysis and modelling applicable to the discipline
K3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline
K4: Engineering specialized knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline
K5: Engineering knowledge that aids effective practice-area problem-solving.

K6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline
K7: Comprehension of the role of engineering in society and of the identified issues in engineering practice in the discipline: ethics and the engineer's professional responsibility to public safety; the impacts of engineering activity in economic, social, cultural, environmental and sustainability terms
K8: Engagement with selected knowledge in the research literature of the discipline
Attribute-2: Creative and critical thinking, and problem solving
Creative: Able to find new ways to address problems sustainably, answer questions or expressing meaning.
Critical thinking: Able to evaluate and draw conclusions from information, to find sustainable solutions to complex problems and make decisions
Innovation: Involve the creative use of engineering principles and research-based knowledge in novel ways
Attribute-3: Interpersonal skills and digital literacy
Communication: Graduates convey ideas and information effectively to a range of audiences for a variety of purposes and contribute in a positive and collaborative manner to achieving common goals.
Professionalism and leadership: Graduates engage in professional behavior and have the potential to be entrepreneurial and take leadership roles in their chosen occupations or careers and communities.
Collaboration: Able to work effectively with others and in teams, encouraging collaboration and contributing positively.
ICT proficient: Able to use the devices, applications and software commonly used in the discipline and in general use. Stays up-to-date with the latest advancements and effectively utilizing widely used digital tools, programs, and apps within and beyond the industry are essential components for success in the digital age.
Information and digital literacy: Demonstrate a comprehensive understanding of legal, ethical, and security requirements is essential for interpreting, critically analyzing, and accurately representing information in various contexts.
Attribute-4: Ethics and sustainability
Integrity: Acting ethically, honestly and fairly in personal, academic and workplace settings.
Appropriate conduct: Demonstrating appropriate and socially responsible behavior, including academic conduct.
Sustainability: Acquiring the knowledge and skills to promote societal and environmental sustainability.

12. Program Educational Objectives (PEOs)

PEO-1: To produce leather products graduate engineers equipped with in-depth knowledge of science, engineering and technology and capable of critical analysis

PEO-2: To foster graduates with professional and ethical attributes in the practice of engineering

PEO-3: To nourish graduates who are engaged in pursuit of knowledge through continuing education, research and professional development activities

PEO-4: To provide leather products graduates with language proficiency and digital literacy who contribute to the well-being of their organizations and communities

PEO-5: To advance in career paths associated with the leather products engineering disciplines, including industrial engineering and environmental engineering and sciences related opportunities

13. Program Learning Outcomes (PLO)

PLO1: Engineering knowledge (Fundamental)

Able to apply the knowledge of mathematics, science, engineering fundamentals and leather products engineering as specified in K1 to K4 to the solution of complex engineering problems.

PLO2: Problem analysis (Thinking Skill)

Able to identify, formulate, research the literature and analyze complex engineering problems and reach substantiated conclusions using first principles of mathematics, the natural sciences and the leather products and allied engineering sciences (K1 to K4, K8).

PLO3: Design/development of solutions (Thinking Skill)

Able to design solutions for complex leather products allied engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal and environmental concerns (K5).

PLO4: Investigation (Thinking)

Able to conduct investigations of complex problems using research-based knowledge (K8), considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

PLO5: Modern tool usage (Fundamental)

Able to create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations (K6).

PLO6: The Engineer and Society (Social)

Able to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice (K7).

PLO7: Environment and sustainability (Social)

Able to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development (K7).

PLO8: Ethics (Personal)

Able to apply ethical principles and commit to professional ethics, responsibilities and the norms of the engineering practice. (K7)

PLO9: Individual work and teamwork (Personal)

Able to function effectively as an individual and as a member or leader of diverse teams as well as in multidisciplinary settings.

PLO10: Communication (Social)

Able to communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions.

PLO11: Project management and finance (Personal)

Able to demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work as a member or a leader of a team to manage projects in multidisciplinary environments.

PLO12: Lifelong learning (Personal)

Able to recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.

14. Mapping mission of the university with PEOs

	Mission I	Mission II	Mission III
PEO1	✓	✓	
PEO2	✓	✓	✓
PEO3		✓	✓
PEO4		✓	✓
PEO5	✓	✓	✓

15. Mapping of PLOs with PEOs

PLOs	PEO1	PEO2	PEO3	PEO4	PEO5
PLO1	✓				
PLO2	✓		✓		✓
PLO3	✓		✓		✓
PLO4	✓		✓	✓	✓
PLO5	✓		✓		✓
PLO6		✓	✓	✓	✓

PLO7	✓		✓		✓
PLO8	✓	✓			✓
PLO9		✓	✓	✓	✓
PLO10	✓	✓	✓	✓	✓
PLO11	✓	✓		✓	✓
PLO12	✓	✓	✓	✓	✓

16. Mapping courses with the PLOs

Course	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
0723-LPE-1101	✓	✓	✓	✓	✓	✓						
0541-Math-1103	✓	✓	✓	✓								
0533-Phy-1105	✓	✓	✓	✓	✓							✓
0531-Chem-1107	✓	✓	✓	✓								
0531-Chem-1109	✓	✓	✓				✓	✓				✓
0531-Chem-1110	✓	✓	✓	✓				✓	✓	✓		✓
0715-ME-1112	✓	✓	✓	✓					✓	✓		✓
0417-Hum-1114	✓	✓			✓	✓			✓	✓	✓	✓
0723-LPE-1116	✓	✓			✓				✓	✓		✓
0723-LPE-1201	✓	✓	✓	✓		✓	✓					
0723-LPE-1202	✓	✓	✓	✓	✓		✓		✓			
0723-LPE-1203	✓	✓	✓	✓	✓			✓		✓		✓
0723-LPE-1204	✓	✓	✓	✓					✓		✓	✓
0541-Math-1205	✓	✓		✓	✓							
0611-CSE-1207	✓	✓	✓	✓	✓	✓				✓		✓
0611-CSE-1208	✓	✓	✓	✓	✓	✓				✓	✓	✓
0531-Chem-1209	✓	✓	✓	✓	✓							✓
0531-Chem-1210	✓	✓	✓		✓			✓	✓	✓		✓
0723-LPE-2101	✓	✓	✓	✓	✓		✓					

0723-LPE-2102	✓	✓	✓	✓	✓		✓		✓			
0723-LPE-2103	✓	✓	✓	✓	✓			✓				✓
0723-LPE-2104	✓	✓	✓	✓	✓	✓			✓			✓
0723-LPE-2105	✓	✓	✓	✓	✓	✓			✓	✓		✓
0723-LPE-2106	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓
0714-EEE-2107	✓	✓				✓	✓					✓
0533-Phy-2108	✓	✓	✓		✓				✓	✓		✓
0541-Math-2109	✓	✓		✓								
0723-LPE-2201	✓	✓	✓		✓	✓						✓
0723-LPE-2202	✓	✓	✓	✓	✓	✓			✓	✓		✓
0531-Chem-2203	✓	✓	✓	✓	✓	✓	✓					✓
0531-Chem-2204	✓	✓	✓		✓			✓	✓	✓		✓
0531-Chem-2205	✓	✓		✓	✓		✓					
0531-Chem-2206	✓	✓	✓		✓		✓	✓	✓	✓		✓
0715-ME-2207	✓	✓	✓	✓	✓							✓
0715-ME-2208	✓	✓	✓	✓	✓				✓			✓
0723-LPE-2210	✓				✓				✓	✓		✓
0723-LPE-3101	✓	✓	✓	✓	✓				✓	✓		✓
0723-LPE-3102	✓	✓	✓	✓	✓				✓	✓		✓
0531-Chem-3103	✓	✓	✓	✓	✓							✓
0531-Chem-3104	✓	✓	✓	✓	✓	✓	✓			✓		
0723-LPE-3105	✓	✓	✓	✓	✓	✓	✓	✓				✓
0715-ME-3107	✓	✓	✓	✓	✓	✓	✓					
0417-Hum-3109	✓	✓		✓		✓		✓	✓	✓		✓
0541-Math-3111	✓	✓	✓	✓								✓
0723-LPE-3112	✓	✓	✓	✓	✓				✓			✓
0723-LPE-3201	✓	✓	✓	✓		✓	✓					✓
0723-LPE-3202	✓	✓	✓		✓	✓		✓	✓	✓		✓

0723-LPE-3203	✓	✓	✓	✓								✓
0723-LPE-3204	✓	✓	✓	✓	✓				✓			✓
0723-LPE-3205	✓	✓	✓	✓	✓			✓	✓			✓
0723-LPE-3206	✓	✓	✓	✓	✓				✓			
0723-LPE-3207	✓	✓	✓	✓	✓							
0417-Hum-3208	✓	✓	✓	✓	✓				✓	✓	✓	✓
0723-LPE-3209	✓	✓	✓	✓	✓							
0723-LPE-3210	✓				✓				✓	✓		✓
0723-LPE-4101	✓	✓	✓	✓		✓	✓	✓	✓			✓
0723-LPE-4102	✓	✓	✓	✓					✓		✓	✓
0723-LPE-4104	✓	✓	✓	✓	✓				✓			✓
0723-LPE-4105	✓	✓	✓		✓	✓			✓			✓
0723-LPE-4106	✓	✓		✓	✓				✓	✓		✓
0417-Hum-4107	✓	✓	✓	✓	✓						✓	
0723-LPE-4109	✓	✓		✓	✓				✓			✓
0723-LPE-4110	✓	✓		✓	✓				✓	✓		✓
0723-LPE-4111	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓
0723-LPE-4201	✓	✓	✓	✓	✓		✓					
0723-LPE-4202	✓	✓	✓	✓	✓		✓		✓	✓		✓
0723-LPE-4203	✓	✓	✓	✓	✓				✓			✓
0723-LPE-4204	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0723-LPE-4206	✓	✓	✓							✓		✓
0723-LPE-4208	✓	✓	✓			✓				✓		✓
	70	69	62	57	53	23	17	14	38	29	8	53

Part B

17. Structure of the Curriculum

(a) Duration of the Program: Years: 4, Semesters: 8

(b) Admission Requirements:

DU-A(Science)unit entrance examination requirements

- i. A candidate has to be a recently passed student in HSC in Science group or recognized equivalent examinations.
- ii. Candidates must be obtained at least GPA of 3.50 (scale of 5.00) in both SSC and HSC/ equivalent examinations, and the total GPA should be 8.00 (including additional subjects).
- iii. DU A(Science)-unit admission exam will be based on MCQ and written exam.
- iv. Other criteria and selection of the candidates for admission shall be decided as per the University admission rules and regulations.

Leather Products Engineering program requirements

- i. A candidate must pass the DU-A(Science) unit entrance examination.
 - ii. A Candidate must be either in the merit or waiting list of the DU A-unit entrance examination announced by DU A-unit admission authority.
 - iii. A candidate has to select the Leather Products Engineering program in his/her preference list and he/she has to be among the leading candidates preferring this discipline based on their merit position and seat capacity of the discipline in DU.
- (c) Total credit requirement to complete the program: 160.0
 (d) Total class weeks in a semester: 14 weeks
 (e) Minimum CGPA requirements for graduation: 2.50
 (f) Maximum academic years of completion: 6 academic years
 (g) Category of Courses:

i. General Education Courses: Total 45.5 credits

Theoretical Courses				
Course Code	Course Title	Course Credit	Year	Semester
0541-Math-1103	Algebra and Geometry	3.0	1 st	I
0533-Phy-1105	Engineering Physics	3.0	1 st	I
0531-Chem-1107	Inorganic Chemistry	3.0	1 st	I
0531-Chem-1109	Physical Chemistry	3.0	1 st	I
0541-Math-1205	Calculus	3.0	1 st	II
0531-Chem-1209	Organic Chemistry	3.0	1 st	II
0541-Math-2109	Differential Equation and Numerical Methods	3.0	2 nd	I
0531-Chem-2205	Analytical Chemistry	3.0	2 nd	II
0531-Chem-3103	Instrumental Analysis	3.0	3 rd	I

0417-Hum-3109	Industrial Sociology	2.0	3 rd	I
0541-Math-3111	Probability and Statistics	3.0	3 rd	I
0417-Hum-4107	Cost and Management Accounting	3.0	4 th	I
Lab Courses				
0531-Chem-1110	Inorganic and Physical Chemistry Lab	1.5	1 st	I
0417-Hum-1114	Employability Skills-I	1.5	1 st	I
0531-Chem-1210	Organic Chemistry Lab	1.5	1 st	II
0533-Phy-2108	Physics and Electronics Lab	1.5	2 nd	I
0531-Chem-2206	Analytical Chemistry Lab	1.5	2 nd	II
0531-Chem-3104	Chemical Analysis of Leather and Leather Products Lab	1.5	3 rd	I
0417-Hum-3208	Employability Skills-II	1.5	3 rd	II

ii. Core Courses: In Leather Products Engineering program, ILET, DU would like to divide the core courses further in to 2 sub categories under core course category i.e., Core Engineering Courses, Aligned Engineering Courses.

Core Engineering Courses: Total 82.0 credits

Theoretical Courses				
Course Code	Course Title	Course Credit	Year	Semester
0723-LPE-1101	Fundamentals of Leather	3.0	1 st	I
0723-LPE-1201	Leather Processing-I	3.0	1 st	II
0723-LPE-1203	Leather Products Manufacturing- I	3.0	1 st	II
0723-LPE-2101	Leather Processing-II	3.0	2 nd	I
0723-LPE-2103	Leather and Non-Leather Products Design	3.0	2 nd	I
0723-LPE-2105	Leather Products Manufacturing-II	3.0	2 nd	I
0723-LPE 2201	Leather Products Manufacturing-III	3.0	2 nd	II
0723-LPE-3101	Leather Garments Manufacturing	3.0	3 rd	I

0723-LPE-3105	Environmental Science and Engineering	2.0	3 rd	I
0723-LPE-3201	Non-Leather Materials Synthesis	3.0	3 rd	II
0723-LPE-3203	Testing of Leather Products and Allied Materials	3.0	3 rd	II
0723-LPE-3205	Footwear Manufacturing	3.0	3 rd	II
0723-LPE-3207	Supply Chain Management	3.0	3 rd	II
0723-LPE-3209	Leather and Non-Leather Products Merchandising	2.0	3 rd	II
0723-LPE-4101	Non-Leather Products Manufacturing	3.0	4 th	I
0723-LPE-4105	Industrial Utility and Maintenance	3.0	4 th	I
0723-LPE-4109	Total Quality Management	3.0	4 th	I
0723-LPE-4111	Industrial Project Management	3.0	4 th	I
0723-LPE-4201	Wastewater and Solid Waste Management	3.0	4 th	II
0723-LPE-4203	Production Planning and Quality Control	3.0	4 th	II
Lab Courses				
0723-LPE-1202	Leather Processing -I Lab	1.5	1 st	II
0723-LPE-1204	Leather Products Manufacturing-I Lab	1.5	1 st	II
0723-LPE-2102	Leather Processing-II Lab	1.5	2 nd	I
0723-LPE-2104	Product Design and Pattern Making-I Lab	1.5	2 nd	I
0723-LPE-2106	Leather Products Manufacturing-II Lab	1.5	2 nd	I
0723-LPE-2202	Leather Products Manufacturing-III Lab	1.5	2 nd	II
0723-LPE-3102	Leather Garments Manufacturing Lab	1.5	3 rd	I
0723-LPE-3112	Product Design and Pattern Making-II Lab	1.5	3 rd	I
0723-LPE-3202	Non-Leather Materials Synthesis Lab	1.5	3 rd	II
0723-LPE-3204	Testing of Leather Products and Allied Materials Lab	1.5	3 rd	II
0723-LPE-3206	Footwear Manufacturing Lab	1.5	3 rd	II

0723-LPE-4102	Non-Leather Products Manufacturing Lab	1.5	4 th	I
0723-LPE-4104	Computer Aided Design	1.5	4 th	I
0723-LPE-4106	Industrial Utility and Maintenance Lab	1.5	4 th	I
0723-LPE-4110	Quality Management Lab	1.5	4 th	I
0723-LPE-4202	Waste Management Lab	1.5	4 th	II

Allied Engineering Courses: Total 21.0 credits

Theoretical Courses				
Course Code	Course Title	Course Credit	Year	Semester
0611-CSE-1207	Fundamentals of Computer and Information Technology	3.0	1 st	II
0714-EEE-2107	Fundamentals of Electrical and Electronics Engineering	3.0	2 nd	I
0531-Chem-2203	Polymer Science and Engineering	3.0	2 nd	II
0715-ME-2207	Fundamentals of Mechanical Engineering	3.0	2 nd	II
0715-ME-3107	Materials Science and Engineering	3.0	3 rd	I
Lab Courses				
0715-ME-1112	Engineering Drawing	1.5	1 st	I
0611-CSE-1208	Fundamentals of Computer and Information Technology Lab	1.5	1 st	II
0531-Chem-2204	Polymer Science and Engineering Lab	1.5	2 nd	II
0715-ME-2208	Mechanical Workshop Practice	1.5	2 nd	II

iii. Elective Courses: In B. Sc. Engineering in Leather Products Engineering program, all of the courses are compulsory course. So, there is no elective/optional course in this program.

iv. Capstone Course/Internship/Field Tour/Project: Total 11.5 credits

Course Code	Course Title	Course Credit	Year	Semester
0723-LPE-1116	Field Tour-I	1.0	1 st	I
0723-LPE-2210	Field Tour-II	1.0	2 nd	II
0723-LPE-3210	Field Tour-III	1.0	3 rd	II
0723-LPE-4204	Capstone Project	3.0	4 th	II
0723-LPE-4206	Comprehensive Viva	2.5	4 th	II
0723-LPE-4208	Internship	3.0	4 th	II

18. Semester wise distribution of courses

Year-1st, Semester-I			
Course Code	Course Title	Credit	
		Theoretical	Lab
0723-LPE-1101	Fundamentals of Leather	3.0	
0541-Math-1103	Algebra and Geometry	3.0	
0533-Phy-1105	Engineering Physics	3.0	
0531-Chem-1107	Inorganic Chemistry	3.0	
0531-Chem-1109	Physical Chemistry	3.0	
0531-Chem-1110	Inorganic and Physical Chemistry Lab		1.5
0715-ME-1112	Engineering Drawing		1.5
0417-Hum-1114	Employability Skills-I		1.5
0723-LPE-1116	Field Tour-I		1.0
	Total	15.0	5.5
	Semester Total	20.5	

Year-1st, Semester-II			
Course Code	Course Title	Credit	
		Theoretical	Lab
0723-LPE-1201	Leather Processing-I	3.0	
0723-LPE-1202	Leather Processing -I Lab		1.5
0723-LPE-1203	Leather Products Manufacturing-I	3.0	
0723-LPE-1204	Leather Products Manufacturing-I Lab		1.5
0541-Math-1205	Calculus	3.0	
0611-CSE-1207	Fundamentals of Computer and Information Technology	3.0	

0611-CSE-1208	Fundamentals of Computer and Information Technology Lab		1.5
0531-Chem-1209	Organic Chemistry	3.0	
0531-Chem-1210	Organic Chemistry Lab		1.5
	Total	15.0	6.0
	Semester Total	21.0	

Year-2nd, Semester-I			
Course Code	Course Title	Credit	
		Theoretical	Lab
0723-LPE-2101	Leather Processing-II	3.0	
0723-LPE-2102	Leather Processing-II Lab		1.5
0723-LPE-2103	Leather and Non-Leather Products Design	3.0	
0723-LPE-2104	Product Design and Pattern Making-I Lab		1.5
0723-LPE-2105	Leather Products Manufacturing-II	3.0	
0723-LPE-2106	Leather Products Manufacturing-II Lab		1.5
0714-EEE-2107	Fundamentals of Electrical and Electronics Engineering	3.0	
0533-Phy-2108	Physics and Electronics Lab		1.5
0541-Math-2109	Differential Equation and Numerical Methods	3.0	
	Total	15.0	6.0
	Semester Total	21.0	

Year-2nd, Semester-II			
Course Code	Course Title	Credit	
		Theoretical	Lab
0723-LPE-2201	Leather Products Manufacturing-III	3.0	
0723-LPE-2202	Leather Products Manufacturing-III Lab		1.5
0531-Chem-2203	Polymer Science and Engineering	3.0	
0531-Chem-2204	Polymer Science and Engineering Lab		1.5
0531-Chem-2205	Analytical Chemistry	3.0	
0531-Chem-2206	Analytical Chemistry Lab		1.5
0715-ME-2207	Fundamentals of Mechanical Engineering	3.0	
0715-ME-2208	Mechanical Workshop Practice		1.5
0723-LPE-2210	Field Tour-II		1.0
	Total	12.0	7.0
	Semester Total	19.0	

Year-3rd, Semester-I			
Course Code	Course Title	Credit	
		Theoretical	Lab
0723-LPE-3101	Leather Garments Manufacturing	3.0	
0723-LPE-3102	Leather Garments Manufacturing Lab		1.5
0531-Chem-3103	Instrumental Analysis	3.0	
0531-Chem-3104	Chemical Analysis of Leather and Leather Products Lab		1.5
0723-LPE-3105	Environmental Science and Engineering	2.0	
0715-ME-3107	Materials Science and Engineering	3.0	
0417-Hum-3109	Industrial Sociology	2.0	
0541-Math-3111	Probability and Statistics	3.0	
0723-LPE-3112	Product Design and Pattern Making-II Lab		1.5
	Total	16.0	4.5
	Semester Total	20.5	

Year-3rd, Semester-II			
Course Code	Course Title	Credit	
		Theoretical	Lab
0723-LPE-3201	Non-Leather Materials Synthesis	3.0	
0723-LPE-3202	Non-Leather Materials Synthesis Lab		1.5
0723-LPE-3203	Testing of Leather Products and Allied Materials	3.0	
0723-LPE-3204	Testing of Leather Products and Allied Materials Lab		1.5
0723-LPE-3205	Footwear Manufacturing	3.0	
0723-LPE-3206	Footwear Manufacturing Lab		1.5
0723-LPE-3207	Supply Chain Management	3.0	
0417-Hum-3208	Employability Skills-II		1.5
0723-LPE-3209	Leather and Non-Leather Products Merchandising	2.0	
0723-LPE-3210	Field Tour-III		1.0
	Total	14.0	7.0
	Semester Total	21.0	

Year-4th, Semester-I			
Course Code	Course Title	Credit	
		Theoretical	Lab
0723-LPE-4101	Non-Leather Products Manufacturing	3.0	
0723-LPE-4102	Non-Leather Products Manufacturing Lab		1.5
0723-LPE-4104	Computer Aided Design		1.5
0723-LPE-4105	Industrial Utility and Maintenance	3.0	
0723-LPE-4106	Industrial Utility and Maintenance Lab		1.5
0411-Hum-4107	Cost and Management Accounting	3.0	
0723-LPE-4109	Total Quality Management	3.0	
0723-LPE-4110	Quality Management Lab		1.5
0723-LPE-4111	Industrial Project Management	3.0	
	Total	15.0	6.0
	Semester Total	21.0	

Year-4th, Semester-II			
Course Code	Course Title	Credit	
		Theoretical	Lab
0723-LPE-4201	Wastewater and Solid Waste Management	3.0	
0723-LPE-4202	Waste Management Lab		1.5
0723-LPE-4203	Production Planning and Quality Control	3.0	
0723-LPE-4204	Capstone Project		3.0
0723-LPE-4206	Comprehensive Viva		2.5
0723-LPE-4208	Internship		3.0
	Total	6.0	10.0
	Semester Total	16.0	

Total Credits: 160.0

Part C

19. Description of all courses of the program

Course Code: 0723-LPE-1101 Course Title: Fundamentals of Leather Credits: 3

Rationale of the Course: This course aims to provide students with an in-depth understanding of the fundamental concepts of leather technology. The course covers topics such as the structure and composition of hides and skins, preservation and curing of hides and skins, molecular structure and properties of collagen, leather biotechnology, and natural and synthetic polymers.

Course Content

Introduction: Hides and skins- Historical background, different parts, types, sources, world supply, national supply, and regional status.

Slaughtering: Slaughtering and flaying of animals; tools, equipment, and techniques of slaughtering and flaying, hides and skins of slaughtered and fallen animals; cares to be taken during flaying.

Preservation/curing of hides and skins: Handling and storage, collection practice in Bangladesh, degradation, degradation factors, importance and principles of preservation, methods of preservation/curing, advantages and disadvantages of different types of curing, factors affecting preservation/curing process, preservation defects.

Hides/Skins structure and its components: Structural difference between hides and skins of different origins, chemical composition of hides and skins; structure of fibrous and globular proteins, importance of histology in leather production; tissues- epithelial tissues, connective tissues, and cells; histological structure of hide and skin and appearances of cross-sections under a microscope.

Molecular structure and properties of collagen: Formation of the collagen fiber structure, hierarchy of collagen structure, arrangement of amino acid, peptide chain, collagen genes, and RNA, amino acid composition and primary structure, helix stabilization, Diameter, strength, three-dimensional weaves of collagen in leather, interweave, bonding, tensile strength, and flexibility. Properties of crosslinks.

Leather Biotechnology: Bacteria and its classifications: morphological, mode of nutrition, temperature, and pH; structure, nutritional requirements, bacterial culture media. General principles of microbial control. Introduction to fermentation, basic concepts of enzymes—characteristics, classification, catalytic properties, lowering of activation energy, concept of specificity of enzyme, Michaelis–Menten equation, K_m and V_{max} determination and their significance, different methods for enzyme assay, application of enzymes in curing, soaking, dehairing, bating, degreasing, tanning.

Natural and man-made polymer: Natural- vegetable (cellulose), cotton, jute, etc., animal (protein)- leather, wool, virgin wool, silk, hair, etc., mineral- asbestos, Man-made- cellulosic, viscose, acetate, rubber, synthetic polymers, etc.

Course Objectives

- a. To introduce students to the historical background, different types, sources, and world supply of hides and skins.
- b. To familiarize students with animal slaughtering and flaying techniques and the importance of care during flaying.
- c. To equip students with the principles and methods of preservation and curing of hides and skins.
- d. To provide students with an understanding of the structure and composition of hides and skins and their components.
- e. To enable students to comprehend collagen's molecular structure and properties and its applications in leather technology.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

Course Learning Outcomes (CLOs): Upon successful completion of this course, students will be able to-

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	State different parts, types, sources, and world supplies of hides and skins.	C1, A1
CLO2	Explain the modern slaughtering and flaying techniques for animals.	C2, A3
CLO3	Compare and analyze diverse, modern, and environment-friendly curing methods.	C3, C4
CLO4	Illustrate and analyze the histological structure of hides and skins, including their importance in leather production.	C4, A4
CLO5	Correlate the role of biotechnology and various natural and man-made polymers used in leather, leather products, and the footwear industries.	C4, A4

Mapping of Course Learning Outcomes (CLOs) with Programs Learning Outcomes (PLOs)

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	3	-	3	-	-	-	-	-	-	-	-
CLO2	3	2	2	-	3	1	-	-	-	-	-	-
CLO3	3	-	3	-	3	-	2	-	-	-	-	-
CLO4	3	3	-	3	2	-	-	-	-	-	-	-
CLO5	3	3	3	2	3	-	3	-	-	-	-	-

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Whiteboard illustration, Group discussion	In-course assessment, Final examination, Assignment
CLO2	Lecture, Multimedia presentation	Group Presentation, In-course Exam; Final Exam
CLO3	Lecture, Video presentation, Group discussion, Multimedia presentation, Audiovisual, Assignment	In-course Assessment, Oral presentation, Final examination, Assignment, Case study and quiz.
CLO4	Audio-visual presentation, Group discussion, Pictorial	In-course assessment, Final examination
CLO5	Lecture and Multimedia presentation	In-course Assessment and Final examination

Learning Materials

i. Recommended Readings

- a) Anthony D. Covington- Tanning Chemistry: The Science of Leather
- b) Dutta S.S.-An introduction to the principles of leather manufacture.

- c) Wiseman A.-Topics in Enzyme and Fermentation Biotechnology' (Several volumes).
Vol.2

ii. Supplementary Readings

- a) Procter H.R.-The Principle of Leather Manufacture.
b) Sarkar K.T.-Theory and Practice of Leather Manufacture.

iii. Others: Handout/lecture material provided by the course teacher.

Course Code: 0541-Math-1103 Course Title: Algebra and Geometry Credits: 3

Rationale of the Course: This course covers formulas, algebraic expressions, first-degree equations, inequalities, the rectangular coordinate system, the area, perimeter, and volume of geometric shapes, as well as the properties of triangles and circles which are essential for engineers as a fundamental course.

Course Content:

Inequalities, Vector Algebra and Vector Calculus: Review of geometric vectors in R^2 and R^3 space, scalar and vector products, solutions of vector equations, applications of vectors in geometry, vectors in R^n and C^n , inner product, norm and distance in R^n and C^n .

Matrices and Determinants: Notion of matrix, types of matrices, matrix operations, laws of matrix algebra, determinant function, properties of determinants, minors, cofactors, expansion and evaluation of determinants, elementary row and column operations and row-reduced echelon matrices, invertible matrices.

System of Linear Equations: Linear equations, system of linear equations (homogeneous and non-homogeneous) and their solutions, Application of Matrices and determinants for solving system of linear equations, applications of the Algebra in science, engineering and business.

Two-dimensional Geometry: Change of axes, pair of straight lines, general equation of second degree, circle and system of circle, parabola and hyperbola.

Three-dimensional Geometry: Rectangular co-ordinates, direction ratios and cosines of a line, equations of a line and a plane, intersecting planes, symmetric form of a straight line, angle between lines and planes, coplanar lines, skew lines, shortest distance, equations of a sphere.

Course Objectives:

- To know about inequalities, vector algebra, and vector calculus.
- To know about matrices and determinants.
- To know about applications of algebra in science, engineering, and business.
- To know about two- and three-dimensional geometry.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: Upon completion of the course, the students will be able to -

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Describe the basic ideas of inequalities, vector algebra, and vector calculus.	C1, A1
CLO2	Understand the properties of matrices and determinants; and solve systems of linear equations.	C2, A2
CLO3	Relate applications of algebra in science, engineering, and business.	C3, A3
CLO4	Sketch graphs of and discuss relevant features of lines, circles, and other conic sections.	C3, A3
CLO5	Find equations of lines and planes in space and identify and describe quadratic surfaces.	C4, A4

Mapping of CLOs with PLOs

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	-	1	-	-	-	-	-	-	-	-
CLO2	3	3	-	1	-	-	-	-	-	-	-	-
CLO3	3	3	1	1	-	-	-	-	-	-	-	-
CLO4	3	3	-	1	-	-	-	-	-	-	-	-
CLO5	3	3	-	1	-	-	-	-	-	-	-	-

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, group discussion, and problem-based exercises	Assignment, In-course Exam, and Final Exam
CLO2	Lecture, group discussion, and problem-based exercises	Assignment, In-course Exam, and Final Exam
CLO3	Lecture, group discussion, and problem-based learning (PBL): Identifying the problem to be solved	Assignment, In-course Exam, and Final Exam
CLO4	Lecture, group discussion, and problem-based exercises	Assignment, In-course Exam, and Final Exam
CLO5	Lecture, group discussion, and problem-based exercises	Group Presentation, Assignment, In-course Exam, and Final Exam

Learning Materials

i. Recommended Readings

- a) H. Anton, and C.Rorres, Linear Algebra with Applications
- b) S. Lipshutz, Linear Algebra, Schaum's Outline Series.
- c) Brestscher, Linear Algebra with Applications.

ii. Supplementary Readings

- a) Khosh Mohammad, Analytic Geometry and Vector Analysis.
- b) G. Strang, Linear Algebra with Applications.

iii. **Others:** Handout/lecture material provided by the course teacher.

Course Code: 0533-Phy-1105 Course Title: Engineering Physics Credits: 3.0

Rationale of the Course: Engineering physics will provide a more thorough ground in applied physics for a selected specialty such as wave and oscillations, forces and motion, heat, elasticity, properties of matter, electricity and magnetism, nuclear physics, modern physics, and optics. The course will also bridge the gap between theoretical science and practical engineering.

Course Content

Elasticity: Rigid body, perfectly elastic body, plastic body, stress and strain, stress-strain curve for ductile and brittle material, Hooke's law and different elastic constants-moduli of elasticity, poisson's ratio, determination of elastic constants, factors affecting elasticity.

Optics: Theories of light, electromagnetic spectrum, optical instruments, compound microscope, polarizing microscope, camera and photographic techniques, spectrophotometer, interference of light, Young's experiment, Fresnel's bi-prism, Newton's rings, diffraction of light, Fresnel and Fraunhofer diffraction, diffraction gratings, resolving power of a grating, polarized and unpolarized light, polarization by reflection and refraction, Brewster's and Malu's law, double refraction, polarization by scattering, optical activity.

Heat: Humidity, vapor pressure, temperature-related humidity, transmission of heat, thermal conductivity of solids and liquids, coefficient of thermal conductivity, good and bad conductor of heat, heat flow through compound walls.

Electricity and magnetism: Electric charge, Coulomb's law, electric field, electric dipole, electric flux and Gauss's law, applications of Gauss's law, electric potential, equipotential surface, capacitor capacitance and dielectrics, combination of capacitors in series and parallel, dielectrics and Gauss's law, energy storage in an electric field, electric current and current density, resistance, resistivity and conductivity, continuity equation, Ohm's law, combination of resistances, Kirchhoff's laws, Wheatstone bridge, Lorentz force, Ampere's circuital law with applications, solenoid, toroid, electromagnetic induction-Faraday's laws, Lenz's law, self and mutual induction, inductor and inductance, energy stored in magnetic field.

Nuclear physics and modern physics: Properties of atomic nucleus, mass defect, binding energy, nuclear stability, natural and artificial radioactivity, laws of radioactive disintegration, half-life and mean life, radio-toxicity, radioactive waste management. X-ray and their applications, wave-particle duality, de-Broglie hypothesis, photoelectric effect, Compton effect.

Course Objectives: The aims of this course are:

- a. To provide fundamental knowledge and illustrate to the students on different topics of Physics.
- b. To impart knowledge in basic concepts of physics relevant to engineering applications.
- c. To relate the physical phenomena with proficiency in problem-solving, critical thinking, and analysis.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: By the end of the course students will be able to -

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	State various physical laws and fundamental concepts of physics.	C1, A1
CLO2	Explain the factors and related theories of elasticity, optics, heat, electricity and magnetism, nuclear physics, and modern physics.	C2, A2
CLO3	Analyze and apply a conceptual and quantitative understanding of properties of elasticity, optics, heat, electricity, and nuclear physics.	C3, C4, A3
CLO4	Relate and evaluate application-driven ideas that can be applied in solving engineering problems of the leather products industry.	C5, A4

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	-	-	-	-	-	-	-	-	-	-
CLO2	3	2	2	2	-	-	-	-	-	-	-	-
CLO3	3	3	3	3	2	-	-	-	-	-	-	-
CLO4	3	2	2	1	2	-	-	-	-	-	-	2

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture whiteboard lustration, slide presentation, problem practices, interactive discussion	In-course Exam; Final Exam
CLO2	Interactive audiovisual lecture, whiteboard lustration, slide presentation, problem practices	In-course Exam; Final Exam
CLO3	Lecture, whiteboard illustration, problem-based excesses	Quiz, Assignment, and Final Exam
CLO4	Lecture, slide presentation, group discussion, whiteboard illustration, and problem-based exercises	Assignment, In-course Exam, and Final Exam

Learning Materials

i. Recommended Readings

- Resnick/Halliday/Krane-Physics, Vol I and II.
- David Halliday/Robert Resnick/Jearl Walker-Fundamentals of Physics.
- Dr. Gias Uddin Ahmad: Physics for Engineers Part-1 and 2

ii. Supplementary Readings

- Arther Beiser-Concepts of Modern Physics.
- Francis A. Jenkins and Harvey E. White: Fundamentals of Optics

iii. **Others:** Handout/lecture material provided by the course teacher.

Course Code: 0531-Chem-1107 Course Title: Inorganic Chemistry Credits: 3.0

Rationale of the Course: The course is designed to provide applied knowledge on inorganic chemistry related to leather, leather products and allied engineering education. The different concepts from this course will help students understand the mechanism involved in different leather processing and leather products manufacturing.

Course Contents

Concepts in chemical bond: A review of ionic, covalent and co-ordinate bond, covalent character in ionic compounds: Polarization, Fajan's rules; VSEPR theory, valence bond theory: General description, hybridization, multiple bonding; molecular orbital theory: MO diagram of molecules, bond order; ionic character covalent compound, hydrogen bond and other intermolecular forces, metallic bond.

Acids and bases: Arrhenius concept, Bronsted-Lowry concept, Lewis concept, solvent system concept, hard and soft acid-base, acid-base strengths, acid strength of BX_3 , oxoacids, haloacids, self-ionization of water, pH, buffer solutions and mechanism, importance of pH in tanning processes, acid base titrations, equivalent point and end point, selection of indicator in acid-base titration, common ion effect, common ion effect in group separation table.

Redox reactions: Oxidation-reduction reactions, oxidation number, balancing oxidation-reduction equations by half-reaction method, strengths of oxidizing and reducing agents, disproportion reaction, auto-oxidation, induced oxidation, redox titration, redox indicator, iodometry and iodimetry, Back titration and its application, applications of redox titration.

Transitional and inner-transitional metals: d-block and 1st transitional elements, characteristics of transitional elements, shape and orientation of d-orbitals, structure and property relations in 'd' block elements; 4f-block element: Lanthanides, general characteristics, application of transition metal compounds in leather tanning.

Theories of co-ordination chemistry: double salt and complex compounds, ligand and its types, coordination number, Werner's coordination theory, chelate complexes, nomenclature, Sidgwick theory; Valence Bond Theory (VBT) of structure of inorganic complex with simple examples, Crystal Field Theory, application of crystal field theory color of transition metal complexes.

Inorganic compounds used for tanning: Chromium salts, their behavior in solution, variable oxidation state of chromium, color of chromium compounds, structure and bonding of chromium in leather.

Course Objectives: This course will guide the students to learn about-

- a. the basic concepts involved in inorganic chemistry that will prepare the students for advanced coursework in chemistry as well as leather and leather products engineering.

- b. different types of bonds and interactions related to leather, polymeric and other leather products materials.
- c. in-depth knowledge of chemical science directed towards materials, energy technology, and leather tanning, and leather products manufacturing.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: Upon completing this course students will be able to

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Define chemical bonding, and molecular geometry based on established theories, and develop critical thinking skills in different intermolecular forces.	C1, A1
CLO2	Apply the fundamentals principle of chemical bonding and transitional metal chemistry in different steps of leather processing.	C3, A2
CLO3	Illustrate and analyze the chemistry theories to explain the interactions between acids and bases and the fundamental ideas of buffer solutions.	C2, C4, A3
CLO4	Describe the concept of redox reactions and the various redox titration techniques, and apply them in real-life applications purpose.	C2, C3, A2
CLO5	Analyze the theories of coordination chemistry along with aqueous chemistry of chromium and apply them in tanning process.	C4, A3

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	2	2	-	-	-	-	-	-	-	-
CLO2	2	2	2	-	-	-	-	-	-	-	-	-
CLO3	3	2	1	-	-	-	-	-	-	-	-	-
CLO4	3	2	1	-	-	-	-	-	-	-	-	-
CLO5	3	2	2	-	-	-	-	-	-	-	-	-

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Interactive audiovisual lecture, whiteboard illustration, slide presentation, problem practices	In-course Exam; Final Exam
CLO2	Interactive audiovisual lecture, whiteboard illustration, slide presentation, problem practices	In-course Exam; Final Exam
CLO3	Lecture, whiteboard illustration, problem-based exercises	Quiz, Assignment, and Final Exam
CLO4	Lecture, slide presentation, group discussion, whiteboard illustration, and problem-based exercises	Quiz, In-course Exam, and Final Exam
CLO5	Lecture, whiteboard illustration, group discussion, and problem-based exercises	In-course Exam, Assignment, Final Exam

Learning materials

i. Recommended readings

- a) G. F. Lipotrot- Modern Inorganic Chemistry.
- b) F. Albert Cotton, Geoffrey Wilkinson, Paul L. Gaus- Basic Inorganic Chemistry
- c) Darren Ebbing and Steven D . Gammon - General Chemistry, 10th edition

ii. Supplementary Readings

- a) R. D. Madan- Modern Inorganic Chemistry.
- b) K. N. Upadhyaya- A Text Book of Inorganic Chemistry.

iii. **Others:** Lecture/hand notes provided by the course teachers.

Course Code: 0531-Chem-1109 Course Title: Physical Chemistry Credits: 3.0

Rationale of the Course: The course is designed to give the students an understanding of different topics on physical chemistry like introductory concepts on surface chemistry, reaction kinetics, thermodynamics, photochemistry, colloidal science, colligative properties as well as corrosion and reaction. After completion of the course, students will be able to gather theoretical knowledge of physical chemistry and apply it in related engineering fields.

Course Contents

Surface chemistry: Residual force of surface, adsorption and absorption, nature and characteristics of adsorption, types of adsorption, types of adsorption isotherms, theoretical study of adsorption of gas by solid: Freundlich, Langmuir, and BET isotherms, adsorption of solid from solution, applications adsorption.

Colloidal solution: True solution, suspension, types of colloids, general methods of preparation and purification, general properties of sols, the origin of charge, protective action; emulsion, types and preparation of emulsion, emulsifier, stability of emulsions, application of colloids in tanning processes.

Photochemistry: Laws of photochemistry - Grotthuss-Draper law, Stark-Einstein law and Beer-Lambert law (derivation and problems), quantum yield, significance of quantum yield, photophysical processes: Jablonski diagram, chemiluminescence, fluorescence, phosphorescence, photosensitization and photoquenching, applications of photochemistry.

Chemical kinetics: Rate of reaction, order, and molecularity, elementary and overall reaction integral rate equation for 1st, 2nd, and 3rd order kinetics, half-life, order determination methods, temperature dependence of reaction rate, simple theories of reaction rate, energy of activation, collision theory of reaction rates.

Properties of dilute solution: Review of different types of solution, colligative properties, lowering of vapor pressure, elevation of boiling point, depression of freezing point, osmotic pressure and osmosis, deduction of their formula, molecular weight from Raoult's Law, their experimental determination, application of colligative properties, applications of colligative properties.

Corrosion and reactions: Introduction, different types of corrosion, influence of different factors on corrosion, thermodynamics of corrosion, mechanisms of corrosion, different corrosion prevention methods

Thermodynamics: Work, heat, energy, internal energy and enthalpy, thermodynamics systems, 1st law of thermodynamics, reversible and irreversible processes, isothermal and adiabatic expansion of ideal gas, 2nd law of thermodynamics, spontaneous process, entropy, Carnot's cycle, efficiency of a machine.

Course Objectives:

- a. To expose and explain different laws of physical chemistry.
- b. To provide lessons on analysis and derivation of different standard equations using various parameters and variables.
- c. To improve the ability of the students to interpret the tabulated experimental data for different physical processes.
- d. To promote knowledge of the basic concepts of physical chemistry to enter into the field of engineering education.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: At the completion of this course students will be able to -

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Narrate the physical law and principles of surface chemistry and apply them in environmental remediation methods.	C1, C3, A3
CLO2	Explain colloids and emulsion, their classification, preparative methods, and properties of sol, and illustrate the real-life applications.	C2, C4, A3
CLO3	Illustrate different principles of photochemistry, and concepts of photochemical and photophysical processes, and compare them with thermal reactions.	C3, A3
CLO4	Compare the kinetics of zero, 1 st , 2 nd , and 3 rd order reactions and narrate the different reaction order determination techniques and the theories of reaction rate.	C2, C4, A3
CLO5	Explain four colligative properties, and concepts of thermodynamics and apply them in real-life practices.	C3, A3
CLO6	Explain the concept of corrosion of materials in different environmental conditions and design the methods for the prevention of corrosion.	C2, C5, A4

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	1	-	-	-	-	-	-	-	-	1
CLO2	3	2	2	-	-	-	-	-	-	-	-	1
CLO3	3	3	2	-	-	-	2	-	-	-	-	-
CLO4	2	2	-	-	-	-	-	-	-	-	-	-
CLO5	3	2	-	-	-	-	2	-	-	-	-	1
CLO6	3	2	-	-	-	-	2	1	-	-	-	-

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Interactive audiovisual lecture, whiteboard illustration, problem-solving practices	In-course Exam; Final Exam
CLO2	Interactive audiovisual lecture, whiteboard illustration, problem-solving practices	In-course Exam; Final Exam
CLO3	Lecture, whiteboard illustration, slide presentation, problem-based exercises	Quiz, Assignment, and Final Exam
CLO4	Lecture, slide presentation, group discussion, whiteboard illustration, and problem-based exercises	In-course Exam, and Final Exam
CLO5	Lecture, whiteboard illustration, group discussion, and problem-based exercises	In-course Exam, Assignment, Final Exam
CLO6	Lecture, whiteboard illustration, and problem-based exercises	Assignment, Final Exam

Learning Materials

i. Recommended Readings

- a) S. Glasstone-Text Book of Physical Chemistry.
- b) Moron and Lando- Fundamentals of Physical Chemistry.

ii. Supplementary Readings

- a) Bahl And Tuli- Essentials Physical Chemistry.
- b) S.S. Dara- Engineering Chemistry, 1st Edition.

iii. Others: Handout/lecture material provided by the course teacher

Course Code: 0531-Chem-1110

Course Title: Inorganic and Physical Chemistry Lab

Credits: 1.5

Rationale of the course: The course is designed to provide knowledge related to safety during working in the Chemistry laboratory, and the development of skills for the use of lab apparatus and equipment using mainly quantitative and qualitative analysis.

Course Contents

1. Uses of some common apparatus and reagents: Preparation of the substance for analysis and weighing the sample, Preparation of the standard solution of primary standard substances like oxalic acid, succinic acid, sodium carbonate, potassium dichromate.
2. Titration: Acid- base titration: standardization of secondary standard substances like sodium hydroxide, hydrochloric acid, sulphuric acid; redox titration: standardization of secondary standard substances like potassium permanganate, sodium thiosulphate; estimation of Fe and Cu from supplied sample solution.
3. Systematic qualitative analysis of inorganic salts: Physical appearance, preliminary dry test, wet test for acid radicals, flame test, group separation table.

Course Objectives: The course learning objectives of this course are to

- a. familiarize a student with the basic techniques of chemistry laboratory such as weighing, measuring, and transferring liquids, heating, and filtering.
- b. impart knowledge on the identification of different cations and anions by systematic semi micro qualitative analysis.
- c. prepare different standard solutions and perform quantitative analysis.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning outcomes

a. **CLOs:** At the end of the course, students will be able to -

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Explain the principles behind the experiment performed in the laboratory.	C2, P2
CLO2	Perform the hands-on experimental work on volumetric analysis using the equipment/set-up in the laboratory to achieve the respective objectives of the experiments individually or in a group.	C3, P3
CLO3	Inspect the salts and analysis them to determine the cations and anions present in the sample salts through systematic quantitative analysis.	C4, P3
CLO4	Write laboratory reports that compare and contrast theoretical predictions and experimental measurements as well as observations and draw conclusions and inferences from agreements and/or disagreements observed.	C3, P3

b. Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	-	-	-	-	-	-	-	-	-	-
CLO2	3	2	1	-	-	-	-	-	2	-	-	-
CLO3	3	2	2	2	-	-	-	-	-	-	-	-
CLO4	3	2	-	-	-	-	-	2	-	2	-	2

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning, and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Interactive Lectures, Group Discussions, Demonstration, Hands-on practice, and Group work	Quiz, Viva Voce, Report evaluation, Final Exam
CLO2	Lecture, Demonstration, Hands-on practice, and Group work	Presentation, Report evaluation, Final Exam
CLO3	Lecture, Demonstration, Hands-on practice, and Group work	Quiz, Viva Voce, Report evaluation, Final Exam
CLO4	Lecture, Demonstration, Hands-on practice, and Group work	Report evaluation, Final Exam

Learning materials

i. Recommended readings

- Vogel A. I. - Qualitative Chemical Analysis
- Vogel A. I. - Text Book of Quantitative Chemical Analysis

ii. Supplementary Readings

- P. K. Sarker - Analytical Chemistry for Leather Manufacture.

- b) Fifield and Haines-Environmental Analytical Chemistry.
- iii. **Others:** Lecture notes and Lab procedure provided by the course teachers.

Course Code: 0715-ME-1112 Course Title: Engineering Drawing Credits: 1.5

Rationale of the Course: This course is assigned for first-year students to know and practice the types of drawing instruments, types of projection, projection of points, straight lines, and solids; development of surface, etc. At the end of the course, the students will be able to develop skills in basic engineering drawings related to leather products and allied engineering.

Course Content

Drawing equipment and the uses of instruments; basic drafting techniques, planning of drawing sheet; dimensioning, types of lines, lettering, numbering.

Geometrical construction, theory of projection, orthographic projection, first and third angle projection, multi-view projection problems, oblique and isometric drawings, perspective views, sectional views, auxiliary views, assembly drawings, and basic concepts of working drawing.

Course Objectives: This course is designed to provide adequate knowledge on-

- a. different types of drawing tools, and equipment.
- b. letters and numbers in drawing sheets.
- c. different types of projections related to points, straight lines, and solids.
- d. the development of different types of views and surfaces.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program

Learning Outcomes (PLOs)

CLOs: Upon successful completion of this course, students will be able to

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Define and identify different types of lines, shapes, and views.	C1, A1, P1
CLO2	Explain and illustrate different theories or concepts of Engineering Drawing.	C2, A2, P2
CLO3	Apply various geometrical construction rules and techniques for drawing different projections of 3D objects.	C3, A3, P3
CLO4	Solve the drawing-related problems of different projections, views, and angles.	C4, A4, P3

Mapping of Course Learning Outcomes (CLOs) with Programs Learning Outcomes (PLOs)

CLOs	Program Learning Outcomes (PLOs)											
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	1	-	-	-	-	-	-	-	-	-	-
CLO2	3	1	-	-	-	-	-	-	-	-	-	-
CLO3	3	3	2	2	-	-	-	-	2	1	-	-
CLO4	3	3	2	2	-	-	-	-	-	-	-	1

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning, and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Interactive Lectures, Group Discussions, Demonstration, Hands-on practice, and Group work	Quiz, Viva Voce, Report evaluation, Final Exam
CLO2	Lecture, Demonstration, Hands-on practice, and Group work	Presentation, Report evaluation, Final Exam
CLO3	Lecture, Demonstration, Hands-on practice, and Group work	Quiz, Viva Voce, Report evaluation, Final Exam
CLO4	Lecture, Demonstration, Hands-on practice, and Group work	Report evaluation, Final Exam

Learning Materials

i. Recommended Readings

- a) Chandra Mandal, Dr. Amalesh and Islam, Dr. Md. Kamrul,- “Mechanical Engineering for Engineers”.
- b) Geisecke E., Federick; Mitchel E., Alva; Spencer C., Henry; Hill L., Ivan; Dygdon Thomas., John; Novak E., James; Loving O. R.; Lockhart E., Shawna- “Technical Drawing with Engineering Graphics”.

ii. Supplementary Readings

- a) Simmons H., Colin; Dennis E., Maguire and Phelps., Neil- “Mechanical Engineering Drawing”
- b) Warren J. Luzadder and Jon M. Duff.-“Fundamental of Engineering Drawing”

iii. Others: Handout/Lecture notes provided by course teacher.

Course Code: 0417-Hum-1114 Course Title: Employability Skills-I Credits: 1.5

Rationale of the Course: This course is designed to enable students in employability-related communication to enhance their performance in different types of communicative English. After completing the course, students will be competent in speaking, listening, writing, reading, and developing communicative skills in technical and business English.

Course Content

Language: Function, Difference between written and spoken language, Planning format, paragraph heading, Listening, understanding and speaking skills, effective communication, techniques of description, uses of visual aids, reading skills.

Different types of Communication: Intrapersonal, interpersonal, small group, organizational, intercultural, and mass communications; significance of communication in corporate and multinational business organizations; communication network- Vertical communications downward communication and upward communication, horizontal communication, systems of communication: Stimulus to communication, communication components.

Business letters: Drafting letters, applications, letters of complaint, letters to the press, apology and explanation, request letters, functions of a first, middle and last paragraph(s), characteristics and drafting process of positive letters, negative letters, persuasive letters, routine letters and memos.

Report Writing: Types of report, characteristics, and importance of different types-Purpose-Scope-different styles of writing reports. The process of preparing informal and formal reports, drafting reports, progress reports, technical reports, and industrial reports.

Proposals: For new equipment, increasing production, description of visits, experiments, etc. Explaining: Process explaining, complaining, and reporting damage.

Course Objectives

- a. To assist students in becoming well-versed, responsible, and creative communicators through individual skill assessments by exploring their values and career choices.
- b. To encourage students about realistic employment choices and to identify the steps necessary to achieve their goals.
- c. To develop students' communication skills in the structure, elucidation, and delivery of messages in diverse professional, cultural, and global communities.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: The course is designed to achieve the following learning outcomes

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Demonstrate the basic domains of English language, business letters, reports, and proposal writing.	C2, A2, P2
CLO2	Manipulate and apply the language skills, tools, and techniques to develop technical and professional letters, reports, and proposals.	C3, A2, P3
CLO3	Relate and apply the acquired skills on Communicative English to explore future career.	C4, A3, P3

Mapping of CLOs with PLOs

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	3	-	-	-	2	-	-	3	3	3	2
CLO2	3	3	-	-	2	3	-	-	2	3	2	3
CLO3	3	3	-	-	-	2	-	-	2	3	3	3

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning, and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Multimedia presentation, group discussion	Lab Performance Report, Continuous Assessment; Final Examination
CLO2	Lecture, Video presentation, Problem-based Learning (PBL): Identifying the problems to be solved	Lab Performance Report, Assignment, Continuous Assessment; Final Examination
CLO3	Lecture, multimedia presentation, literature review, group discussion, analysis, and comparison through various circumstances	Lab Performance Report, Continuous Assessment; Final Examination

Learning Materials

i. Recommended Readings:

- a) Mishra. B, Sharma. S (2011) Communication Skills for Engineers and Scientists. PHI Learning Pvt. Ltd. ISBN: 8120337190.
- b) Chaturvedi P. D, Chaturvedi M. (2011) Business Communication: Concepts, Cases and Applications. Pearson Education India. ISBN: 8131718727.
- c) Greenbaum. Sidney. College Grammar of English. Longman Publishers. ISBN: 9780582285972.

ii. Supplementary readings:

- a) Frances Trought (2017) Employability Skills: How to stand out from the crowd in the graduate job market ISBN: 978-1-292-15890-7

iii. Others: Handout/lecture material provided by the course teacher

Course Code: 0723-LPE-1116 Course Title: Field Tour-I Credit Value: 1.0

Rationale of the Course: Industrial visits serve as an excellent platform to learn for students pursuing B.Sc. in Leather Products Engineering degree and they help in bridging the gap between classroom learning and the actual work conditions. The Field Tour-I course is designed to help inculcate the practical workplace environment to the students and to render a holistic engineering

education to them.

Course Content

In 1st Year 1st Semester, students will visit a reputed leather industry.

Discussions with the company supervisor about any project or assignment/task.

Understanding the systems in the workplace – Processes, Organization, Administration.

Recording all the work done or knowledge gained.

Maintaining a logbook and giving feedback to the guide teacher.

Course Objectives

- a. To provide exposure to the students to leather engineering practices in the tannery.
- b. To instill communication skills in engineering which include interaction with the working environment and technical writing.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: At the completion of this course students will be able to -

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Identify and recognize the machines and equipment of leather industry.	C2, A2, P1
CLO2	Describe and analyze the process flowchart, faults, remedies and recent development in leather processing.	C2, C4, A3, P3
CLO3	Write technical reports and deliver oral presentations related to the industrial visit/work completed.	C3, A2, P2

Mapping Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	-	-	-	2	-	-	-	2	-	-	2
CLO2	2	2	-	-	2	-	-	-	2	-	-	-
CLO3	2	-	-	-	-	-	-	-	2	3	-	2

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course-Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Interactive Lecture, Display and demonstration, Presentation and viva	Participation and performance assessment, Presentation, Report Evaluation
CLO2	Interactive Lecture, Display and demonstration, Presentation and viva	Participation and performance assessment, Presentation, Report Evaluation
CLO3	Discussion, Self-study, Motivational discussion, Presentation and viva	Participation and performance assessment, Presentation, Report Evaluation

Learning Materials

i. Recommended Readings

- a) Writing the Winning Thesis or Dissertation: A Step-by-Step Guide - By Allan A. Glatthorn, Randy L. Joyner.
- b) Relevant books, scientific journals, handbooks, patents and manuals.

Course Code: 0723-LPE-1201 Course Title: Leather Processing-I Credits: 3.0

Rationale of the Course: This course explores the essential pre-tanning processes in leather manufacturing including sorting, grading, beam house operations, soaking, unhairing, liming, delimiting, bating, pickling, and degreasing. Students will develop the knowledge and skills needed to analyze, evaluate, and apply these processes for the production of high-quality leather products.

Course Content

Sorting and gradation of raw hides and skins: Principles; objectives, methods, and importance in leather processing.

Beam house operation/ pre-tanning Processes: Introduction and role of beam house operations in leather making.

Soaking: Objectives and mechanism, soaking of different hides and skins, enzymatic soaking, influencing factors, role of hyaluronic acid, aids and controls, eco-friendly process technologies in soaking, defects and their remedies, green fleshing.

Unhairing and liming: Objectives, types, advantages and disadvantages, immunization of keratin, swelling of collagen based on Dornan's theory, mechanism of unhairing, sulphide free unhairing system, enzymatic unhairing, control of enzymatic unhairing and advantages and, scope of hair utilization or disposal, prevention of H₂S emission from lime effluent.

Fleshing: Objectives, types, advantages and disadvantages.

Deliming and bating: Objectives, selection of delimiting agents, completion test of delimiting, mechanism of bating, effect of bating on leather quality, acid and alkali bating: advantages and disadvantages, bating completion test, pollutants emission, cleaner technology options.

Pickling: Acid binding capacity of collagen, organic acids and salts in pickling, importance and controls, de-pickling.

Degreasing: Objectives and importance, different systems and methods of degreasing.

Course Objectives

- To provide students with a comprehensive understanding of sorting, grading, and beam house operations in the leather-making process.
- To enable students to comprehend the processes of soaking, unhairing, liming, and fleshing.
- To familiarize students with the objectives, types, advantages, and disadvantages of delimiting, bating, pickling, and degreasing in leather manufacturing.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

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

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Recall and explain the principles of sorting, and grading of raw hides and skins, and leather processing.	C1, C2, A1, A2
CLO2	Describe the role and importance of beam house operations in leather making.	C2, A2
CLO3	Analyze the mechanism, environmental impact, and factors influencing the beam house operations.	C3, A3
CLO4	Compare and analyze different techniques of different pre-tanning operations.	C3, C4, A4
CLO5	Evaluate the suitability of pre-tanning operations based on specific leather manufacturing requirements.	C5, A4

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	-	-	-	-	-	-	-	-	-	-	-
CLO2	3	2	-	-	-	-	-	-	-	-	-	-
CLO3	3	3	2	2	-	2	2	-	-	-	-	-
CLO4	3	3	2	2	-	-	3	-	-	-	-	-
CLO5	3	3	2	2	-	2	3	-	-	-	-	-

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Multimedia presentation, demonstration and problem-based exercises	Group Presentation, In-course Exam; Final Exam
CLO2	Lecture, group discussion and problem-based exercises	Group Presentation, In-course Exam; Final Exam
CLO3	Lecture, guided reading and problem-based learning (PBL): Identifying the problem to be solved	Assignment, Group Presentation, In-course Exam, and Final Exam
CLO4	Lecture, multimedia presentation, group discussion, literature review, demonstration, and problem-based exercises	Group Presentation, In-course Exam, and Final Exam
CLO5	Lecture, group discussion, literature review, and problem-based exercises	Group Presentation, Assignment, In-course Exam, and Final Exam

Learning Materials

i. Recommended Readings

- a. Theory and Practice of Leather Manufacture–K. T. Sarkar, Macmillan India Press, Madras
- b. Tanning Chemistry: The Science of Leather-Anthony D Covington
- c. Possible Defects in Leather Production-Gerhard John.

ii. Supplementary Readings

- a. Introduction to the Principles of Leather Manufacture- S. S. Dutta, 4th Edition.
- b. Leather Technician`s Handbook–J. H. Sharphouse, Vernon Lock Ltd., 125 High Holborn, London W-C1

iii. Others: Handout/lecture material provided by the course teacher

Course Code: 0723-LPE-1202 Course Title: Leather Processing-I Lab Credits: 1.5

Rationale of the Course: Leather Processing-I Lab is a practical course that is designed to develop graduate's essential knowledge of leather manufacturing. The main aim of this course is to introduce the students to skills necessary for manufacturing of wet-blue leather. The course will deal with the different stages of pre-tanning process, the importance of pre-tanning, and its methods resulting in enhancing interest in the chemistry and mechanism of leather.

Course Content

- a. Identification of raw hides and skins/ wet blue/ crust leather/finished leather.
- b. Curing of freshly flayed cow hides and goat skins with sodium chloride (common salt) and its effect on moisture content at different time intervals.
- c. Determination of rate of moisture uptake and degree of swelling of cow hides and goat skins during soaking.

- d. Painting method of unhairing for wet salted goat skins/sheep skins.
- e. Liming with slaked lime and/or sodium sulfide.
- f. Comparative effects of deliming with boric acid, lactic acid, ammonium chloride, and ammonium sulfate.
- g. Bating with acidic/alkaline bate powder of wet salted goat skins/sheep skins/cowhides.
- h. Effect of sodium chloride on pickling of wet salted goat skins/sheep skins/cowhides.
- i. Manufacturing of chrome-tanned wet blue leather from wet salted hides and skins.

Course Objectives:

- a. To introduce students to quantitative and qualitative control parameters in pre-tanning operations.
- b. To enhance the student’s ability to analyze and alleviate the issues during leather manufacturing.
- c. To guide students in assessing different completion parameters of different stages of the pre-tanning operations.
- d. To develop students’ skills on the manufacturing of wet blue leather.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

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

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Identify and classify different types of leather, according to origin, grain patterns, and texture.	C2, A2, P2
CLO2	Apply and analyze the process of curing and pre-tanning operations of hides and skins.	C3, C4, A2, P3
CLO3	Compare and evaluate the effectiveness of different techniques of beam house operations.	C4, C5, A3, P4
CLO4	Demonstrate practical proficiency in the manufacturing of wet-blue leather as an individual and/or teamwork.	C5, A3, P4

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	2	2	1	-	1	-	-	-	-	-
CLO2	3	3	2	3	2	-	2	-	-	-	-	-
CLO3	3	3	2	3	2	-	3	-	-	-	-	-
CLO4	3	3	2	3	2	-	3	-	3	-	-	-

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Demonstration, Hands-on practice, and Group work	Lab Performance, Viva, Report, Final Exam
CLO2	Lecture, Demonstration, Hands-on practice, Group discussion, and Group work	Lab Performance, Viva, Report, Final Exam
CLO3	Lecture, Demonstration, Hands-on practice, and Group work	Lab Performance, Viva, Report, Final Exam
CLO4	Lecture, Demonstration, Hands-on practice, and Group discussion	Lab Performance, Viva, Report, Final Exam

Learning Materials

i. Recommended Readings

- a) Leather Technician`s Handbook–J. H. Sharphouse, Vernon Lock Ltd., 125 High Holborn, London W-C1
- b) Theory and Practice of Leather Manufacture- K.T. Sarkar.
- c) Possible Defects in Leather Production-Gerhard John.

ii. Supplementary Readings

- a) Introduction to the Principles of Leather Manufacture- S. S. Dutta, 4th Edn. I. L. T. A., Calcutta.
- b) Tanning Chemistry, The Science of Leather-Anthony D Covington.

iii. Others: Handout/lecture material provided by the course teacher

Course Code: 0723-LPE-1203

Course Title: Leather Products Manufacturing-I

Credits: 3.0

Rationale of the Course: Leather products manufacturing-I is a foundational course that explores a proper concept on history and base of leather products, pattern concept, cutting operations, splitting, skiving operation with different joining techniques to enhance the boundary of knowledge and skills in product manufacturing. The course also concludes the implementation of theoretical knowledge on manufacturing a small leather product-money bag from designing to the finishing operation.

Course Content

History of leather products and its classification: History, classification of leather products and leather goods, characteristics and variations in a leather, difference between real leather & artificial leather.

Foundation of Leather products: Terms used in leather goods, tools, machinery and accessories used in leather products manufacturing, role of raw materials, edge construction, evaluation of design and fashion trend.

Pattern making: Concept of pattern making with classification, indication of pattern, garments pattern, free hand drawing, 3D-2D concept, allowance, role of designing and pattern making.

Cutting operations for leather products: Principle and classification of cutting system, advantages and limitations of cutting techniques, manual die cutting, automatic cutting, NC die cutting, automatic die cutting, universal die cutting, die-less cutting system with specifications, special cutting procedure, norms of cutting, qualification of a good cutter, wastage.

Splitting: Introduction, classification and techniques, parts and functions of splitting machine, trouble shooting, procedure, process control, acceptance criteria.

Skiving: Introduction, classification, parts and function of skiving machine, trouble shooting, procedure, process control, acceptance criteria.

Joining techniques: Definition of stitch, seam and sewing, types of stitch and seams with techniques, constructional seam-open seam, closed seam, taped seam, top-stitched seam, flat-felled seam, butted seam, silked seam, brooklyn seam, welted seam, piped seam, decorative seam.

Wallet: Introduction, types and use, raw materials, perspective drawing, components, measurement instruction, total pattern making, leather consumption, splitting and skiving, construction, assembling and finishing.

Course Objectives

- a. To familiarize students with the history and foundation of leather products
- b. To provide students with a comprehensive understanding of pattern concept, cutting operations, splitting, skiving and joining techniques.
- c. To enable students gather theoretical knowledge on how to manufacture a wallet from designing to finishing.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

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

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Recall and explain the fundamental knowledge about history and foundation of leather products manufacturing.	C1, C2
CLO2	Comprehend the concept of pattern knowledge and its types, pattern cutting instructions etc. to explore ideas from thoughts to launch	C2, A2
CLO3	Recognize cutting, splitting, skiving and discover its applications with control process, acceptance criteria on manufacturing	C3, C4
CLO4	Discover skill in joining techniques, construction and assembling.	C4
CLO5	Illustrate a comprehensive knowledge in the fundamentals of a wallet manufacturing from pattern cutting to finishing	C4

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3											
CLO2	3											
CLO3	3	3	2									
CLO4	3	3	3	3								
CLO5	3	3	3	2	3			2		2		3

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture with multimedia presentation, Interactive Discussion, White Board Illustration	In-course Exam, Final Exam
CLO2	Lecture, White Board Illustration, Group Discussion, Video Presentation	Assignment, In-course Exam; Final Exam
CLO3	Lecture, Lecture discussion with multimedia, Interactive Discussion, White Board Illustration	Assignment, Group Presentation, In-course Exam, and Final Exam
CLO4	Lecture with multimedia presentation, Interactive Discussion, White Board Illustration	Group Presentation, In-course Exam, and Final Exam
CLO5	Lecture, Video Presentation, Problem based learning, White Board Illustration	Assignment and Final Exam

Learning Materials

i. Recommended Readings

- a) Martin M. Shoben & Janet P. Ward-Pattern Cutting and making Up.
- b) Moseley, G.C-Leather Goods Manufacture.
- c) Jane E. Garner-The Complete Handbook of Leather crafting

ii. Supplementary Readings

- a) Mary and E.A. Manning-Leatherwork.
- b) Moseley, G.C-Leather Goods Manufacture.

iii. Others: Handout/lecture material provided by the course teacher

Course Code: 0723-LPE-1204

Course Title: Leather Products Manufacturing-I Lab

Credits: 1.5

Rationale of the Course: Leather Products Manufacturing-1 Lab is a practical course that is designed to develop graduate's essential knowledge on leather products manufacturing. The course imparts knowledge on different tools and tooling techniques, cutting and sewing practice, pattern

making, edge treatment, joining techniques by which one can correlate with theoretical concepts thus resulting in exploring ideas and thoughts on manufacturing process. This course will lay out the manufacturing of different leather products from designing and pattern development stage to the final assembling with wastage calculation and consumption.

Course Contents

1. Introduction of tools, tooling techniques and accessories.
2. Introduction to different types of joining techniques, stitch, seam, sewing machine, needle, thread and edge treatment techniques.
3. Introduction to different types of skiving and splitting procedures, machines and their parts and practice on leather and non-leather materials
4. Hand cutting exercise on pattern paper with hand knife on different shaped curve and straight line drawn on cutting practice sheet.
5. Hand Cutting Practice on leather and non-leather materials
6. Machine Cutting Practice on leather and non-leather materials with different types of single edge and double edge dies.
7. Sewing on different shaped line of supplied paper with various sewing machine.
8. Pattern cutting: Introduction of pattern cutting technique, consideration of allowance, basic, working and cutting pattern making.
9. Manufacturing of the following products:
 - Coin Purse
 - Key Case
 - Wallet

Course Objectives

- a) To introduce students with tools, tooling techniques and accessories for leather products manufacturing.
- b) To impart rudimentary knowledge on hand cutting and machine cutting, joining techniques, sewing machine, needle, thread and edge treatment
- c) To provide students with the knowledge of pattern cutting and different techniques.
- d) To guide students in manufacturing of different leather products like coin purse, key case, wallet to explore their creative ideas and thoughts.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

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

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Identify different types of tools, tooling techniques, accessories, joining techniques, needle, thread and edge treatment techniques for leather products manufacturing	C1, A1, P1
CLO2	Explain different splitting, skiving procedures and apply the knowledge on leather and non-leather materials	C2, C3, P2, A3
CLO3	Demonstrate the cutting and sewing operations on leather and non-leather materials by hand cutting and machine cutting practice	C3, P4, A3
CLO4	Evaluate and critically analyze the role and importance of different pattern cutting techniques by getting acquainted with the types	C4
CLO5	Design and develop different types of leather products such as; coin purse, key case, wallet with practical proficiency	C6, A5, P7

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	1									
CLO2	3	3	2	2								
CLO3	3	3	2	2								
CLO4	3	3	3	2								
CLO5	3	3	3						3		2	3

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Demonstration, Group discussion, Video presentation	Lab Performance, Continuous assessment: Quiz, Viva, Report, Final Exam
CLO2	Lecture, Hands-on practice, Process oriented learning	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO3	Lecture, Hands-on practice, Process oriented learning, Problem based learning and Group work	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO4	Lecture, Hands-on practice, Process oriented learning, Problem based learning and Video presentation	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO5	Lecture, Demonstration, Video presentation and Problem-based group discussion, Process oriented learning	Lab Performance, Continuous assessment: Viva, Group Presentation, Report, Final Exam

Learning Materials

i. Recommended Readings

- a) Anne & Jane Cope-Leatherwork.
- b) Martin M. Shoben & Janet P. Ward-Pattern Cutting and making Up.
- c) Moseley, G.C-Leather Goods Manufacture.

ii. Supplementary Readings

- a) Francesca Sterlacei-Leather Apparel Design.
- b) Hamlyn-Leatherwork –A step-by-step Guide.

iii. Others: Lecture material/ Lab manual provided by the course teacher

Course Code: 0541-Math-1205 Course Title: Calculus Credits: 3.0

Rationale of the Course: This course will help students develop a deeper grasp of functions, differentiation, and integration. Calculus concepts explored include limits and continuity, derivatives, definite integrals, exponential and logarithmic functions, trigonometric functions, and techniques of integration. Examining how calculus is used in the actual world is a major focus of this course.

Course Content:

Differential calculus: Functions of real variable and their graphs, limits of functions, continuity and derivative, higher derivatives, Leibnitz theorem, Role's theorem, mean value theorem, Taylor's theorem, Taylor's and Maclaurin's series, Maximum and minimum values of functions and applied maximum and minimum problems in science, and engineering, functions of two and three variables.

Integral calculus: Antiderivatives and indefinite integrals, Techniques of integration, Definite integration using antiderivatives, Definite integration using Riemann sums, Applications of the definite integral in geometry, science, and engineering.

Fundamental theorems of calculus: Basic properties of integration, Integration by reduction, Application of integration: Plane areas, Solids of revolution, Volumes by cylindrical shells, Volumes by cross-sections, Arc length and surface of revolution, Improper integrals: Gamma and beta functions.

Vector calculus: vector function of scalar variables, differentiation of vector functions and applications.

Course Objectives: The aims of this course are:

- a. To provide a firm foundation in the concepts and techniques of the calculus, including basic functions and graphs and their properties, curve sketching, limits, continuity, differentiation, relative extrema and applications.
- b. To introduce the students with integral calculus, the techniques of integration and some of the applications of integration to physical problems.
- c. To provide knowledge on the applications of calculus in commerce and economics.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: Upon completion of the course, the students will be able to -

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Identify a function from an algebraic, numerical, graphical, and verbal perspective and extract information relevant to the phenomenon modeled by the function.	C1, A1
CLO2	Describe the concept of limit and continuity of a function at a point graphically and algebraically using appropriate techniques.	C2, A1
CLO3	Calculate the area between curves, volumes of solids of revolution, surface area, arc length using integration.	C3, A2
CLO4	Interpret the derivative of a function at a point as the instantaneous rate of change and as the slope of the tangent line, the consequences of Rolle's theorem, and the mean value theorem.	C4, A3
CLO5	Evaluate integrals using different techniques of integration.	C5, A4

Mapping of CLOs with PLOs

CLOs	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	3	-	1	-	-	-	-	-	-	-	-
CLO2	3	3	-	1	-	-	-	-	-	-	-	-
CLO3	3	3	-	2	-	-	-	-	-	-	-	-
CLO4	3	3	-	2	1	-	-	-	-	-	-	-
CLO5	3	2	-	2	-	-	-	-	-	-	-	-

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture and literature review	Assignment, In-course Exam, and Final Exam
CLO2	Lecture, group discussion, and problem-based exercises	Assignment, In-course Exam, and Final Exam
CLO3	Lecture, guided reading, and problem-based learning (PBL)	Assignment, In-course Exam, and Final Exam
CLO4	Lecture, group discussion, and problem-based exercises	Assignment, In-course Exam, and Final Exam
CLO5	Lecture, group discussion, and problem-based exercises	Group Presentation, Assignment, In-course Exam, and Final Exam

Learning Materials

i. Recommended Readings

- a) H. Anton, I. C. Bivens, S. Davis, Calculus.
- b) E.W. Swokowski, Calculus.

c) James Stewart, Calculus: Early Transcendentals.

ii. Supplementary Readings

a) Deborah Hughes-Hallett, Applied Calculus.

b) Stefan Waner and Steven Costenoble, Applied Calculus.

iii. Others: Handout/lecture material provided by the course teacher.

Course Code: 0611-CSE-1207 Course Title: Fundamentals of Computer and Information Technology Credits: 3.0

Rationale of the Course: This course is intended to introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the internet, networking, and mobile computing. It focuses on such computer literacy that prepares students for lifelong learning of computer concepts and skills.

Course Content:

Computer Basics: Generations of computer, block diagram of a computer, functions of the different units: input unit, output unit, memory unit, CPU (ALU+CU), input and output devices, computer memories: primary memory, secondary memory.

Computer Hardware and Software: Computer hardware, computer software, types, computer languages: machine language, assembly language, high-level language, program language translators: assembler, compiler, interpreter, computer virus: types of viruses.

Operating System: Some popular operating Systems - UNIX - MS-DOS - Windows XP - Windows Vista - Linux, process management - multi-programming - multi-Tasking - multi-threading - multi-processing - time sharing - memory management - file management.

Digital Logic Design: Boolean algebra - logic gates - AND, OR, NOT, NAND, NOR gate - logic circuits - converting expression to logic circuit - universal NAND gate - universal NOR gate - Exclusive OR and equivalence function - design of combinational circuit - design of half-adder - design of full-adder

Computer Networks: Resource share: hardware, software, information, network types: private, public, peer-to-peer, client-server, PAN, LAN, MAN, WAN, Network-related devices: modem, NIC, hub, switch, router, gateway, bridge, repeater, network topology: star, mesh, ring, bus, tree, hybrid, cloud computing

Communication systems: Analog signal, digital signal, data communication system, data transmission speed, data transmission method, bit synchronization, data transmission skills, data transmission mode, wired communication media: co-axial cable, twisted pair cable, optical fiber cable, wireless communication media: Wifi, bluetooth, hotspot, etc, mobile communication: 1G, 2G, 3G, 4G, TDMA, FDMA, CDMA, GSM, Telephone Number Systems in Bangladesh.

Internet: How internet works, internet server, ARPANET, types of internet, OSI Model, TCP/IP model, IP addressing, VPN.

Course Objectives:

- a. To provide students the fundamental vocabulary of key terms related to computer hardware and software.
- b. To develop knowledge on computer operating systems and language.
- c. To introduce students with data management, and communication systems.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program**Learning Outcomes (PLOs)**

CLOs: Upon completion of the course, the students will be able to -

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Describe the computer and information technologies, their internal mechanisms, and classifications.	C1, A1
CLO2	Explain the basics of the internet, mobile and wireless communications.	C2, A2
CLO3	Apply the fundamental of computer programming as well as the software development process and networking.	C3, A2
CLO4	Analyze and evaluate the information system briefly with real-life examples.	C5, A3

Mapping of CLOs with PLOs

CLOs	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	1	1	2	-	-	-	-	2	-	-
CLO2	3	2	2	1	2	1	-	-	-	2	-	-
CLO3	3	2	2	2	3	-	-	-	-	3	-	-
CLO4	3	2	1	3	3	1	-	-	-	3	-	3

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, multimedia presentation, group discussion,	Assignment, In-course Exam, and Final Exam
CLO2	Lecture, multimedia presentation, group discussion	Assignment, In-course Exam, and Final Exam
CLO3	Lecture, multimedia presentation, group discussion	Assignment, In-course Exam, and Final Exam
CLO4	Lecture, multimedia presentation, group discussion	Group Presentation, In-course Exam, and Final Exam

Learning Materials**i. Recommended Readings**

- a) H. Anton S. France- Computer Science.
- b) Warford- Computer Science.

c) Peter Norton – An Introduction to Computer Science.

ii. Supplementary Readings

a) James Martin - Information Engineering: Introduction.

b) Kenneth C. Laudon and Jane P. Laudon- Management Information Systems:

iii. Others: Handout/lecture material provided by the course teacher.

Course Code: 0611-CSE-1208 Course Title: Fundamentals of Computer and Information Technology Lab Credits: 1.5

Rationale of the Course: A hands-on introduction to personal computers and application software. Students will learn basic computer terminology, the role of computers in society, and the use of word processing, spreadsheet, presentation, database, and Internet software.

Course Content:

Operating Computer using GUI Based Operating System: What is an Operating System; Basics of Popular Operating Systems; The User Interface, Using Mouse; Using right Button of the Mouse and Moving Icons on the screen, Use of Common Icons, Status Bar, Using Menu and Menu-selection, Running an Application, Viewing of File, Folders and Directories, Creating and Renaming of files and folders, Opening and closing of different Windows; Using help; Creating Short cuts, Basics of O.S Setup; Common utilities.

Understanding Word Processing: Word Processing Basics; Opening and Closing of documents; Text creation and Manipulation; Formatting of text; Table handling; Spell check, language setting and thesaurus; Printing of word document, Latex.

Making Small Presentation: Basics of presentation software; Creating Presentation; Preparation and Presentation of Slides; Slide Show; Taking printouts of presentation / handouts. Using Spread Sheet: Basics of Spreadsheet; Manipulation of cells; Formulas and Functions; Editing of Spread Sheet, printing of Spread Sheet.

Web meeting: GoToMeeting, Cisco WebEx, TeamViewer, Skype, Join.me, Zoom, Google Meet, Microsoft Teams, Dialpad Meetings, Apache OpenMeeting

Database Management System: My SQL language, program language.

Course Objectives:

- a. To provide lessons on basic information systems using MS Office products.
- b. To introduce different techniques and tools for programming, presentations, and effective communication.
- c. To develop skills in data processing, web meeting, and data management.
- d. To acquaint students with basic functional maintenance of computer.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: Upon completion of the course, the students will be able to -

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Learn and apply the basic MS Office tools to prepare word files, and spreadsheets with figures, columns, and tables.	C1, C3, A2, P1
CLO2	Illustrate how to use a popular spreadsheet to maintain a minor bookkeeping, statistical and graphical analysis of data.	C2, A2, P2
CLO3	Prepare academic and professional PowerPoint presentation using MS Office products and Illustrator.	C4, A3, P3
CLO4	Execute the basics of computer programming.	C5, A4, P4

Mapping of CLOs with PLOs

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	1	1	2	-	-	-	-	-	-	3
CLO2	3	2	-	1	3	1	-	-	-	2	-	2
CLO3	3	2	-	2	2	-	-	-	-	2	1	3
CLO4	3	2	1	2	3	-	-	-	-	-	2	1

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, multimedia presentation, group discussion	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO2	Lecture, multimedia presentation, group discussion	Group Presentation, Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO3	Lecture, multimedia presentation, group discussion	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO4	Lecture, multimedia presentation, group discussion	Lab Performance, Continuous assessment: Viva, Report, Final Exam

Learning Materials

i. Recommended Readings

- a) Clive Finkelstein – An Introduction to Information Engineering.

ii. Supplementary Readings

- a) James A. O'Brien George M. Marakas - Introduction to Information System.

iii. Others: Handout/lecture material provided by the course teacher.

Course Code: 0531-Chem-1209

Course Title: Organic Chemistry

Credits: 3.0

Rationale of the Course: The course is designed to provide fundamental knowledge related to basic organic chemistry. The students will learn about different organic functional groups, their

synthesis, reaction mechanisms as well as structural orientations. This course also provides basic knowledge about fat, oil, wax, pigment, paints, varnish, and lacquers.

Course Contents

Introduction: A review of different organic functional groups, factors affecting melting and boiling point of organic compounds, hybridization of simple organic compounds, isomerism: geometrical and optical isomerism.

Concept of organic reaction: Electronic displacements: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications; carbocations, carboanions, free radicals, nucleophiles, electrophiles, organic acids and bases and their relative strength.

Aromatic compounds: Aromaticity: Hückel's rule, aromaticity of common heterocyclic compound, electrophilic and nucleophilic aromatic substitution reactions, orientation of substitution reaction of benzene derivatives, aromatic amines, types of amines, diazonium salt, azo compounds, coupling reaction.

Carboxylic acids: Structure, preparation, properties, and use of carboxylic acids; Functional derivatives of carboxylic acid: Structure, preparation, properties, relative reactivity of acid halides, acid anhydrides, esters, and amides.

Amino acids and protein: Introduction, synthesis and reaction of amino acids, physical and chemical properties of amino acids, peptide bond, structure of proteins: primary, secondary, tertiary, and quaternary, denaturation.

Fats, oils, and waxes: Introduction to fat, oil and wax, fatty acids, physical and chemical properties, analysis of fat and oil: Free acid and alkali value, acid value, iodine value, saponification value, and unsaponifiable matter, Acetyl value, Reichert meissl and Polenske value.

Paint, varnish, and lacquers: Pigment, classification of pigment, paints, constituents of paints, varnish, characteristics, constituents, types of varnish, comparison between varnish and lacquers.

Course Objectives: The learning objectives of this course are to-

- a. provide the fundamental principles of organic chemistry, synthesis, and reactivity of important functional groups.
- b. impart knowledge on functional group transformations, simple reaction mechanisms, and the synthesis of organic molecules by multi-step synthesis strategies.
- c. deliver conceptual knowledge about fat, oil, wax, pigment, paints, varnish, and lacquers.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: Upon completing this course students will be able to:

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Describe the fundamental principles of organic chemistry that include chemical bonding, hybridization, physicochemical properties, and isomerism.	C1, A1
CLO2	Explain the concepts of aromaticity and the reaction orientation of benzene derivatives with mechanisms.	C2, A2
CLO3	Illustrate the preparative methods, properties, reactions, and uses of carboxylic acid and its functional derivatives as well as aromatic amines and diazonium salt.	C3, A3
CLO4	Compare the structural properties of amino acids and the formation of protein.	C4, A3
CLO5	Analyze and interpret the physicochemical properties of lipids, and surface-coating materials.	C4, C5, A3

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	-	-	-	-	-	-	-	-	-	-
CLO2	3	2	-	-	-	-	-	-	-	-	-	-
CLO3	2	2	1	-	-	-	-	-	-	-	-	-
CLO4	3	3	2	2	-	-	-	-	-	-	-	-
CLO5	3	2	2	2	2	-	-	-	-	-	-	2

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Interactive audiovisual lectures, group discussions, problem-solving practices	In-course Exam; Final Exam
CLO2	Lecture, whiteboard illustration, slide presentation, problem-based exercises	Quiz, Final Exam
CLO3	Lecture, slide presentation, group discussion, whiteboard illustration, and problem-based exercises	In-course Exam, Final Exam
CLO4	Lecture, multimedia presentation	In-course Exam, Final Exam
CLO5	Lecture with whiteboard illustration, multimedia presentation, audio-visual	Assignment, In-course Exam, Final Exam

Learning materials

i. Recommended readings

- Morrison and Boyd- Organic Chemistry.
- I. L. Finar- Organic Chemistry, Volume - 1
- O.G. Palanna- Engineering Chemistry

ii. Supplementary Readings

- Raghupati Mukhopadhyay- Engineering Chemistry.
- B. S. Bahl and Arun Bahl- Organic Chemistry.

iii. Others: Lecture/hand notes provided by the course teachers.

Course Code: 0531-Chem-1210 Course Title: Organic Chemistry Lab Credits: 1.5

Rationale of the Course: The course is designed to provide practical knowledge related to safety during working in an organic chemistry laboratory, and the development of skills for the use of lab apparatus and equipment using mainly qualitative and quantitative analysis of organic compounds and leather chemicals.

Course Content

1. Identification of organic compounds: Physical appearance, elemental analysis (detection of N, S, and halogens in organic compounds), solubility test, functional group analysis: carboxylic acids, carbonyls, alcohols, phenols, esters, amines, amides, and substituted amides, nitro compounds, unsaturated compounds, halogenated compounds, thiol compounds, determination of physical properties of organic compounds, literature survey, the naming of the identified compounds.

2. Test for protein and amino acids.

Course Objectives:

- To conduct experiments on the identification of organic compounds through systematic analysis.

- b. To provide the facility to carry out experiments related to the chemical analysis of leather samples.
- c. To improve students' capability for both individual and teamwork.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: After completing this course, students will be able to -

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Demonstrate elemental analysis of organic compounds and leather samples.	C2, A2
CLO2	Manipulate the laboratory experiments on functional group analysis of organic compounds and leather samples.	C2, P2
CLO3	Determine melting and boiling point of organic compounds as well as conduct the systematic analysis of organic compounds.	C3, A2
CLO4	Perform and analyze laboratory experiments on quantitative analysis of amino acids, and proteins through specific tests as individual and/or teamwork.	C3, C4, P3, A3
CLO5	Prepare laboratory reports based on experimental data without resorting to plagiarism.	C5, A4

Mapping of CLOs with PLOs

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	-	-	-	-	-	-	1	-	-	-
CLO2	3	2	-	-	-	-	-	-	2	-	-	-
CLO3	3	2	-	-	2	-	-	-	2	-	-	-
CLO4	2	2	2	-	-	-	-	-	3	-	-	-
CLO5	2	2	-	-	-	-	-	2	3	2	-	2

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Interactive Lectures, Group Discussions, Demonstrations, and Group work	Quiz, Viva Voce, Report evaluation, Final Exam
CLO2	Lecture, Demonstration, and Group work	Quiz, Report evaluation, Final Exam
CLO3	Lecture, Demonstration, Hands-on practice, and Group work	Quiz, Viva Voce, Report evaluation, Final Exam
CLO4	Lecture, Demonstration, Hands-on practice, and Group work	Quiz, Report evaluation, Viva voce
CLO5	Interactive Lectures, Demonstration	Report Evaluation, Viva voce

Learning Materials

i. Recommended Readings

- a) Oliver Kamm- Qualitative organic analysis; an elementary course in the identification of organic compounds
- b) Ralph L. Shriner- The Systematic Identification of Organic Compounds

ii. Supplementary Readings

- a) Vogel A. I. - Text Book of Quantitative Chemical Analysis
- b) P. K. Sarker - Analytical Chemistry for Leather Manufacture.

iii. Others: Lecture notes and Laboratory procedure provide by the course teachers.

Course Code: 0723-LPE-2101 Course Title: Leather Processing-II Credits: 3.0

Rationale of the Course: This course provides an introduction to the tanning and post-tanning processes in leather manufacturing. By the end of the course, students will gain knowledge of the theory behind tanning processes and their practical applications in the leather manufacturing industry.

Course contents

Tanning: Basic concept, theoretical background, tanning behavior of group elements, tanning potentials of various metal, non-metals, natural and synthetic materials, tanning characteristics, hydrothermal stability and shrinkage temperatures of various tanning materials, Aluminium, Titanium tanning and iron tanning, aldehyde tanning, Zirconium tanning.

Chrome tanning: Chromium complexes and their structures, study on the phenomena of hydrolysis, olation, oxolation, polymerisation of chrome complexes, masking, principle of masking, effect of masking on chrome tannage, method of chrome tannage, preparation of chrome liquors and powders, sammying, splitting, and shaving.

Neutralization: Wetback, objectives and principles of neutralization for chrome tanned leather, vegetable tanned leather, influencing factors of neutralization, selection of proper neutralizing agents, controls of neutralization, test for neutralization, neutralization and its impact on subsequent leather processing.

Vegetable tanning: Tannin, non-tannin materials, classification of vegetable tannins, chemistry of vegetable tanning materials, theory of vegetable tanning, physicochemical properties of vegetable tannin, vegetable tanning materials and their properties, leaching of vegetable tanning and general methods of tannin extract preparation, mechanism of vegetable tanning, principle of vegetable tanning, sources, supply of vegetable tanning materials, different syntans, classification of syntans, semi chrome leather.

Dyeing and fat-liquoring: Leather dyes and their applications, factors affecting dyeing process, dyeing methods, dyeing defects. Fat liquoring: objectives, modern model of fat liquoring mechanism, classification of fat liquor, function of anionic, cationic and amphoteric fat liquors, setting, and drying.

Finishing: Definition, classification of finishes, structure of finishes, materials for leather finishing, theory of film formation, preparation of leather for finishing: buffing, snuffing, de-dusting, conditioning, polishing, ground coating, season coatings, intermediate coatings, top coating, ironing, glazing, plating, shoe upper leather, lining leather, nubuck, corrected grain leather.

Course Objectives:

- a. To introduce the fundamental concept of tanning, characteristics of various tanning materials, and different leather processing techniques.
- b. To provide comprehensive knowledge on tanning, post-tanning, and finishing operations.
- c. To improve knowledge on developing different types of shoe upper and lining leather.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

Course Learning Outcomes (CLOs): Upon successful completion of this course, students will be able to -

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Describe the basic concept of the tanning and post-tanning operations of leather manufacturing.	C1, A1
CLO2	Explain various characteristics of tanning and post-tanning materials.	C2, A2
CLO3	Analyze the selection criteria of different chemicals for leather manufacturing.	C4, A3
CLO4	Evaluate and rectify various defects of wet-blue, crust, and finished leather.	C5, A4
CLO5	Develop recipes for specific types of shoe-upper leather from different origins.	C5, A4

Mapping of Course Learning Outcomes (CLOs) with Programs Learning Outcomes (PLOs)

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	-	-	-	-	-	-	-	-	-	-
CLO2	3	3	-	-	-	-	-	-	-	-	-	-
CLO3	3	3	2	3	-	-	2	-	-	-	-	-
CLO4	3	3	3	2	2	-	3	-	-	-	-	-
CLO5	3	3	2	3	2	-	3	-	-	-	-	-

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, White board illustration, Group discussion, Pictorial	In-course assessment, Final examination, Assignment
CLO2	Lecture, Multimedia presentation	Group Presentation, In-course Exam; Final Exam
CLO3	Lecture, Video presentation, Group discussion, Multimedia presentation, Audiovisual, Assignment	In-course Assessment, Oral presentation, Final examination, Assignment, Case study, and quiz.
CLO4	Audio-visual presentation	Final examination
CLO5	Lecture and Multimedia presentation	In-course Assessment and Final examination

Learning Materials:

i) Recommended Readings

- a) Anthony D. Covington- Tanning Chemistry: The Science of Leather.
- b) Heidenmann Eckhart - Fundamentals of Leather Manufacture.
- c) Procter H.R.-The Principle of Leather Manufacture.

ii) Supplementary Readings

- a) Sarpouse J.H.-Leather Technicians Handbook.
- b) Gerhard John--- Possible Defects in Leather Production.

iii) Others: Handout/lecture materials or notes on provided by the course teacher.

Course Code: 0723-LPE-2102 Title: Leather Processing-II Lab Credits: 1.5

Rationale of the Course: The course is designed to enhance the skills of students in the field of leather manufacturing. This course aims to equip students effectively applying practical methodologies, tools, and techniques in developing different types of shoe upper leather.

Course Contents:

1. Manufacturing of full chrome shoe upper dyed crust leather.
2. Manufacturing of full vegetable-tanned natural crust leather
3. Manufacturing of chrome-free combination tanned leather
4. Manufacturing of shoe lining leather.
5. Manufacturing of aniline-finished shoe upper leather
6. Manufacturing of corrected grain shoe upper leather.

Course Objectives: The objectives of the course are

- a. To impart skills on the application of different chemicals in leather processing.
- b. To enhance the student's ability for developing specific types of shoe upper and lining leather.

- c. To improve skills on different finishing techniques in shoe upper leather preparation.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

Course Learning Outcomes (CLOs): Upon successful completion of this course, students will be able to -

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Select raw materials, processes, chemicals, tools, and machinery for crust and finished leather manufacture.	C2, A1, P1
CLO2	Apply appropriate recipes for the manufacturing of crust and finished leather.	C3, A2, P2
CLO3	Perform quality and process control for crust and finishing operations.	C3, A2, P3
CLO4	Optimize the recipes for different types of crust and finished shoe upper and lining leather.	C4, A3, P4

Mapping of Course Learning Outcomes (CLOs) with Programs Learning Outcomes (PLOs)

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO 8	PLO9	PLO10	PLO11	PLO12
CLO1	3	3	1	3	-	-	1	-	2	-	-	-
CLO2	3	3	2	2	2	-	2	-	2	-	-	-
CLO3	3	3	2	3	3	-	2	-	3	-	-	-
CLO4	3	3	3	3	3	-	3	-	3	-	-	-

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Audiovisual Lecture	Viva and class test.
CLO2	Lecture, Multimedia presentation, Group discussion	Lab performance, Evaluate the report writing.
CLO3	Lecture, Group Discussion, Flip chart presentation, Multimedia presentation.	Lab performance, Presentation, Quiz.
CLO4	Lecture, Video presentation, Whiteboard illustration, Group Discussion, Pictorial, Problem-based teaching method,	Final lab examination and evaluate the report writing, Assignment, Viva, Demonstration, Class test.

Learning Materials:

i. Recommended Readings

- Anthony D. Covington- Tanning Chemistry: The Science of Leather.
- Heidenmann Eckhart - Fundamentals of Leather Manufacture.
- Procter H.R.-The Principle of Leather Manufacture.

ii. Supplementary Readings

- a) Sarphouse J.H.-Leather Technicians Handbook.
- b) Gerhard John--- Possible Defects in Leather Production.

iii. Others: Handout/lecture materials or notes on provided by the course teacher.

**Course Code: 0723-LPE 2103 Course Title: Leather and Non Leather Products Design
Credits: 3.0**

Rationale of the Course:

Leather products design and drafting course is designed to provide basic knowledge on product design and pattern development. This program will introduce students to the designing process of various leather products. It will prepare students for work in high level designing courses and help to make innovative products. This program includes the terms such as art and design, free hand drawing, design and techniques for leather products, design analysis, concepts of pattern, pattern grading, modifications, enlargement etc.

Course Contents:

Art and Design: Definition, idea and discussion on art, design, motif, fashion, style, fads, craze, newness, crafts. Application of design, style, fashion, motif and elements of color in leather products.

Free Hand Drawing: Line (straight and curve), triangle, circle, ellipse, rectangle, tone (silver tone, first tone, second tone, third tone) composition. Color, fundamentals of color , color scheme.

Design and Techniques for Leather Products: Planning the design and selecting the leather, creating a design/spec sheet. Elements of design-line, space, value color, texture, composition. Line in leather design-preparation of leather for line, tracing. Use of body proportions, leather and other materials in garments manufacture.

Design Analysis: Subjective judgment taste and aesthetics subjectivity, objectivity; high and low cultural values in design, means of production changing language from craft workshops to factory assembly line, criticism in fashion design, issues of luxury and utility. The value of design costing and negotiating design project, market segmentation, demographic and psychographics design implication for different customer groups.

Concepts of Patterns: Introduction, concept of patterns, procedure of making various types pattern, transferring patterns, placement of pattern. Rectangular pattern, curved pattern.

Product Development: Procedure of product development, story board, theme board, color board preparation, motif analysis, logo design, value addition, research and inspiration, cultural value in design.

Style, Design Variations and Modifications: Block preparations of men’s women’s and children clothing. Panel styling and perspective design implements, different sleeves, collars, necklines, hemlines, facings, button-stands designing and style variations.

Pattern Grading and Enlargement for Goods, Men’s and Women's Clothing: Introduction, history, size and measurements, system development, grading methodology, system of enlargement, body measurement and system analysis for enlargement procedure and calculations followed by standard sizing charts.

Course Objectives:

- a) To provide basic concept of art and design, product development, style and design variation, design analysis, story board preparation, Free hand logo design and size modifications of leather products
- b) To impart idea generations of different products design, color schemes of design and will learn how to provide visual representation of a product initially through theme board and story board.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: Upon successful completion of this course, students will be able to

CLOs	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Describe the basics leather products designing, including pattern making.	C1
CLO2	Identify various stages of product design.	C1, A1, P1
CLO3	Apply the principles of fashion designing.	C3
CLO4	Illustrate leather products design through theme board and story board.	C4
CLO5	Analyze and evaluate various designed product with specific purpose.	C4, C5

Mapping CLOs with PLOs

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3		2		2							
CLO2	3		3	2				2				
CLO3	3		3	2								
CLO4	3		2									2
CLO5	3	2	3	3								2

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Multimedia presentation.	Group Presentation, In-course Exam; Final Exam
CLO2	Lecture, group discussion.	Group Presentation, In-course Exam; Final Exam
CLO3	Lecture, problem-based learning (PBL): Identifying the problem to be solved	Assignment, In-course Exam, and Final Exam
CLO4	Lecture, multimedia presentation, group discussion.	Group Presentation, In-course Exam, and Final Exam
CLO5	Lecture, group discussion and problem-based exercises	Assignment, In-course Exam, and Final Exam

Learning Materials

- i. Recommended Readings**
 - a) Pattern Cutting & Making up- Martin M. Shoben.
 - b) Leather Apparel Design – FranceseaSterlacci.
- ii. Supplementary Readings:** Clothing Technology- Europa Lehrmittel.
- iii. Others:** Handout/lecture material provided by the course teacher.

Course Code: 0723- LPE 2104 Course Title: Product Design and Pattern Making-I Lab
Credits: 1.5

11. Rationale of the Course:

Leather Products Design and Pattern Making-I Lab is a hand on course that basically involves the expression of individual's ideas and thoughts through designing the process that can result in significant product manufacturing. This initiates the thoughts of creativity by expressing through the development of theme board, story board etc. Once equipped with this, one can easily get expertise on making any kind of patterns and create own designed product.

Course Contents:

Manufacturing techniques of the following items-

- Free hand sketch of different shapes
- Draw different motifs

- Preparation of Theme Board.
- Preparation of story board
- Free hand logo design practice
- Design and Development of various types of leather products
- Different Size Modifications.

Course Objectives:

- a) To provide the practical knowledge of designing, Drawing, theme board preparation, story board preparation, Free hand logo design and size modifications of leather products.
- b) To impart idea generations of different products design, color schemes of design and will learn how to provide visual representation of a product initially through theme board and story board.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

Course Learning Outcomes (CLOs): Upon successful completion of this course, students will be able to

CLOs	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Describe different shape of the products.	C1, P1, A1
CLO2	Solve different manufacturing problems.	C3, A5
CLO3	Display different size ranges of a product through grading.	P2, A5
CLO4	Construct theme board and story board for different leather products.	C3, P4

Mapping of Course Learning Outcomes (CLOs) with Programs Learning Outcomes (PLOs)

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2				2						2
CLO2	3	3	2	2								
CLO3	3	2	2		2							
CLO4	3				2				2			2

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Demonstration and Group work	Continuous assessment: Viva, Report, Final Exam
CLO2	Lecture, Demonstration, Hands-on practice, and Group work	Continuous assessment: Viva, Report, Final Exam
CLO3	Lecture, Demonstration, Hands-on practice.	Continuous assessment: Viva, Report, Final Exam
CLO4	Lecture, Demonstration, Hands-on practice, and Group work	Continuous assessment: Viva, Report, Final Exam

Learning Materials

i. Recommended Readings

- a) Pattern Cutting & Making up- Martin M. Shoben
- b) Leather Apparel Design – FranceseaSterlacci
- c) Clothing Technology- Europa Lehrmittel.

ii. Supplementary Readings

- a) Pattern Cutting for Women’s Outerwear- Gerry Cooklin.
- b) Metric Pattern Cutting for Children’s Wear and Baby Wear- Winifred Aldrich.

iii. Others: Handout/lecture material provided by the course teacher.

Course Code: 0723-LPE 2105

Course Title: Leather Products Manufacturing-II

Credits: 3.0

Rationale of the Course: It is a fundamental course of the department which provides insight on the utilization of finished leather for manufacturing different types of small leather goods. Furthermore, the course provides overview about the manual and automated machines used in the leather goods industry, needle and thread system, reinforcement materials and the edge treatment methods associated with manufacturing leather goods.

The catalogue description of the course is given below:

Course Contents

Introduction: Finished leather, classification of finished leather, finishing defects, edge treatment, different types of dyeing machine for open edge treatment.

Machine cutting: Manual and automatic die cutting machine, process control, acceptance criteria, advantage, troubleshooting.

Materials used in Leather products- Lining Material and Their Uses: Different types of lining material, interlining material and reinforcements used in manufacturing, function and suitability of the materials.

Sewing machines: Sewing machine, parts of sewing machine, mechanism of feeding system, theory of stitch formation.

Thread: Yarns – composition, types, properties and numbering, threads, types of thread twist, properties and sizing of thread, selection of ideal thread, thread and needle relationship.

Needle: Definition, parts of needle, needle identification-needle size, needle point, needle system, Selection of sewing needle.

Waist belt and Wrist watch belt: Introduction, materials, design, perspective drawing, measurement instruction, pattern making, bench operation, instruction for machine operation, finishing operation, material consumption, cost analysis.

Passport case: Introduction, materials, perspective drawing, measurement instruction, pattern making, construction and assembling, material consumption and cost analysis.

Photo frame: Introduction, materials, perspective drawing, measurement instruction, pattern making, instruction for machine operation, construction and assembling, consumption and cost analysis.

File folder: Introduction, raw materials, perspective drawing, list of components, measurement instruction, total pattern making, leather consumption, splitting and skiving instruction, construction and assembling.

Course Objectives: The objectives of this course are-

- (a) To provide students with basic theoretical knowledge about leather products manufacturing.
- (b) To enlighten the students about the suitability and functionality of different lining materials, reinforce materials, thread and needle sizing system etc.
- (c) To educate the students about the pros and cons of the different types of manual and automated machines used in the leather products manufacturing.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

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

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Describe finished leather, finishing defects. edge coloring etc.	C1, A1
CLO2	Explain advantages of different types of machines used for manufacturing along with their troubleshooting.	C2, A3
CLO3	Compare suitability and functionality of lining and reinforcement materials, sewing machines and their feeding mechanism, thread, needle etc.	C3, A4
CLO4	Analyze different materials and machines and produce diversified leather goods.	C3, C4

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2			3				3			
CLO2	3	2			3				3			
CLO3	3	2			3				3			
CLO4	3	3	2	2	3	2			3	3		3

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Multimedia presentation, demonstration, video presentation	Quiz, In-course Exam, Final Exam
CLO2	Lecture, video presentation, interactive discussion, white board illustration	Assignment, In-course Exam, Final Exam
CLO3	Lecture, pictorial, theme board illustration, story board illustration, multimedia presentation, white board illustration, demonstration	Assignment, In-course Exam, Final Exam
CLO4	Multimedia presentation, white board illustration, group discussion and demonstration	Assignment, In-course Exam, Final Exam

Learning Materials

i. Recommended Readings

- a) Carr & Latham-The Technology of Clothing Manufacture
- b) Ben and Elizabeth Morris-Making Clothes in Leather
- c) Francesca Sterlacei-Leather Apparel Design

ii. Supplementary Readings

- a) Martin M. Shoben & Janet P. Ward-Pattern Cutting and making Up.
- b) Moseley, G.C-Leather Goods Manufacture.

iii. Others

Handout/lecture material provided by the course teacher

Course Code: 0723- LPE 2106

Course Title: Leather Products Manufacturing-II Lab

Credits: 1.5

Rational of the Course:

This course is one of the basic courses of Leather Products Engineering which is designed to give emphasis on developing thorough understanding of various decoration techniques involved in leather products manufacturing. Alongside, the course is intended to develop knowledge and skill about pattern making, use of different lining and reinforcement materials and different leather goods manufacturing.

Course Contents:

Leather decoration techniques: Stamping, engraving, batik, screen-printing, molded work, embroidery, carving, beveling, shading, appliqué, perforating.

Pattern cutting: Introduction to different patterns and their cutting techniques, consideration of allowance, basic pattern cutting of different types of products.

Use of different lining and reinforcement materials: Selection and application of suitable lining and reinforcement materials for different leather products manufacturing.

Manufacturing of Photo frame: Designing, pattern making, cutting, splitting, skiving, assembling, sewing, final preparation, finishing, costing.

Manufacturing of Passport Case: Designing, pattern making, cutting, splitting, skiving, assembling, sewing, final preparation, finishing, costing.

Manufacturing of File Folder: Designing, pattern making, cutting, splitting, skiving, assembling, sewing, final preparation, finishing, costing.

Manufacturing of Wrist Watch Belt: Designing, pattern making, cutting, splitting, skiving, assembling, sewing, final preparation, finishing, costing.

Manufacturing of Waist Belt: Designing, pattern making, cutting, splitting, skiving, assembling, sewing, final preparation, finishing, costing.

Course Objectives:

- To introduce students with the tooling techniques for leather crafting.
- To enhance the students' ability to use different steps of leather products manufacturing.
- To select and apply suitable lining and reinforcement materials for different leather products manufacturing.
- To create, analyze and critically evaluate the issues of practical in the realm of leather products manufacturing.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

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

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Explain and apply different decoration techniques on leather	C2, C3, P2, A3
CLO2	Construct different types of patterns with consideration of allowance	C3, P4
CLO3	Compare and contrast different lining and reinforcement materials for different leather products	C4, A4
CLO4	Design and create different leather goods	C6, P7, A4

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	3	3		3				3			
CLO2	3	3	2		3				3	2		2
CLO3	3	3	2		3				3			
CLO4	3	3	3	3	3	3		3	3	3		3

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Interactive Lectures, Group Discussions, Demonstrations, Hands-on practice, and Group work	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO2	Interactive Lectures, Demonstrations, Hands-on practice, and Group work	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO3	Interactive Lectures with illustration, Demonstration, Hands-on practice, and Group work	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO4	Lecture, Demonstration, Hands-on practice, and Group work	Lab Performance, Continuous assessment: Viva, Report, Final Exam

Learning Materials

i. Recommended Readings

- a) Anne & Jane Cope-Leatherwork.
- b) Sylvia Grainger-Leatherwork.
- c) Martin M. Shoben & Janet P. Ward-Pattern Cutting and Making Up.

ii. Supplementary Readings

- a) Mary and E.A. Manning-Leatherwork.
- b) Francesca Sterlacei-Leather Apparel Design.

iii. Others: Handout/lecture material provided by the course teacher.

Course Code: 0714-EEE-2107 Course Title: Fundamentals of Electrical and Electronics Engineering Credits: 3.0

Rationale of the course: This course offers a thorough review of electric circuit analysis which is the most fundamental area in electrical and electronics engineering. The course is designed at a very basic level and included in the Leather and allied engineering program as an allied engineering course.

Course Contents

Electrical Engineering: Introduction to Voltage, current, power, energy, D.C. fundamentals, Series- parallel network, Network Theorems, Generators and their characteristics, Motors, and their characteristics, and Speed control process.

AC Current: AC fundamentals, Flow of AC through inductance, capacitance, and resistance in series and parallel; Power in AC Circuit, Power Factor and its improvement; Resonance in AC circuits, Transformer, Poly phase circuits, Induction motors (types and purpose). Sub-station equipment, Distribution board, and sub-distribution board.

System network: Typical distribution circuits, cables, and wiring systems and their selection.

System protection: Types of faults, (transformer and motor) principles of protection, Protective devices.

Electrical hazards: Electrocutation, Electric Shock and its factors, Electric current on human body, Identifying and recognizing hazards, PPE, protection against shock and fire, earthing and its importance, procedure to be adopted when a person is in contact with a live conductor.

Electronics: Semiconductor physics, Diodes and their uses, Rectifiers, Transistors, Amplifiers, Voltage amplification, Power amplification, Photo sensor, Clippers, Clampers, Transducer, Integrated Circuits.

Course Objectives

- To provide a comprehensive understanding of the theoretical background in circuit theory.
- To enable the students to analyze the DC circuits, distribution circuits, cables, and wiring systems.
- To familiarize them with the basics of AC circuits.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: At the end of the course, students will be able to -

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Explain the theory behind DC circuits, and magnetic circuits and solve complex AC circuits using network theorems.	C2, C3, A3
CLO2	Analyze DC and AC circuits using KVL, KCL, or other analysis methods.	C4, A4
CLO3	Recognize, select, and evaluate measurement devices used in electrical and electronics engineering.	C2, C5, A4
CLO4	Identify the electrical hazards and take protective measures in real-life.	C1, C3, A2

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2										
CLO2	2	3										
CLO3	2	3										
CLO4	2	2				2	2					2

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of CLOs with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, whiteboard illustration, problem-solving exercises	In-course Exam, Final Exam
CLO2	Lecture, slide presentation, problem-solving exercises	Assignment, In-course Exam, Final Exam
CLO3	Lecture, whiteboard illustration, slide presentation	Quiz, In-course Exam, Final Exam
CLO4	Lecture, group discussion, audio-visuals	Case study, Oral presentation, In-course Exam, Final Exam

Learning materials

i. Recommended readings

- a) Charles K. Alexander, Matthew N. O. Sadiku – Fundamentals of Electric Circuits (5th edition)
- b) Robert Boylestad – Introductory Circuit Analysis (13th edition).
- c) R. M. Kerchner, G.F. Corcoran – Alternating Current Circuits, 4th Edition.

ii. Supplementary Readings

- a) A Textbook of Electrical Technology (vol: I and II), B. L. Theraja
- b) Alternating Current Circuit, George F. Corkoran

iii. Others: Lecture/hand notes provided by the course teachers.

Course Code: 0533-Phy-2108 Course Title: Physics and Electronics Lab Credits: 1.5

Rationale of the course: This course will cover the basic principles of fundamental physics and Electronics through experiments that will help the students getting practical knowledge on how a theory can be applied to practical aspects. It also provides an elementary training to the students on carefulness in handling scientific instruments in a laboratory for accomplishing an experiment successfully.

Course Contents

Part A: Physics

1. Determination of the value of “g” by Kater’s reversible pendulum.
2. Verification of Ohm’s law and measurement of low resistance by ammeter and voltmeter.

3. Determination of the refractive index of a material of a given prism by a spectrometer.
4. Determination of the grating constant of a plane diffraction grating.
5. Determination of the value Y , η and σ for the material of a given wire by Searle's apparatus.
6. Determination of the modulus of rigidity of a cylindrical wire by dynamic method.

Part B: Electronics

1. Verification of voltage divider and current divider rule.
2. Verification of Thevenin's theorem.
3. Determination of the characteristics of I-V curve of a diode.
4. Verification of the mechanism of half wave rectifier.
5. Study the basic characteristics of logic GATES.

Course Objectives

- a. To provide a broad training in physics and electronics principles with laboratory experiments.
- b. To assist the students become more proficient in measurements, dimensioning, critical thinking, and data analysis.
- c. To help the students to pursue independent research towards the development of new devices and products using sophisticated engineering concepts.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: Upon completion of this course, students will be able to:

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Identify the different physical parameters and their importance in understanding and manipulating voltages, currents and resistances in electronic circuits.	C2, P2, A3
CLO2	Apply experimental techniques on the basis of established theory to determine/compare the values of specific parameters.	C3, A3
CLO3	Design and conduct experiments, as well as to analyze and interpret data.	C3, P3, A3
CLO4	Develop the ability to collaborate with peers in a scientific/lab environment which will eventually help to communicate their ideas with others and function effectively in multidisciplinary terms.	C3, A3
CLO5	Draw meaningful conclusions from the experimental data and present them as a part of a clear, well-organized lab report.	C4, A4

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	-	-	-	-	-	-	-	-	-	-
CLO2	2	2	-	-	-	-	-	-	-	-	-	-
CLO3	2	2	2	-	2	-	-	-	-	-	-	-
CLO4	2	2	-	-	-	-	-	-	2	2	-	2
CLO5	2	2	-	-	-	-	-	-	-	2	-	2

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Demonstration, and Hands-on practice	Lab Performance, Final Exam
CLO2	Lecture, Demonstration, and Hands-on practice	Lab Performance, Final Exam
CLO3	Lecture, Demonstration, Hands-on practice, Video presentation, and Problem-based group discussion	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO4	Lecture, Demonstration, Hands-on practice, Video presentation, and Problem-based group discussion	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO5	Lecture, Demonstration, Hands-on practice, Video presentation, and Problem-based group discussion	Lab Performance, Continuous assessment: Viva, Report, Final Exam

Learning materials

i. Recommended readings

- a) Charles K. Alexander, Matthew N. O. Sadiku – Fundamentals of Electric Circuits (5th edition)
- b) Robert Boylestad – Introductory Circuit Analysis (13th edition).
- c) R. M. Kerchner, G.F. Corcoran – Alternating Current Circuits, 4th Edition.

ii. Supplementary Readings

- a) A Textbook of Electrical Technology (vol: I & II), B. L. Theraja
- b) Alternating Current Circuit, George F. Corkoran

iii. Others: Lecture/hand notes provided by the course teachers.

Course Code: 0541-Math-2109
Methods Credits: 3.0

Course Title: Differential Equations and Numerical

Rationale of the Course: This course is a study of mathematical techniques used to model engineering systems. Differential equations and numerical methods are covered in this course as an introduction. This course deals with the different differential equations, numerical problems, and their real-life applications.

Course Content:

Ordinary Differential Equations: Definition of Differential Equation, Order and Degree; Classification of Differential Equations; Formulation; Solution of first order differential equation by various methods; Solutions of general linear equations of second and higher order with constant co-efficient; Solutions of homogeneous linear equation.

Modeling with First Order Differential Equations: Construction of differential equations as mathematical models (exponential growth and decay, heating and cooling, mixture of solutions,

series circuit, logistic growth, chemical reaction, falling bodies). Model solutions and interpretation of results.

Modeling with Second Order Differential Equations: Vibration of a mass on a spring, free and undamped motion; free and damped motion; forced motion; electric circuit problems.

Partial Differential Equations: Formation of partial differential equations, solution of standard types of first order equation and Lagrange's equation, classification of second order partial differential equations, linear partial differential equations of second order and higher order with constant coefficients.

Solution of Equations and Eigenvalue Problems: Solution of algebraic and transcendental equations – Bisection method - Fixed point iteration method – Newton Raphson method – Iterative methods of Gauss Jacobi and Gauss Seidel - Matrix Inversion by Gauss Jordan method - Eigenvalues of a matrix by Power method.

Interpolation and Approximation: Interpolation with unequal intervals – Lagrange's interpolation – Newton's divided difference interpolation – Newton's forward and backward difference formulae.

Numerical Differentiation and Integration: Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's rule – Evaluation of double integrals by Trapezoidal and Simpson's rules.

Initial and Boundary Value Problems for Differential Equations: Runge-Kutta method for solving first-order equations, Milne's and Adams-Bashforth predictor corrector methods for solving first order equations.

Course Objectives: The aims of this course are:

- a. To introduce the basics of differential equations and terminologies regarding them.
- b. To solve different types of ordinary differential equations and partial differential
- c. equations analytically using well-known techniques.
- d. To explore the utility of differential equations in modeling numerous physical and
- e. biological systems.
- f. To determine the approximate numerical solutions of mathematical problems that
- g. cannot always be solved by conventional analytical techniques.
- h. To demonstrate the importance of selecting the right numerical technique for a
- i. particular application and carefully analyzing and interpreting the obtained results.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: Upon completion of the course, the students will be able to -

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Formulate differential equations by removing arbitrary constants from algebraic relations and draw solutions curves using direction field.	C5, A4
CLO2	Classify first-order differential equations as separable, homogeneous, linear, exact, Bernoulli's, etc. and solve them using appropriate methods.	C2, C3, A2
CLO3	Derive higher order differential equations, classify and solve them using appropriate methods.	C3, A2
CLO4	Find numerical approximations to the roots of an equation by Newton method, Bisection Method, Secant Method, etc.	C3, A2
CLO5	Demonstrate the use of interpolation methods to find intermediate values for any given set of points.	C3, A2

Mapping of CLOs with PLOs

CLOs	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	3	-	1	-	-	-	-	-	-	-	-
CLO2	3	3	-	1	-	-	-	-	-	-	-	-
CLO3	3	3	-	1	-	-	-	-	-	-	-	-
CLO4	3	3	-	1	-	-	-	-	-	-	-	-
CLO5	3	3	-	1	-	-	-	-	-	-	-	-

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, group discussion, problem-based learning (PBL): Identifying the problem to be solved	Assignment, In-course Exam, and Final Exam
CLO2	Lecture, group discussion and problem-based exercises	Assignment, In-course Exam, and Final Exam
CLO3	Lecture, group discussion and problem-based exercises	Assignment, In-course Exam, and Final Exam
CLO4	Lecture, group discussion, and problem-based exercises	Assignment, In-course Exam, and Final Exam
CLO5	Lecture, group discussion, and problem-based exercises	Group Presentation, Assignment, In-course Exam, and Final Exam

Learning Materials

i. Recommended Readings

- S. L. Ross, Differential Equation.
- D. G. Zill, A First Course in Differential Equations with Applications.

c) H.J.H. Piaggio, An Elementary Treatise on Differential Equations.

ii. Supplementary Readings

a) Chapra. S.C., and Canale. R. P., “Numerical Methods for Engineers”, Tata, McGraw-Hill, New Delhi, 5th Edition, 2007.

b) Brian Bradie, “A Friendly Introduction to Numerical Analysis”, Pearson Education, Asia, New Delhi, 2007.

iii. Others: Handout/lecture material provided by the course teacher.

Course Code: 0723-LPE 2201

Course Title: Leather Products Manufacturing-III

Credits: 3.0

Rationale of the Course: Leather Products Manufacturing-III is a core course in leather products engineering which focuses on designing, different techniques and aesthetics of leather products manufacturing. This course provides information about the health and safety practices to be adapted in the leather products industries.

Course Contents

Fabrication Technology of Leather Products: Introduction, preparatory process, bench operations, finishing.

Unit Operations in Leather Products Manufacturing: Essential and supplementary operations with equipment, process control, procedure, acceptance criteria of marking, stamping and attaching.

Construction of Gussets: Introduction, types of gussets: plain, “V”, flat, three parts (plain and double).

Ladies Bags: Types of bags, materials, tools and equipment for bags manufacture, bag shapes: no-gusset, one-gusset, two-gusset; joining one-and two-gusset bags, attaching straps to gussets, flap fastening, pockets, making a one-gusset bag pattern, bag fastenings.

Executive Bags: Introduction, raw materials, perspective drawing, list of components, measurement instruction, total pattern making, leather consumption, splitting and skiving instruction, construction.

Luggage: Introduction, raw materials, perspective drawing, list of components, measurement instruction, total pattern making, leather consumption, splitting and skiving instruction, construction.

Molded Hardcase: Introduction, Overview of molded hardcases and their applications in the leather industry, Mold design and construction, Production process- molding process, including heating, vacuum-forming, and compression molding

Backpack: Backpacks by trip length and capacity- weekend, multiday, extended trip, climbing packs, backpack fit, additional backpack fit adjustments, backpack features

Troubleshooting: Defects identification in different steps of Leather Products manufacturing and their remedies.

Packaging and Labeling: Introduction, functions and purposes, factors influencing packaging, types of packaging and labels, role of labeling in packaging. requirements of export packing, ecological packaging, packaging policies and strategies,

Health and Safety: Fire-risk and prevention/precaution, types of combustion and risks, firefighting methods and equipment, Hazards: solvent, mechanical and electrical; ventilation and working environment, ergonomics, fatigue, accident factors, lighting methods, occupational safety and health act.

Course Objectives

- a. To describe various fabrication technology and unit operations of Leather Products Manufacturing.
- b. To design various types of leather goods.
- c. To ensure the OSH practice in a leather products factory.
- d. To select the proper package and label.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

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

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Explain the concepts of fabrication technology and unit operations involved in leather goods manufacturing.	C2
CLO2	Construct different types of leather goods with influences on overall manufacturing process	C3, P4
CLO3	Apply fundamentals knowledge about the health and safety at work place in a manufacturing unit.	C3
CLO4	Select proper packaging and labeling for leather product.	C4
CLO5	Analyze the defects in different steps of leather products manufacturing.	C4

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3				2							
CLO2	3		2		2							
CLO3	3		2			2						3
CLO4	3		3									
CLO5	3	2										

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Multimedia presentation, pictorial, white board illustration, charts	Quiz, Assignment, In-course Exam, Final Exam
CLO2	Lecture, multimedia presentation, white board illustration, demonstration, group discussion	Group presentation, Assignment, In-course Exam, Final Exam
CLO3	Lecture, Multimedia presentation, Pictorial, Charts, Discussion	Group presentation, In-course Exam, Final Exam
CLO4	Lecture, White board illustration	In-course Exam, Final Exam
CLO5	Multimedia presentation, interactive discussion	Quiz, In-course Exam, Final Exam

Learning Materials

i. Recommended readings

- a) Martin M. Shoben & Janet P. Ward-Pattern Cutting and making Up.
- b) Moseley, G.C-Leather Goods Manufacture.
- c) Jara-Samaniego, J., & Peña-Rodríguez, C. (2018). Design and construction of molds for the production of leather products. Revista Iberoamericana de Ciencias, 5(9), 1-13.

ii. Supplementary Readings

- a) The Innovation Notebooks for The Leather Goods Industry, PISIE
- b) Fashion from concept to consumer, seventh edition - Gini Stephens Frings

iii. Others: Handout/lecture material provided by the course teacher

**Course Code: 0723-LPE-2202 Course Title: Leather Products Manufacturing-III Lab
Credit: 1.5**

Rationale of the Course: Leather Products Manufacturing-III Lab is a practical course in leather products engineering focusing on the designing and fabrication of different types of bags. Furthermore, in this course students will gather knowledge about selecting the appropriate material, developing the products through making patterns as well as constructing the leather goods through different bench operations.

Course Contents

1. **Manufacturing of Executive bag:** Designing, pattern making, cutting, splitting, skiving, assembling, stitching, final preparation, finishing, costing.
2. **Manufacturing of Laptop bag:** Designing, pattern making, cutting, splitting, skiving, assembling, stitching, final preparation, finishing, costing.
3. **Manufacturing of Travel bag:** Designing, pattern making, cutting, splitting, skiving, assembling, stitching, final preparation, finishing, costing.

4. **Manufacturing of Gents lunch bag:** Designing, pattern making, cutting, splitting, skiving, assembling, stitching, final preparation, finishing, costing.
5. **Manufacturing of Tote bag:** Designing, pattern making, cutting, splitting, skiving, assembling, stitching, final preparation, finishing, costing.

Course Objectives: The objectives of this course are

- To familiarize students with the various practical aspects of leather products manufacturing.
- To foster an understanding of the importance of pattern engineering.
- To enable the students to apply various techniques of design in making leather goods.
- To provide comprehensive knowledge about the organization and management of leather goods manufacturing.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLO)

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

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Choose and explain the suitability of different materials for making leather bags.	C1, C2, A1, P1
CLO2	Construct different types of leather bags	C3, P4
CLO3	Evaluate and analyze different quality parameter of leather bags.	C3, C4

Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	3	3	1								
CLO2	3	3	3		3				3	3		2
CLO3	3	2	2	1		1						2

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture on theoretical background and principle, hands on demonstration on the implementation, group discussion	Lab performance and report
CLO2	Lecture on theoretical background and principle, hands on demonstration on the implementation, group discussion	Lab performance and report
CLO3	Lecture on theoretical background and principle, hands on demonstration on the implementation, group discussion	Lab performance and report

Learning materials

i. Recommended readings

- a) Sylvia Grainger-Leatherwork.
- b) Moseley, G.C-Leather Goods Manufacture.
- c) Jara-Samaniego, J., & Peña-Rodríguez, C. (2018). Design and construction of molds for the production of leather products. *Revista Iberoamericana de Ciencias*, 5(9), 1-13.

ii. Supplementary Readings

- a) Hamlyn-Leatherwork –A step-by-step Guide.
- b) Mary and E.A. Manning-Leatherwork.

iii. Others: Handout/lecture material provided by the course teacher

Course Code: 0531-Chem-2203

Course Title: Polymer Science and Engineering

Credits: 3.0

Rationale of the Course: This course is designed to impart the fundamentals of polymers and their derivatives, bonds, structures, and properties. The course also introduces the knowledge of various polymerization techniques along with associated technologies and emphasizes various environmental aspects.

Course Content

Polymer structure: Concept of polymer, oligomer and macromolecule, classifications of polymer, tacticity, degree of polymerization, contour length, functionality of monomer, molecular forces and chemical bonding in polymers.

Polymerization: Step-reaction (condensation) polymerization: mechanism, polycondensation; Radical chain (addition) polymerization: mechanism-initiation, propagation, termination, kinetics and chain transfer; Ionic polymerization: cationic and anionic polymerization, polymerization by transition metal catalysts, ring opening polymerization; Polymerization technique: Solution, bulk, suspension, emulsion.

Polymer solution: Criteria for solubility, heat of dissolution and solubility parameters, conformation of polymer chains in solutions, nature of polymer molecules in solution, size and shape of macromolecules in solution, effect of molecular weight on solubility, solubility of crystalline and amorphous polymers, viscosity of dilute polymer solutions.

Structure and properties of polymers: Chemical and geometrical structure of polymer molecules, Glass transition temperature (T_g): Free volume theory, factors affecting on T_g , melting point, mechanical properties of crystalline polymers.

Molecular weight and size of polymers: Number average, molecular weight average, Z-average and viscosity average molecular weight; distribution of molecular weight; contour length, molecular weight determination methods.

Polymer technology: Polymer compounding and significance, different compounding ingredients for rubber and plastics, crosslinking and vulcanization.

Environmental considerations: Polymer degradation: Definition, types, factors affecting polymer degradation, preventions, recycling, remoulding, depolymerisation, incineration, biodegradable polymers, green synthetic approach of polymer.

Course Objectives

- To provide knowledge and understanding of polymers, structures, properties and synthetic routes of various polymers.
- To disseminate knowledge on polymerization techniques, mechanism, and processing.
- To impart comprehensive knowledge on polymer additives, ultimate applications and environmental aspects.

Course learning outcomes (CLOs) and mapping of CLOs with program learning outcomes (PLOs)

CLOs: Upon completion of the course, the students will be able to-

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Define and classify polymers, their structures, and configurations.	C1, C2, A1
CLO2	Illustrate different types of polymerization techniques, technological aspects and mechanisms.	C2, A2
CLO3	Correlate different polymer properties with their structure and molecular weight.	C3, A3
CLO4	Compare various determination methods of polymer molecular weight with their pros and cons.	C4, A3
CLO5	Assess the environmental impacts of polymers in real-life applications.	C5, A4

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	2	-	-	-	-	-	-	-	-	-
CLO2	3	2	3	1	-	-	-	-	-	-	-	-
CLO3	3	2	1	2	1	-	1	-	-	-	-	-
CLO4	3	2	2	1	2	-	-	-	-	-	-	-
CLO5	3	2	2	2		2	2	-	-	-	-	2

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, demonstration and problem-based exercises	Group Presentation, In-course Exam, Quiz, Assignment, Final Exam
CLO2	Lecture, multimedia presentation, video presentation, demonstration, group discussion	Group Presentation, In-course Exam; quiz, assignment, case study, Final Exam
CLO3	Lecture, multimedia presentation, literature review, group discussion	Assignment, Quiz, Group Presentation, In-course Exam, and Final Exam
CLO4	Lecture, multimedia presentation, group discussion, literature review, video presentation, demonstration, and problem-based exercises	Quiz, Assessment, Group Presentation, In-course Exam, and Final Exam
CLO5	Lecture, multimedia presentation, group discussion, literature review, video presentation, demonstration, and problem-based learning	Assignment, Quiz, Group presentation, Oral presentation, In-course Exam, and Final Exam

Learning Materials

i) Recommended Readings

- a) Charles E. Carraher Jr- Carraher's Polymer Chemistry 8th Edition
- b) Gowrikar V. R., Viswanathan N.V. and JayadevSreedhar, "Polymer Science", New Age Publication, New Delhi 2003.
- c) Gupta V. B. and Kothari V. K., "Manufacture Fibre Technology", Chapman and Hall Publication, UK 1997.

ii) Supplementary Readings

- a) Billmeyer F. M., "Text Book of Polymer science", Wiley Inter Science, New York, 2002.
- b) Odion G., "Principles of Polymerization", John Wiley, UK, 2002.

iii) Others: Handout/lecture materials provided by the course teacher

**Course Code: 0531-Chem-2204 Course Title: Polymer Science and Engineering Lab
Credit: 1.5**

Rationale of the Course: This course is based on the theoretical knowledge of polymer science and engineering. The course is designed to provide practical knowledge while working in a polymer chemistry laboratory, developing skills in the use of lab apparatus and equipment mostly used in both qualitative and quantitative analysis of polymeric substances.

Course Content

1. Identification of different polymeric materials in leather products.

2. Determination of relative viscosity of polymeric substances.
3. Determination of molecular weight of different polymers.
4. Synthesis and characterization of resins from the precursors.
5. Preparation of polystyrene /PMMA by suspension polymerization method.
6. Determination of chemical compositions of selected polymers.
7. Determination of solvent stability and ionic character of selected polymers and surfactants.
8. Determination of film hardness of acrylic, polyurethane, butadiene binders.
9. Determination of tensile strength and elongation of the finish film formation by acrylic, polyurethane, butadiene binders
10. Determination of ironing effect of acrylic, polyurethane, butadiene binders.

Course Objectives

- a. To familiarize in-depth practical knowledge in the synthesis and characterization of polymeric materials.
- b. To develop skills on the determination techniques of polymer molecular weight and kinetics.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: After completion of this course students will be able to-

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Identify different types of polymeric materials using physical and chemical methods.	C2, A2, P2
CLO2	Prepare and characterize different types of polymeric materials.	C3, A2, P3
CLO3	Determine molecular weights of polymers applying different methods.	C3, A2, P3
CLO4	Manipulate and analyze the conventional experimental methods to produce polymer derivatives.	C4, A4, P3
CLO5	Generate reports based on the results practicing the ethical acknowledgement of used sources or avoiding copying from other written sources.	C5, A4, P5

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	2						2			
CLO2	3	2	1		2							
CLO3	3	2	1									
CLO4	3	3	2		2				2			
CLO5	3		2					2		2		2

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Demonstration, Group work	Lab Performance, Quiz test, Continuous Assessment, Report evaluation, Viva, Final Exam
CLO2	Literature review, Demonstration, Video presentation, Hands-on practice, Group work	Lab Performance, Quiz test, Assignment, Report evaluation, Viva, Final Exam
CLO3	Literature review, Video presentation, Group work	Lab Performance, Continuous Assessment, Quiz test, Viva, Report evaluation, Final Exam
CLO4	Demonstration, Hands-on practice, Presentation, Group work, Problem based exercises	Lab Performance, Continuous Assessment, Case study, Report evaluation, Final Exam
CLO5	Discussion, Multimedia presentation, Lecture Group work	Report evaluation, Final Exam

Learning Materials

i. Recommended Readings

- a) Billmeyer F.W. Jr. - Text Book of Polymer Science.
- b) Ralph L. Shriner- The Systematic Identification of Organic Compounds
- c) Gowariker V. R. -Polymer Science.

ii. Supplementary Readings

- a) Arora M.G. & Singh M. - Polymer Chemistry.
- b) Charles E. Carraher Jr- Carraher's *Polymer Chemistry* 8th Edition

iii. Others: Lab Procedures /lecture material provided by the course teacher

Course Code: 0531-Chem-2205 Course Title: Analytical Chemistry Credits: 3.0

Rationale of the Course: The aim of the course is to introduce a broad range of modern and classic techniques that are useful in analytical chemistry. The interdisciplinary nature of chemical analysis makes analytical chemistry a vital tool in science, industrial, government, and academic laboratories throughout the world. This course is also helping students to develop an in-depth theoretical understanding to carry out research.

Course Contents

Statistical analysis of data: Evaluation of analytical results, uncertainty in measurement, accuracy and precision, significant figures, sensitivity, selectivity and specificity of chemical reaction, repeatability, reproducibility, errors, rejection of data: the Q test and Grubb's test.

Gravimetric and complexometric methods: Principles of gravimetric methods, conditions for precipitation co-precipitation and post-precipitation, precipitation from homogeneous solution, complexometric titration, metallochromic indicator, buffer solution in EDTA titration.

Chromatographic techniques: Introduction, classification of chromatographic methods, partition and adsorption chromatography, R_f value, illustration of paper, thin layer chromatography (TLC) and column chromatography; ion exchange chromatography: Introduction, exchangers, characteristics, and its applications.

Ultraviolet-Visible spectrometry: Introduction, principle, broad nature of spectrum, instrumentation, Beer-Lambert law, absorption spectrum, and λ_{\max} , shifting of λ_{\max} : Conjugation, solvent polarity, pH; Woodward-Fieser rules for λ_{\max} calculation, analysis of heavy metals and other pollutants.

Atomic absorption spectrometry: Introduction, basic principles, instrumentation, hollow cathode lamp, sample preparation, type of techniques, flame, and types of flame, electrothermal analyzer, different interferences, recent developments, applications.

Environmental analysis: Sampling of wastewater, Analysis of tannery wastewater sample: alkalinity, acidity, Different types of solids, hardness of water, banned amines; Analysis of chrome-tanned leather.

Safety practice in laboratory: Introduction, safety rules, MAK values of working material that involved health hazards, list of harmful materials, emission protection law, prevention of accidents, and first aid in laboratory.

Course Objectives:

- a) To provide fundamental knowledge on the accuracy, precision, and errors of experimental results by applying statistical methods.
- b) To give an overview of the use of selected classical and instrumental qualitative and quantitative analytical methods.
- c) To equip students with skills to solve analytical problems by selecting appropriate analytical tools.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: At the completion of this course students will be able to -

CLOs	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Describe the fundamental statistical analysis and its utilization in calculating statistical parameters.	C1, A1
CLO2	Explain the basics of different analytical methods, their applications, and safety practices in the laboratory.	C2, A2
CLO3	Apply gravimetric, chromatographic, and spectroscopic techniques in qualitative and quantitative analysis.	C3, A2
CLO4	Analyze and compare different qualitative and quantitative results of analytical techniques for authentication.	C4, A3
CLO5	Correlate the analytical techniques for the analysis of finished leather, wastewater, and other environmental contaminants.	C5, A4

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	-	-	-	-	1	-	-	-	-	-
CLO2	3	2	-	-	2	-	3	-	-	-	-	-
CLO3	3	2	-	-	-	-	2	-	-	-	-	-
CLO4	3	3	-	3	-	-	2	-	-	-	-	-
CLO5	3	3	-	2	-	-	3	-	-	-	-	-

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Interactive lecture with whiteboard illustration, Problem practice.	In-course and Final Exam
CLO2	Interactive lecture with whiteboard illustration, Slide presentation, Problem practice.	Quiz and Final Exam
CLO3	Interactive lecture with whiteboard illustration, Slide presentation.	Assignment and Final Exam
CLO4	Interactive lecture with whiteboard illustration, Problem practice, Displaying UV instrument.	In-course and Final Exam
CLO5	Interactive lecture with whiteboard illustration, Case study.	In-course and Final Exam

Learning Materials

i. Recommended Readings

- a) Gary D. Christian- Analytical Chemistry.
- b) Skoog, West and Holler- Fundamental of Analytical Chemistry.

c) David Harvey- Modern Analytical chemistry.

ii. Supplementary Readings

a) Bryan m. Ham and Aihui Maham-Analytical chemistry.

b) Séamus Higson- Analytical chemistry.

iii. Others: Handout/lecture material provided by the course teacher

Course Code: 0531-Chem-2206 Course Title: Analytical Chemistry Lab Credits: 1.5

Rationale of the course: The course is designed to provide practical knowledge related to safety during working in an analytical laboratory, development of skills for the use of lab apparatus and equipment's using mainly advanced titration methods, and quantitate analysis by spectrophotometric method.

Course content

Determination of hardness (complexometry), sulphite (iodometry), sulphide(iodimetry), chloride (Volhard method), Ammonium(titrimetry), gravimetric determination of metal like lead, calcium, aluminum, Determination of total organic carbon in soil sample, Spectrophotometric determination of Fe(II), ammonium and sulphate from the supplied sample solution, Determination of Calcium(II) in a calcium compound/tablet; Analysis of fat, oil, and soap.

Course Objectives:

- a) To introduce the fundamental knowledge and skill of different laboratory experiments based on titration, gravimetry, and spectrophotometry.
- b) To determine toxic metals and other toxic chemicals both in leather and tannery effluents.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: At the end of the course, students will be able to -

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Explain the theoretical principles of classical analytical methods within titration, and various techniques within gravimetric and spectroscopic methods.	C2, A3
CLO2	Apply the volumetric and gravimetric and spectroscopic methods to carry out laboratory scale experiments and environmental analysis based on manipulation ability and understanding.	C3, P2, A2
CLO3	Demonstrate the analysis of fat, oil, and soap. Articulate laboratory measurements and data, including units, significant figures, precision, and accuracy.	C3, P3, A3
CLO4	Demonstrate knowledge of good laboratory practices, professionalism, ethical behavior, and teamwork by turning in required reports and completing laboratory work in a regular basis.	C3, P3, A3

Mapping of CLO with PLO

CLOs	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	-	-	1	-	-	-	-	-	-	-
CLO2	3	2	2	-	2	-	2	-	-	-	-	-
CLO3	3	2	-	-	-	-	-	-	-	-	-	-
CLO4	2	2	-	-	-	-	-	2	2	2	-	2

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Interactive Lecture, Group Discussion, Demonstration, Hands-on practice, and Group work	Quiz, Viva Voce, Report evaluation, Final Exam
CLO2	Lecture, Demonstration, Hands-on practice, and Group work	Presentation, Report evaluation, Final Exam
CLO3	Lecture, Demonstration, Hands-on practice, and Group work	Quiz, Viva Voce, Report evaluation, Final Exam
CLO4	Lecture, Demonstration, Hands-on practice, and Group work	Report evaluation, Final Exam

Learning materials

i. Recommended readings

- a) Gary D. Christian- Analytical Chemistry.
- b) John Kenkel- Analytical Chemistry for Technicians.
- c) Vogel A. I. - Text Book of Quantitative Chemical Analysis.

ii. Supplementary Readings

- a) P. K. Sarker - Analytical Chemistry for Leather Manufacture.
- b) Fifield and Haines-Environmental Analytical Chemistry.

iii. Others: Lecture notes and Lab procedure provided by the course teachers.

Course Code: 0715-ME-2207

Course Title: Fundamentals of Mechanical Engineering

Credits: 3.0

Rationale of the Course: This course is designed with different basic mechanical theories of rigid bodies, solids, thermodynamics, heat transfer, fluid mechanics, welding, and their mechanisms. After completing the course, students will be able to possess an understanding of different mechanical operations along with their potential application in the leather products industry.

Course Content

Engineering statics: General principles of statics, Vectors, Statics of particles, Equilibrium of rigid bodies, Internal forces and moments, Friction, Centroids and Moments of inertia.

Engineering dynamics: Kinematics of Particles, Rectilinear and curvilinear motion of particles, position vector, velocity and acceleration, derivative of vector functions, Newton's second law of motion- dynamic equilibrium

Mechanics of solid: Introduction to mechanical response of materials and stress-strain relationships, Modulus of elasticity and modulus of rigidity, Shear stress, axial stress in composites, Centrifugal and Thermal stresses; Statically indeterminate members, Stresses in thin-walled and thick-wall members, torsion, column theory.

Thermodynamics: Fundamental concepts and definitions, laws of thermodynamics, thermodynamic processes and cycles, introduction to steam generator units, detail study of boiler, vapor power cycles-rankine, reheat, internal combustion engines, steam turbines, compressor, measurements and automatic control mechanism.

Heat transfer: Different modes of heat transfer-conduction, convection, and radiation, one dimensional steady state conduction of heat in solid plane wall, radiation heat transfer, the laws of black-body radiation, sources of energy.

Fluid mechanics and Pumps: Hydraulics properties of fluids, surface tension and capillary tubes, basic hydrostatic equation, pressure head of a liquid, pressure gauges, flow of fluids, Bernoulli's equation, and equation of continuity. laminar flow and turbulent flow, head loss due to friction in a pipe, fluid flow measurements, pump types, Characteristics and applications of reciprocating and centrifugal pumps.

Welding: Gas welding: principle, equipment used, gas storage and safety measures. Gas cutting. Arc welding: principle, equipment used; AC and DC arc welding, electrodes, shielded arc welding: TIG, MIG and plasma arc welding; electrical resistance welding. Lathe machine and accessories.

Learning Objectives:

- a. To provide the fundamental knowledge of different mechanical theories associated with leather and leather products industries.
- b. To introduce the students to the statics, dynamics, mechanics, and welding of solids.
- c. To develop the basic understanding of thermodynamics as well as fluid mechanics.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: Upon completion of this course, students will be able to:

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	State the basic concepts of different mechanical theories including statics, dynamics, thermal, solid, and fluid mechanics.	C1, A1
CLO2	Explain the mechanisms behind engineering statics, dynamics, heat transfer, pump, and welding along with thermodynamics, solid, and fluid mechanics.	C2, A2
CLO3	Apply the mechanical theories in real-life problem solving.	C3, A2
CLO4	Relate the concepts of mechanics in different areas of leather products manufacturing machinery.	C4, A3

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	-	-	-	-	-	-	-	-	-	-	-
CLO2	3	1	-	-	1	-	-	-	-	-	-	-
CLO3	3	2	2	3	2	-	-	-	-	-	-	2
CLO4	3	2	3	3	2	-	-	-	-	-	-	-

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, multimedia presentation, literature review and problem-based exercises	Group Presentation, Assignment, oral presentation, In-course Exam and Final Exam
CLO2	Lecture, group discussion and problem-based exercises, literature review.	Group Presentation, In-course Exam and Final Exam
CLO3	Lecture, multimedia presentation and problem-based learning: Identifying the problem to be solved	Assignment, Group Presentation, In-course Exam and Final Exam
CLO4	Lecture, multimedia presentation, group discussion, demonstration, and problem-based exercises	Group Presentation, Case study, Assignment, In-course Exam and Final Exam

Learning Materials

i. Recommended Readings

- a) Khurmi R.S., and Gupta J.K., (2020), "Thermal Engineering", S. Chand and Company Limited, New Delhi.

- b) Holman J.P., (2004) "Heat Transfer", 9th Edition, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
- c) Rogers G.F.C., and Mahew Y.R., (1967), "Engineering Thermodynamics: Work and Heat Transfer", 4th Edition (Reprinted), Longman Pub Group.

ii. Supplementary Readings

- a) Ferdinand P. Beer., and E. Russell Johnston, Jr. (2016), "Vector Mechanics for Engineers Statics and Dynamics", Eleventh Edition, McGraw-Hill Education.

iii. Others: Hand notes/Lecture materials will provide by the course teacher.

Course Code: 0715-ME-2208 Course Title: Mechanical Workshop Practice Credits: 1.5

Rationale of the Course: This course is based on 0715-ME-2208 to make students competent to know and practice different types of machinery, gas and arc welding, different types of fitting works, study and practice on pumps, power generators, engines and turbines.

Course Content

1. Use of Hand Tools and Machine Tools
2. Prepare cutting press knives using knife cutting and bending machine
3. Work on lathe machine
4. Work on milling machine
5. Practice with drilling machine
6. Practice with shaper and grinding machine
7. Perform on gas welding machine
8. Perform on arc welding machine and TIG welding
9. Study on pump and its accessories
10. Study on power generating engines.

Course Objectives:

- a. To introduce students to different cutting knife preparations.
- b. To familiarize students with pumps, compressors, power generators, and engines.
- c. To provide skills in gas, arc, and TIG welding.
- d. To develop skills on lathe, shaper, milling, drilling, and grinding machines.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

Course Learning Outcomes (CLOs): Upon successful completion of this course, students will be able to

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Demonstrate different basic tools, equipment, and machines.	C2, A1, P1
CLO2	Illustrate the operating principles and techniques of different machinery like lathe, drilling, milling, shaper, etc.	C3, A2, P2
CLO3	Manipulate and operate different mechanical machinery in real-life practices.	C3, P3, A3
CLO4	Correlate those mechanical operations in leather and leather products machinery.	C4, A3, P3
CLO5	Solve any technical issues while operating those machinery.	C5, A4, P4

Mapping of Course Learning Outcomes (CLOs) with Programs Learning Outcomes (PLOs)

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	-	-	-	-	-	-	-	-	-	-	-
CLO2	3	2	2	-	-	-	-	-	-	-	-	-
CLO3	3	2	2	1	3	-	-	-	2	-	-	3
CLO4	2	1	-	1	-	-	-	-	-	-	-	2
CLO5	3	2	3	2	2	-	-	-	2	-	-	-

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Demonstration and problem-based exercises presentation.	Viva, report evaluation, and final exam
CLO2	Group discussion, demonstration of problem-based exercises, multimedia presentation	Viva, report evaluation, and final exam
CLO3	Demonstration, identifying the problem to be solved	Group presentation, quiz, report evaluation and final exam
CLO4	Multimedia presentations, group discussions, demonstrations and problem-based exercises	Group presentation, viva, report evaluation, quiz, and final exam

Learning Materials

i) Recommended Readings

- a) Khurmi R.S. and Gupta J.K. "A Text Book of Work Shop Technology", 1st Edition (Reprinted 1981), S. Chand and Company Limited, New Delhi.

ii) Supplementary Readings

- a) Chapman, W.A.J., "Workshop Technology Part 1", 5th Edition (1972)

- iii) **Others:** Handout/lecture material provided by the course teacher

Course Code: 0723-LPE-2210 Course Title: Field Tour-II Credit: 1.0

Rationale of the Course: This course is designed to offer first-hand exposure to the business operations and processes that are usually performed in the workplace. Industrial visits will provide the students with a practical perspective of the concepts and theories that are taught to them. It will also help to keep the brilliant students up-to-date with knowing about the prevalent technologies and significant changes happening in the market.

Course Content

In 2nd Year 2nd Semester, students will visit a reputed footwear industry limited.

Discuss with the company supervisor about any project or assignment/task. Try to understand the systems in your workplace – Processes, Organization, and Administrative. Record all the work done or knowledge gained. Maintain logbook and give feedback to guide teacher.

Course Objectives

- To build a learning intervention that is intertwined with practical, hands-on skill enhancement knowledge to ensure that student's learning is not focused solely on theoretic approaches.
- To make a good relationship with various footwear companies and increase their networking opportunities.

Course learning outcomes (CLOs) and mapping of CLOs with program learning outcomes (PLOs)

CLOs: At the completion of this course students will be able to:

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Provide a description of the operations, workstations, plants, machines, assembly lines, and management involved in the footwear industry and engage in discussions with knowledgeable professionals.	C2, A3, P2
CLO2	Improve abilities in collaborating effectively with others, expressing ideas clearly and concisely, and working efficiently in a group setting.	C2, A3
CLO3	Prepare technical documents and give verbal presentations on completed industrial tour work.	C3, C4, A4

Mapping course learning outcomes (CLOs) with program learning outcomes (PLOs)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	-	-	-	3	-	-	-	-	3	-	2
CLO2	2	-	-	-	-	-	-	-	2	2	-	2
CLO3	2	-	-	-	-	-	-	-	-	3	-	2

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Class Lecture, Display and Demonstration	Presentation and viva, Report Evaluation
CLO2	Class Lecture, Display and Demonstration,	Presentation and viva, Report Evaluation
CLO3	Discussion, Discussion and Motivation, Self-study	Presentation and viva, Report Evaluation

Learning Materials

i. Recommended Readings

- a) Writing the Winning Thesis or Dissertation: A Step-by-Step Guide - By Allan A. Glatthorn, Randy L. Joyner.
- b) Relevant books, handbooks, patents and manuals.

Course Code: 0723-LPE-3101 Course Title: Leather Garments Manufacturing
Credits: 3

Rationale of the Course: Leather garments manufacturing course will provide students with knowledge on history of clothing, various types of leather apparel (skirt, waist coat, jacket, trousers etc.), hand gloves, different parts of garments (pockets, sleeves, collar, darts and pleats), body measurements, block pattern, and care and maintenance of leather garments. This course will help student to develop theoretical understanding about leather garments to apply in practical work of garments manufacturing.

Course Contents

Background: History of clothing, clothing culture and communication, Garments Pattern, Garments Pattern classification, Body measurement, points to be considered during body measurement, taking body measurement, man's/women's bodice block, Garment specification sheet.

Clothing Design: Development of a collection, fashion, fashion accessories, elements of cutting, types of cutting, cutting of various patterns with notches, importance of notches, lining cutting.

Dart and Pleat: Concepts of dart, dart placement, dart manipulation, concept of pleat, pleat terminology, types of pleats, methods of pleat construction,

Pockets: Development of different pockets and flaps, gusset pocket and flap, piping pocket, false pocket.

Collars: Pattern construction and development of different collars.

Sleeve: Definition, types, terminology, one-piece sleeve block, two-piece sleeve block, sleeve construction

Skirt: Different parts of simple skirt, types of skirt, construction of basic skirt block, modification in basic skirt, design and construction of flared skirt, paneled skirt, components attachment.

Waist Coat: Construction of basic waist coat block, Different parts of waist coat, Classification of different waist coat. Modification and design development of different waist coat

Jacket: Construction of different parts of simple jacket, Block development for classic casual jacket, types of jackets, fitting problems of jacket.

Trousers: Design and development of different parts of simple trousers, basic trouser block, types of trousers, fitting problems of trousers.

Hand Gloves: Anatomy of hand gloves, types of hand gloves, materials, perspective drawing, measurement instruction, total pattern making, thumb design, different types of hems and back closure used in gloves, ways of lining the gloves, fore finger construction, types of cuff & materials.

Care and Maintenance of Leather Garments: Home care, grain and suede leather care, dry-cleaning equipment, solvent choice, preliminary treatments prior to cleaning.

Course Objectives: The objectives of this course are –

- a) To acquaint students with clothing design and construction of blocks and other patterns for garments manufacturing
- b) To introduce the essential facts and manufacturing techniques of different jacket, skirt, waist coat, trousers, hand gloves etc.
- c) To provide students with knowledge on care and maintenance of leather garments.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: Upon completion of this course, students will be able to-

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Describe the clothing culture, basic body measurements and construction of garments block, garments specification sheet, fashion collection	C1, A1
CLO2	Explain and identify various types of garments – jacket, skirt, waistcoat, trousers and hand gloves,	C1, C2, A1, A3
CLO3	Construct pleats and manipulate darts in garments manufacturing as well as develop pockets, sleeve and collars	C3
CLO4	Apply theoretical knowledge in maintenance of leather garments	C3
CLO5	Analyze the critical points of a design and evaluate the quality of leather garments	C4, C5

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	-	2	-	-	-	-	-	-	-	-
CLO2	3	2	3	-	-	-	-	-	-	-	-	2
CLO3	3	3	3	-	3	-	-	-	-	-	-	2
CLO4	3	3	3	2	-	-	-	-	-	-	-	2
CLO5	3	3	2	3	-	-	-	-	2	3	-	2

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Multimedia presentation, Group discussion	Group Presentation, In-course Exam; Final Exam
CLO2	Lecture, group discussion	Group Presentation, In-course Exam; Final Exam
CLO3	Lecture, Demonstration, Video presentation	Group Presentation, In-course Exam, and Final Exam
CLO4	Lecture, multimedia presentation, group discussion,	Quiz, In-course Exam, Final Exam
CLO5	Lecture, Demonstration, group discussion	Group presentation, Assignment, In-course Exam, and Final Exam

Learning Materials

i) Recommended Reading

- a) Roland Kilgus- Clothing Technology.
- b) Martin M. Shoben & Janet P. Ward- Pattern Cutting and making up
- c) Francesca Sterlacci- Leather Apparel Design

ii) Supplementary Readings

- a) Gerry Cooklin – Pattern Cutting for women’s outerwear
- b) Winifred Aldrich – Metric Pattern Cutting for Menswear

iii) **Others:** Hand notes/Lecture materials will be provided by the course teacher.

Course Code: 0723-LPE-3102 Course Title: Leather Garments Manufacturing Lab
Credits: 1.5

Rationale of the Course: Leather garments manufacturing lab is a practical course that will impart knowledge on construction techniques of different types of leather apparel including skirt, waist coat, jacket, trousers and also introduce the manufacturing process of different parts of leather garments such as pockets, sleeves, collar, darts, pleats and hand gloves. This course is essential for gaining skills in garments manufacturing that will help students in their professional activities.

Course Contents

1. **Pockets:** Manufacturing of different pleated pockets and flaps, gusset pocket and flap, piping pocket, false pocket.
2. **Collars:** Pattern construction and manufacturing of different collars.
3. **Waist Coat:** Construction of basic waist coat blocks, manufacturing of different waist coats.
4. **Skirt:** Construction of basic skirts block, manufacturing of different skirts.
5. **Jacket:** Pattern construction and manufacturing of different jackets.
6. **Trousers:** Construction of basic trousers block, manufacturing of different trousers.
7. **Hand gloves:** Designing, pattern making, cutting, splitting, skiving, assembling, stitching, final preparation, finishing, costing.

Course Objectives: The objectives of this course are:

- a) To provide basic working knowledge for the development of the leather garments.
- b) To introduce the essential facts and development method in different ladies skirt, waist coat, jacket, trouser, and hand gloves.
- c) To impart a comprehensive practical knowledge in the development of basic block, design and pattern making.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: Upon completion of this course, students will be able to:

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Describe basic techniques for leather garments manufacturing such as pocket, dart, pleats etc.	C1, P1, A1
CLO2	Apply different techniques in construction of garments block – jacket, waistcoat, skirt, sleeve, collar, hand gloves and trouser.	C3
CLO3	Construct leather garments (jacket, waistcoat, skirt, sleeve, hand gloves, collar and trouser) as teamwork.	C3, P4
CLO4	Analyze and compare to maintain the quality in leather garments manufacturing.	C4, C5, A4
CLO5	Manipulate new design of garments and construct patterns that will help them to work as designer in industry.	C3, P5

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	-	-	3	-	-	-	2	2	-	2
CLO2	3	2	2	2	2	-	-	-	3	2	-	-
CLO3	3	-	3	-	3	-	-	-	3	2	-	-
CLO4	3	3	2	2	3	-	-	-	3	2	-	2
CLO5	3	2	2	2	3	-	-	-	3	3	-	2

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Demonstration, Hands-on practice, and Group work	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO2	Lecture, Demonstration, Hands-on practice, and Group work	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO3	Lecture, Demonstration, Hands-on practice, and Group work	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO4	Lecture, Demonstration, Hands-on practice, and Group work	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO5	Lecture, Demonstration, Video presentation and Problem-based group discussion	Demonstration, Continuous assessment: Group presentation

Learning Materials

i) Recommended Reading

- a) Winifred Aldrich – Metric Pattern Cutting for Menswear
- b) Winifred Aldrich – Metric Pattern Cutting for womenswear
- c) Martin M. Shoben & Janet P. Ward- Pattern Cutting and making up

ii) Supplementary Readings

- a) Gerry Cooklin – Pattern Cutting for women’s outerwear
- b) Roland Kilgus- Clothing Technology.

iii. Others: Hand notes/Lecture materials will be provided by the course teacher.

Course Code: 0531-Chem-3103 Course Title: Instrumental Analysis Credits: 3.0

Rationale of the Course: This course covers in-depth knowledge of design, operational techniques, principles, and practical applications of modern instrumental methods used in chemical analysis. Using a combination of chromatographic and spectroscopic problem-based learning approaches, the critical thinking and analytical skills of the student will be improved and will assist them in developing their theoretical knowledge to do advanced research.

Course Contents

Gas chromatography: Introduction, classification, principles of gas-liquid chromatography, gas-solid chromatography, techniques of gas-liquid chromatography, phases, oven, columns, detectors: types of detectors, application of GC in chemical analysis.

High-Performance liquid chromatography: Basic concept, instrumentation of HPLC, stationary phases: Normal and reversed-phase, mobile phase, sample injector, selection of column, UV-visible and RI detectors, Peak tailing and fronting, effect of temperature in HPLC, comparison of HPLC with GLC, application of HPLC.

Infrared spectrometry: Basic principle, types of vibration modes, selection rule, parameters determining the position and intensity of bands, characteristic absorption bands of functional groups, influence of substituent, polarity and hydrogen bonding on IR peaks, application of IR spectrum for chemical and leather analysis.

Nuclear Magnetic Resonance Spectroscopy: Fundamental theory, NMR active nucleus, solvents, chemical shift and factors affecting chemical shift, shielding and de-shielding effect, application of ^1H -NMR spectrum in organic compounds and leather chemicals analysis.

Mass Spectrometry: Introduction, principle, isotopic peaks, ionization methods: EI, ESI, CI, fragmentation pattern of simple molecules, applications.

Thermal analysis: Thermogravimetric analysis (TGA): Introduction, objectives, instrumentation, classification, interpretation of TGA curve, factors affecting TGA curve, application in leather science; basic principle of differential thermal analysis (DTA) and differential scanning calorimetry (DSC).

Characterization of collagen: Chromatographic properties, electrophoretic properties, microscopy and spectroscopy techniques for collagen morphology, X-ray diffraction studies of collagen, non-invasive methods of liquid and solid imaging of biological specimens and their relevance to location of defects in hides/skins.

Course Objectives

- a) To improve the analytical knowledge on purification, identification and quantification of the chemical components from their mixture or impurities.

- b) To develop the ability to analyze organic and other chemicals by the combination of spectroscopic data such as infrared spectroscopy, nuclear magnetic resonance spectroscopy, and mass spectrometry.
- c) To provide in-depth knowledge on the thermal stability of leather, synthetic polymers, and leather products materials using TGA and DSC.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: Upon completion of this course, students will be able to:

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Describe the physical laws and working principles, instrumentation, and applications of HPLC and GC as well as compare the different aspects of HPLC and GC.	C2, C4, A2
CLO2	Analyze and interpret IR, NMR, and Mass spectrum of different compounds and elucidate the structure of unknown compounds.	C4, C5, A3
CLO3	Relate the basic principles and significance of TGA, DTA, and DSC techniques and compare the related curves.	C4, A3
CLO4	Characterize collagen through the study of FT-IR, X-ray diffraction, and mechanical and optical properties of collagen fibers.	C4, A3

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	1	-	1	3	-	-	-	-	-	-	-
CLO2	3	2	-	2	3	-	-	-	-	-	-	-
CLO3	3	2	2	2	3	-	-	-	-	-	-	-
CLO4	2	3	2	3	3	-	-	-	-	-	-	-

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, multimedia presentation, demonstration and problem-based exercises.	In-course Exam; Final Exam
CLO2	Lecture, group discussion and problem-based exercises on instrumental analysis.	In-course Exam; Final Exam
CLO3	Lecture, showing sophisticated instruments, Identifying the problems to be solved.	In-course Exam, Final Exam
CLO4	Lecture, audiovisual presentation, multimedia presentation, group discussion, demonstration, and problem-based exercises.	Quiz, Final Exam

Learning Materials

i. Recommended Readings

- a) Gary D. Christian- Analytical Chemistry.
- b) John Kenkel- Analytical Chemistry for Technicians.
- c) Sharma B. K. - Instrumental Methods of Chemical Analysis.

ii. Supplementary Readings

- a) Sarker P. K. - Analytical Chemistry for Leather Manufacture.
- b) Williams D. H. and Ian Fleming- Spectroscopic methods in Organic chemistry.

iii. Others: Handout/lecture material provided by the course teacher

Course Code: 0531-Chem-3104 Course Title: Chemical Analysis of Leather and Leather Products Lab Credits: 1.5

Rationale of the Course: This practical course is based on theoretical knowledge of analytical chemistry and instrumental methods of analysis. The course is designed to provide essential knowledge related to safety during working in an advanced analytical laboratory, and the development of skills for the use of sophisticated instruments and equipment in different chemical analysis. The course is also designed to develop instrumental and analytical skills to conduct research work.

Course Contents

Analysis of Leather: Sulphated ash, fat content, chromic oxide content, Cr⁶⁺ and other trace metals content, formaldehyde, moisture, nitrogen content, and shrinkage temperature of the leather sample; Extraction of collagen and characterization.

Analysis of Chrome liquor: Chromic oxide, sulphate, hydroxide content.

FT-IR and TGA analysis of sole materials.

Course Objectives: The learning objectives of this course are:

a) To introduce the essential experimental knowledge and skills of different tests to determine moisture content, nitrogen content, thermal stability of leather, and synthetic tanning materials, and total fat in leather samples.

b) To apply practical knowledge in analytical chemistry in the leather and allied engineering field.

c) To determine toxic metals like total chromium, lead, and cadmium by atomic absorption spectroscopy (AAS) and chromium (VI) by UV-VIS spectrophotometer.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: Upon completion of this course, students will be able to:

CLOs	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Perform different physical and chemical tests to determine pH, fat content, moisture content, ash content, and shrinkage temperature of leather samples.	C3, P3, A3
CLO2	Apply the titrimetric method (IUC-8) to determine the chromic oxide content in finished leather and chrome liquor samples and determine nitrogen in leather by Kjeldahl method.	C3, P3, A4
CLO3	Demonstrate complexometric and gravimetric methods to determine sulphate from chrome liquor and utilize thermogravimetry and FT-IR to analyze the leather and different synthetic sole materials.	C3, P3, A3
CLO4	Estimate the concentration of total Cr, Pb, Cd and Cr (VI) in leather and effluent samples by spectroscopic method.	C5, P4, A4
CLO5	Write laboratory reports that integrate mathematical, tabular, and graphical representations of data which compare and contrast theoretical predictions and experimental measurements and draw pertinent conclusions.	C4, P3, A4

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	2	-	-	-	-	-	-	-	-	-
CLO2	3	3	2	2	-	-	-	-	-	-	-	-
CLO3	3	2	1	3	2	-	-	-	-	-	-	-
CLO4	3	2	2	2	2	2	2	-	-	-	-	-
CLO5	3	2	-	-	-	-	-	-	-	2	-	-

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Interactive lecture, Group discussion, Demonstration, Hands-on practice, and Group work	Quiz, Viva voce, Report evaluation, Final Exam
CLO2	Lecture, Demonstration, Hands-on practice, and Group work	Presentation, Report evaluation, Final Exam
CLO3	Lecture, Demonstration, Hands-on practice, and Group work	Quiz, Viva Voce, Report evaluation, Final Exam
CLO4	Lecture, Demonstration, Hands-on practice, and Group work	Report evaluation, Final Exam
CLO5	Lecture and whiteboard illustration	Report evaluation

Learning Materials

i. Recommended Readings

- a) Gary D. Christian- Analytical Chemistry.
- b) John Kenkel- Analytical Chemistry for Technicians.

ii. Supplementary Readings

- a) Sarker P. K. - Analytical Chemistry for Leather Manufacture.

iii. Others: Handout/lab procedure manual provided by the course teacher

Course Code: 0723-LPE-3105 Course Title: Environmental Science and Engineering
Credits: 2

Rationale of the Course: Environmental Science and Engineering is a fundamental course for undergraduate engineering students which gives stresses real-time knowledge and skills on the environment. The course will help to deal with various environmental pollutions and their mitigations.

Course Content

Concept of Environment: Definition and concept of environment, types and components of environment, Biodiversity, man-environment relationships.

Air Pollution: Introduction, composition of air, sinks of atmospheric gases, chemical reactions occur in different spheres, smog formation in air, major sources of air pollution and impact on the environment, greenhouse effect, acid rain and its effect, air pollutant and their characteristics, hazardous air pollutants (HAPs).

Soil Pollution: Introduction, sources of soil pollution, detrimental effects of soil pollutants, disease caused by soil pollution, treatment of soil pollutants, control of soil pollution.

Leather and Leather Products Industry and Environment: Manufacturing process sequences and their environmental implications, major chemical inputs and wastes in cutting, sewing, assembling, and finishing.

Waste Management: definition of waste, integrated waste management, transformation of solid waste, Recovery of residues of effluents, organic materials, dissolved salts, energy; recycling of lime/sulphide liquors, dehair; high chrome exhaustion techniques in chrome tanning, chrome recovery and recycling, oil and grease recovery, disposal of effluents.

Environmental Management System (EMS), Policies and Legislation: Concept and certification process of EMS, Environmental legislation in Bangladesh, Environment Conservation/Protection Act and Rules.

Course Objectives

- a. To introduce the students to basic concepts of the environment, environmental pollution, and environmental management system.
- b. To identify the impacts of different natural and anthropogenic activities on the environment and their remediation.
- c. To impart knowledge on industry-specific solid waste management practices and energy recovery approaches.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: The course is designed to achieve the following outcomes-

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Describe the basic concepts of the environment, environmental pollution, integrated waste management, and environmental management system.	C1, A1
CLO2	Explain the causes and effects of environmental pollution and their remediation.	C2, A2
CLO3	Compare and analyze different techniques to ensure proper waste management approaches in leather products and related industries.	C3, C4, A3

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	1	-	-	-	3	3	2	-	-	-	2
CLO2	3	3	2	-	2	3	3	2	-	-	-	3
CLO3	3	3	3	1	2	3	3	-	-	-	-	3

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course-Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Multimedia presentation, white board illustration, problem-based exercises, group discussion	Quiz, In-course exam; Final Exam
CLO2	Lecture, multimedia presentation, problem-based Learning (PBL): Identifying the problems to be solved	Assignment, Group presentation, In-course exam, Final exam
CLO3	Lecture, multimedia presentation, group discussion, analyze and compare through various case-studies	Assignment, In-course Exam, Final Exam

Learning Materials

i. Recommended Readings

- Fifield & Haines. -Environmental Analytical Chemistry.
- Roy M. Harrison-Pollution causes, Effects, and Control.
- B.K. Sharma and H. Kaur-Environmental Chemistry.

ii. Supplementary Readings

- a) Besselievie, B.E. and Schwartz, M. "The Treatment of Industrial wastes", 2nd edn., McGraw Hill.
- b) Infogate, GTZ, "Treatment of Tannery Waste Water", GmbH, Frankfurt, Germany, 2002.

iii. **Others:** Handout/lecture material provided by the course teacher

Course Code: 0715-ME-3107 Course Title: Materials Science and Engineering
Credits: 3.0

Rationale of the Course: This course intends to introduce students to the behavior of materials directly linked to their fundamental structures, and how structures and properties may be altered through processing. It will help the students understand the structure of solids, the mechanical, thermal, electrical, magnetic, and optical properties of materials, and the characterization technique.

Course Content

Materials: Basic concept, classification of materials, smart and intelligent materials, nanotechnology, and recent developments.

Structure of crystalline solids: Introduction, unit cells, metallic crystal structures, density computations, polymorphism and allotropy, crystal systems; crystallographic points, directions, and planes: point coordinates, crystallographic directions, crystallographic planes, linear and planar densities, close-packed crystal structures; crystalline and noncrystalline materials, polycrystalline materials, anisotropy, noncrystalline solids.

Mechanical properties: Tensile strength, plastic deformation, true stress and strain, elastic recovery after plastic deformation, compressive, hardness, variability of material properties, design/safety factors, dislocation, characteristics of dislocations, slip and slip systems, generalized creep behavior, stress and temperature effect, viscoelastic deformation.

Thermal and electrical properties: Heat capacity, thermal expansion, materials of importance invar and other low expansion alloys, thermal conductivity and thermal stresses, electrical conduction, semiconductivity, semiconductor devices, electrical conduction in ionic ceramics and in polymers, dielectric behavior, capacitance, field vectors and polarization, types of polarization, phonons, frequency dependence of the dielectric constant, dielectric strength, dielectric materials, ferroelectricity, piezoelectricity.

Magnetic properties: Basic concepts, diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism and ferrimagnetism. Influence of temperature on magnetic behavior, domains

and hysteresis, magnetic anisotropy, soft and hard magnetic materials, magnetic storage, superconductivity.

Optical properties: Light interactions with solids, atomic and electronic interactions, optical properties of metals, optical properties of nonmetals, refraction, reflection, absorption, transmission, color, opacity, and translucency in insulators, applications of optical phenomena, luminescence, materials of importance-light emitting diodes (LED), photoconductivity, LASERs, optical fibers in communications.

Characterization techniques: X-ray diffraction, structure determination from powder patterns, influence of crystal symmetry and multiplicities on powder pattern, neutron diffraction, SEM, EDX, TEM, XPS, AFM, and VSM.

Composite materials: Particle-reinforced composites: large-particle composites, dispersion-strengthened composites, fiber-reinforced composites, influence of fiber length, influence of fiber orientation and concentration, the fiber phase, the matrix phase, polymer-matrix composites, metal-matrix composites, glass material, phase transition, carbon-carbon composites, processing of fiber-reinforced composites, hybrid composites, structural composites, laminar composites, sandwich panels, materials of importance-nano and bio composites.

Course Objectives: The objectives of this course are as follows:

- a. To provide the students with the fundamental characteristics of materials and their applications in the respective fields.
- b. To introduce various concepts of characterization techniques for different types of materials.
- c. To provide in-depth knowledge on the design, development, and fabrication of diversified materials.

Course Learning Outcomes (CLOs) and Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs: Upon completion of the course, the students will be able to -

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Define and explain the fundamental structures of solid materials.	C1, C2, A1
CLO2	Correlate the structures with the physico-mechanical and electromagnetic properties of materials.	C3, A2
CLO3	Apply the knowledge of materials science to enhance and radically improve existing and future technology.	C3, A2
CLO4	Analyze and interpret the results obtained from different characterization techniques of materials.	C4, C5, A3

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	-	-	-	-	-	-	-	-	-	-	-
CLO2	3	-	-	-	-	-	-	-	-	-	-	-
CLO3	3	3	2	3	-	2	-	-	-	-	-	-
CLO4	3	3	2	3	3	2	1	-	-	-	-	-

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Interactive discussion, lecture discussion with multimedia, and whiteboard illustration	In-course Exam and Final Exam
CLO2	Interactive discussion, lecture-discussion with multimedia, and whiteboard illustration	In-course Exam and Final Exam
CLO3	Lecture discussion with multimedia, white board illustration, and problem-based learning (PBL): Identifying the problem to be solved	Assignment, In-course Exam, and Final Exam

Learning Materials

i. Recommended Readings

- a. Materials Science and Engineering-An Introduction -W. D. Callister Jr.
- b. The Science and Engineering of Materials -D. R. Askeland, P. Phulé.
- c. Foundations of Materials Science and Engineering -W. F. Smith.

ii. Supplementary Readings

- a. Introduction to Physical Metallurgy, Avner.
- b. Strength of Materials, Andrew Pytel, Ferdin and L. Singer.

iii. Others: Handout/lecture material provided by the course teacher.

Course Code: 0417-Hum-3109 Course Title: Industrial Sociology Credits: 2.0

Rationale of the Course: This course provides the students with a basic understanding of the role of social processes, social institutions, and social interactions in their lives and integrates the knowledge drawn from their own degree backgrounds. Industrial sociology concerns the production of goods and services in society and the nature of the social relations involved in this production process.

Course Content

Introduction to Sociology: Definition, Nature, Scope, Importance, Social Interactions, Social Groups, Social Institutions.

Culture and Related Concepts: Types, Elements, Role of Culture in Organization, Socialization and Personality, Work Behavior, Work Environment, Work Ethics and Work Culture.

Interpersonal Relations: Interpersonal Behavior, Formation of Personal Attitudes, Language and Communication, Motivations and Emotions, Public Opinion.

Social Stratification: Factors of Social Stratification, Caste and Class, Power, Prestige, and Authority, Social Mobility, Migration.

Human Ecology: Ecological Processes, Ecosystem, and Energy, Ecosystem and Physical Environment, Solid Waste Disposal, Pollution.

Population Dynamics: World Population Growth and Distribution, Population Dynamics in Bangladesh, Causes and Consequences of Urbanization, Population Policy in Bangladesh.

Community Development: Scope and Subject Matter of Community Development, Processes of Community Development, Community Development Programs in Bangladesh, Community Organization and Related Services.

Deviance and Crime: Crime as a Social and Cultural Phenomenon, Crime and Social Organization, Organized Crime, Culture Based Crime, Economics of Crime.

Sociology of Change and Development: Social Change and Development, Dynamics of Social Change, Role of NGOs in Development, World System and Development, Gender and Development.

Course Objectives

- a. To describe the basic sociological concepts, theories, and methods to analyze societal phenomena.
- b. To introduce students to basic social processes of society, social institutions, and patterns of social behavior.
- c. To impart sociological knowledge of core areas and substantive topics and the ability to critically think about them.

Course Learning Outcomes (CLOs)

After this course, students will be able to -

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Identify and connect the basic ideas and terminology in the study of sociology, human ecology and apply the knowledge in real-life.	C1, C2, A2
CLO2	Explain the major methods and concepts used in the systematic study of society.	C3, A2
CLO3	Relate work culture, work ethics, and ethical behavior in real-life.	C4, A3
CLO4	Critically analyze society, its phenomena using sociological theories, and social problems and their impacts on individuals.	C5, A3

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	2	1	-	1	-	2	-	2	2	-	-	3
CLO2	2	2	-	1	-	2	-	2	2	2	-	3
CLO3	2	2	-	2	-	2	-	3	2	2	-	3
CLO4	3	3	-	2	-	3	-	3	2	2	-	3

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, interactive discussion, audio-visuals	In-course Exam, Final Exam
CLO2	Lecture, group discussion, case study, audio-visuals	Assignment, In-course Exam, Final Exam
CLO3	Lecture, audio-visual lectures	Assignment, Case Study, In-course Exam, Final Exam
CLO4	Audio-visual lecture, multimedia presentation, and group discussion	Quiz, Group Presentation, In-course Exam, Final Exam
CLO5	Lecture, multimedia presentation	In-course Exam, and Final Exam

Learning Materials

i. Recommended Readings

- Schaefer, R. T. (2009). *Sociology: A Brief Introduction* (10th ed.). McGraw-Hill.
- Ian Glover-Engineers in Britain: A Sociological Study of the Engineering Dimension.
- Stewart, E. W. and Glynn, J. A. (1979). *Introduction to Sociology* (3rd Ed). McGraw-Hill.

ii. Supplementary Readings

- Gerald G Marten-Human Ecology: Basic Concepts for Sustainable Development.
- Dealey, James Quayle and Ward, Lester, Frank-A Text Book of Sociology.

iii. Others: Other materials or notes will be provided by the course teacher.

Course Code: 0541-Math-3111 Course Title: Probability and Statistics Credits: 3.0

Rationale of the Course: This course is designed to introduce students to the fundamental ideas and logic behind statistical reasoning. In addition, students will be guided through the process of

developing an understanding of the subject's significance to the sectors in which they choose to further their education.

Course Content

Introduction: Historical development of the subject, collection of data-primary data, and secondary data.

Frequency distribution: Grouped frequency distribution and their presentation in the form of frequency polygon and histogram.

Measures of central tendency: (i) Mean: (a) Arithmetic Mean (b) Geometric Mean (c) Harmonic Mean (ii) Median (iii) Mode, their definitions, computations, advantages, disadvantages and uses.

Measures of dispersion: Absolute measure, (a) Range (b) Mean deviation (c) Quartile deviation (d) Standard deviation, Relative measure, Coefficient of variation, their definitions, computations and uses.

Moment, skewness and kurtosis: Their definitions, computations and uses.

Correlation and regression: Correlation-Ideas of correlation, measurement of correlation. Pearsonian correlation co-efficient, and spearman's rank correlation co-efficient. Multiple correlations, Regression-Ideas about simple regression, equation of the regression line, estimation of the parameters of the regression line.

Probability: Simple idea of probability, different definitions related to probability, addition law of probability for mutually exclusive and not mutually exclusive events, multiplication law of probabilities for dependent and independent events, discrete and continuous random variables, mathematical expectation, conditional probability, probability distribution: (i) Binomial, (ii) Poisson, Simple idea about normal distribution and its probability curve.

Test of significance: Some definitions related to the test of significance.

T-test: (a) Comparison of a sample mean with a known population mean when S.D. is known and when S.D. is not known. (b) Comparison of means of two samples when S.D. is known and also when it is unknown, (c) Paired t-test, its practical use in Leather/Footwear/Leather Product Industry. χ^2 -test: simple application and its practical use in industry.

Sampling: Definition of population, sample, parameter, census, etc. simple random sampling, stratified random sampling, their definitions, computations, uses, advantages and disadvantages.

Design of experiment: Basic principles of experimental design, ideas about CRD, RBD.

Course Objectives

- a) To provide the basic foundations of statistics with applications in real life.
- b) To provide knowledge on descriptive statistics, correlation, regression, probability, and probability distributions for both continuous and discrete random variables.
- c) To discuss the theory and its applications for real-life problem-solving and inquiry.
- d) To provide students with hands-on experience in using statistical theory and methods to perform different statistical analyses and interpret results.

Course Learning Outcomes (CLOs)

Upon completion of the course, the students will be able to -

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	State the fundamental concepts of different terminologies related to statistics.	C1, A1
CLO2	Describe the theories and methods to perform different statistical analyses.	C2, A2
CLO3	Calculate, interpret, and communicate the correlation coefficient and simple linear regression model.	C3, A2
CLO4	Analyze the data related to correlation, regression, probability, and probability distributions for both continuous and discrete random variables.	C4, A3
CLO5	Justify the appropriate statistical data based on experiment conditions and assumptions.	C5, A3

Mapping of CLOs with PLOs

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	-	-	-	-	-	-	-	-	-	-
CLO2	3	3	-	-	-	-	-	-	-	-	-	-
CLO3	3	3	-	-	-	-	-	-	-	-	-	1
CLO4	3	3	2	3	-	-	-	-	-	-	-	2
CLO5	3	3	2	3	-	-	-	-	-	-	-	2

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture and problem-based exercises	Assignment, In-course Exam and Final Exam
CLO2	Lecture, group discussion and problem-based exercises	Assignment, In-course Exam and Final Exam
CLO3	Lecture, guided reading and problem-based learning (PBL): Identifying the problem to be solved	Assignment, In-course Exam and Final Exam
CLO4	Lecture, group discussion, and problem-based exercises	Assignment, In-course Exam and Final Exam
CLO5	Lecture, group discussion, and problem-based exercises	Group Presentation, Assignment, In-course Exam and Final Exam

Learning Materials

i. Recommended Readings

- An introduction to Statistics and Probability, Dr. Nurul Islam.
- Research Methodology (Methods and Techniques), C.R. Kothar.

ii. Supplementary Readings

- Business Statistics (Fourteenth Edition), Dr. S.P. Gupta and Dr. M.P. Gupta.

iii. **Others:** Handout/lecture material provided by the course teacher.

Course Code: 0723-LPE-3112 Course Title: Product Design and Pattern Making–II
Lab Credits: 1.5

Rationale of the Course: Leather products design and drafting lab is a practical course that will impart education on designing and pattern making for various leather products. It provides students with the opportunity to design a new leather product and develop patterns for leather goods and garments. This course imparts practical knowledge on pattern grading, size modifications for garments. Students will also learn the techniques of preparing theme board, style board, story board, color board etc.

Course Contents

Design, development and grading of the following items

- Preparation and Grading techniques of pattern for ladies’ bag.
- Design and Development of gents’ bags.
- Preparation and Grading techniques of pattern for gents’ bag.
- Men’s and women’s outer wear preparation and grading techniques: a) Different types of jacket block, b) Different types of trouser/pant block. c) Different types of waist coat block. d) Different types of sleeves, collar block. e) Different types of skirt block.

Course Objectives

- a) To provide practical knowledge of preparing patterns for ladies’ bag, developing Gent’s bag, different blocks of jacket, trouser, coat, sleeve, collar, skirt etc.
- b) To introduce the grading techniques of these products.
- c) To create own designed product.

Course Learning Outcomes (CLOs)

Upon successful completion of this course, students will be able to

CLOs	Course Learning Outcomes (CLOs)	Learning level
CLO1	Identify different pattern making process and design of pattern.	C1, P1, A3
CLO2	Explain various types of ladies and gent’s bag.	C2, P2, A3
CLO3	Show both manual and software-based designing of leather products.	C3, P2
CLO4	Perform both manual and software-based grading.	P5
CLO5	Solve different manufacturing problems.	C3, A5

Mapping of Course Learning Outcomes (CLOs) with Programs Learning Outcomes (PLOs)

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3		3	1								2
CLO2	3		2									
CLO3	3		1		3				2			2
CLO4	3	2			3							2
CLO5	3	2		3	2				2			2

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Demonstration, Hands-on practice.	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO2	Lecture, Demonstration, Hands-on practice.	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO3	Lecture, Demonstration and Group work	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO4	Lecture, Demonstration, Hands-on practice, and Group work	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO5	Lecture, Demonstration, Multimedia presentation and Problem-based group discussion	Demonstration, Continuous assessment, Final exam.

Learning Materials

i) Recommended Readings:

- a) Pattern Cutting & Making up- Martin M. Shoben.
- b) Leather Apparel Design – FranceseaSterlacci.
- c) Clothing Technology- Europa Lehrmittel.

ii) Supplementary Readings

- a) Pattern Cutting for Women's Outerwear- Gerry Cooklin.
- b) Metric Pattern Cutting for Children's Wear and Baby Wear- Winifred Aldrich.

iii) Others: Handout/lecture material provided by the course teacher.

Course Code: 0723-LPE-3201 Course Title: Non-Leather Materials Synthesis

Credits: 3.0 credits

Rationale of the Course: This course is designed to understand the manufacturing processes, properties, applications and environmental concerns of different non-leather materials which are

inevitable to produce leather goods. The course also introduces various modifications of different polymeric materials, polymer processing techniques together with associated technologies.

Course Content

Industrially important polymeric materials used in leather-products manufacturing:

Introduction, structures, preparations, properties, applications and environmental concerns of mostly used polymeric materials- LDPE, HDPE, Polystyrene, Polypropylene, EVA, ABS, Polyesters, PET, PBT, PTT, PTFE, Polyamides, Nylon 6, Nylon 6 6, Acrylic polymers and its derivatives, Polyvinyl chloride and its derivatives, Cellulose and its derivatives, Epoxy resin, Phenol-formaldehyde resin, Urea-formaldehyde resin, Melamine-formaldehyde resin, Silicones, Biopolymers.

Modifications of polymeric materials: Polymer blending, types of blending and blending processes, high polymer blends, plasticization, Additives of polymers (fillers, antioxidants, flame-retardants, stabilizers, colorants and pigments), post reactions of polymers.

Important polymer processing techniques: Compounding and mixing, moulding techniques, injection moulding, extrusion moulding, compression moulding, calendaring, film casting, reaction injection moulding (RIM), blow moulding, spinning.

Polyester resins: Raw materials, poly-basic acids, poly-functional glycols. curing of resins, various curing systems, catalysts, and accelerators. Molding compositions, fibre and film forming compositions.

Polyurethanes: Raw materials, di-isocyanates and diols, reactions of isocyanates with various functional groups, structures, properties, processing, and applications of polyurethanes, synthesis of polyurethane foams, polyester and polyether foams, flexible foams, polyurethanes in coatings

Rubber and Elastomers: Introduction, importance of elastomers, classification of rubber, synthesis of rubber (compounding, plasticization, vulcanization, mixing and shaping), age resistors and vulcanizing agents, processing techniques (calendaring, coating, extruding, molding), Synthesis, properties and applications of various rubbers: natural rubber, synthetic poly-isoprene, styrene butadiene rubber, SBS rubber, nitrile rubber, EPR and EPDM rubber, polybutadiene rubber, butyl and neoprene/ chloroprene rubber, silicone rubber etc.

Course Objectives

(a) To provide knowledge and understanding of different non-leather materials with structures and properties

(b) To impart an introduction to various processing techniques, ultimate applications and environmental aspects.

Course learning outcomes (CLOs)

Upon completion of the course, the students will be able to-

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Define and describe various properties and rationale of different non-leather materials.	C1, C2
CLO2	Explain different types of modification and polymer processing techniques together with mechanisms and significances of each steps	C2
CLO-3	Illustrate the preparation of various types of industrially important non-leather materials to characterize and apply in products manufacturing.	C3, C4
CLO-4	Assess and identify the environmental issues caused by non-leather appliances in real-life applications	C5, A1

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	2									
CLO2	3	2	3	2		2						
CLO3	3	2	3	2								
CLO4	3	2					3					2

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO-1	Lecture, literature review, multimedia presentation, group discussion	Group Presentation, In-course Exam, Quiz, Assignment, Final Exam
CLO-2	Lecture, multimedia presentation, video presentation, demonstration, group discussion	Group Presentation, In-course Exam; quiz, assignment, case study, Final Exam
CLO-3	Lecture, demonstration, multimedia presentation, literature review, group discussion	Assignment, Quiz, Group Presentation, In-course Exam, and Final Exam
CLO-4	Lecture, multimedia presentation, group discussion, literature review, video presentation, demonstration, and problem-based exercises	Quiz, Assessment, Group Presentation, In-course Exam, and Final Exam

Learning Materials

i) Recommended Readings

- Principles of Polymer Science, by Bahadur and Sastry, Narosa Publishing House 2002
- Polyurethane & synthetic resin by Robinson, R.S and Weeks, C.A.
- Polymer and Resins; Their Chemistry and Chemical Engg, Brage Golding, D.Van Nostrand Company Inc.

ii) Supplementary Readings

- Engineering Thermoplastics Polycarbonates Polyacetals Cellulose Esters, L.Bottenbruch, Hanser Publishers.
- Phenolic Resin by Whitehouse A.A.K, 2nd edition 1967.

iii) Others: Handout/lecture materials provided by the course teacher

Course Code: 0723-LPE-3202 Course Title: Non-Leather Materials Synthesis
Credits: 1.5

Rational of the Course: This practical course is based on the theoretical knowledge of the theoretical course entitled Non-Leather Materials Synthesis. The course is designed to provide practical knowledge while working in a non-leather materials laboratory. This course also enhances the skills to perform both the qualitative and quantitative analysis of non-leather goods made of synthetic polymers.

Course Content

1. Synthesis and characterization of Nylon
2. Synthesis and characterization of PU
3. Preparation and characterization of PMMA/PS
4. Preparation of polymer-based adhesives
5. Manufacturing of Faux leather/vegan leather/artificial leather
6. Determination of water permeability and water absorption of specific non-leather materials
7. Determination of melt flow index (MFI) of the supplied polymer
8. Determination of Heat Deflection Temperature (HDT) of Polymeric materials under Flexural Load in Edgewise Position
9. Determination of Vicat softening point (VSP) of polymeric materials
10. Determination of total solid content of rubber latex

Course Objectives

- (a) To provide an integrated view of non-leather materials which includes the structure, preparation and different processing and modification techniques.
- (b) To impart knowledge on the characterization of industrially important materials.

Course Learning Outcomes (CLOs)

After completion of this course students will be able to-

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Prepare, formulate and identify different types of non-leather materials and characterize those using different physical and chemical tests.	C1, C3, A1, P1
CLO2	Apply knowledge to find out the application of non-leather materials in products manufacturing.	C3
CLO3	Design laboratory-based experiments using theoretical and practical knowledge and solve engineering problem.	C3, A3
CLO4	Analyze and justify non-leather materials for quality products.	C4, A3

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	2						3			
CLO2	3	2			2				3			3
CLO3	3	2			3				3	2		
CLO4	3	3	2		3	2		2	3			2

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Demonstration, Group work	Lab Performance, Quiz test, Continuous Assessment, Report evaluation, Viva, Final Exam
CLO2	Literature review, Demonstration, Video presentation, Hands-on practice, Group work	Lab Performance, Quiz test, Assignment, Report evaluation, Viva, Final Exam
CLO3	Literature review, Video presentation, Group work, Problem based exercise	Lab Performance, Continuous Assessment, Quiz test, Viva, Report evaluation, Final Exam
CLO4	Demonstration, Hands-on practice, Presentation, Group work, Problem based exercises	Lab Performance, Continuous Assessment, Case study, Report evaluation, Final Exam

Learning Materials

i) Recommended Readings

- Principles of Polymer Science, by Bahadur and Sastry, Narosa Publishing House 2002.
- Handbook of Thermoplastics, Second Edition Olagoke Olabisi by CRC Press 2015.
- Laboratory Manual Polymers & Composite Materials Laboratory by Dr. S.J.A. Rizvi

ii) Supplementary Readings

- Engineering Thermoplastics Polycarbonates Polyacetals Cellulose Esters, L.Bottenbruch, Hanser Publishers, 1996.
- Polyurethane Technology by Bruins P. f, Interscience publishers 1969

iii) Others: Handout/lecture materials provided by the course teacher.

Course Code: 0723-LPE-3203 Course Title: Testing of Leather Products and Allied Materials Credits: 3.0

Rationale of the Course: This course emphasizes on the quality assessment of different physical characteristic of leather, leather products and allied materials. It imparts a comprehensive knowledge on different physical testing methods related to leather products manufacturing. Upon completion of the course, students will be able to attain thorough knowledge of quality control in leather products production.

Course Content

Introduction: Objects of carrying out physical testing of finished leather, few popular thumb tests for Bag upper, Luggage upper, Garments leather and synthetic upper materials, advantages and disadvantages of thumb tests, classification of physical testing methods.

Sampling: Introduction, statistical aspects of the sampling problem, collection of samples, sections of finished leather, sampling positions, conditioning of test samples.

Strength and Stretch of Leather: Different strength tests for upper and lining leathers of money bag, wallet, file folder, office bag, ladies' bag, luggage, brief case, leather jacket, trouser, skirt, etc.

Tests for Upper and Lining Leathers: Different comfort and general properties tests for upper and lining leathers of money bag, wallet, file folder, office bag, ladies' bag, luggage, brief case, jacket, trouser, skirt.

Tests for Finish Film: Introduction, bond strength between the leather surface and the finished film, heat resistance, cold crack resistance, light fastness, wet and dry rub fastness, test for bleeding, water fastness, elasticity of finished film, resistance to solvent, washing and cleaning agents, dressing agents, water stains, moisture fastness, plasticizer, buffing of suede leather, and resistance to ageing.

Tests for Synthetic Materials: Tensile strength, tear strength, bursting strength.

Test for Accessories: Tests for Zipper, Buckles, D-Ring, O-Ring, Lace, Hook, Eyelet, and Velcro.

Test for Complete Luggage and Briefcase: Strength of handles, straps, attachments of Luggage and Briefcase, snatch and impact drop tests, rolling road test for wheeled luggage, Water resistance test, Static and dynamic loading test.

Test for Complete Bags: Strength of handles, straps, attachments, seams.

Test for Complete Belt: Strength test, Buckle attachment strength, Grain crack test.

Test for Adhesive: Peel or stripping strength of adhesive bonds (180° peel), bond strength and shear strength, pot life, shelf life.

Test for Industrial and Safety Hand Gloves: Cut resistance test, resistance to puncture, flame, contact heat, convective heat, radiant heat, small splashes of molten metal, big splashes of molten metal.

Course Objectives: Objectives of this course are:

- a. To familiarize students with various theoretical aspects of physical characteristic of leather, leather products and allied materials.
- b. To describe processing steps involved in physical testing of leather, leather products and allied materials.
- c. To make the students competent in the field of quality assessment in leather products industry.

Course Learning Outcomes (CLOs)

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

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Explain different thumb tests of various upper leather, collection of samples for lab tests and sampling positions.	C1, C2, A1
CLO2	Describe different tests according to different international SOP for upper and lining leather, leather products and allied materials	C2, A2
CLO3	Compare and select the best quality leather and other materials for particular leather products manufacturing.	C3, A2
CLO4	Analyze and compare different quality parameters of different leather and allied materials for specialized leather products.	C4, A3
CLO5	Justify and follow the standard quality of different leather products.	C5, A3

Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	-	-	-	-	-	-	-	-	-	-
CLO2	3	2	-	-	-	-	-	-	-	-	-	-
CLO3	3	2	-	-	-	-	-	-	-	-	-	1
CLO4	3	3	2	3	-	-	-	-	-	-	-	2
CLO5	3	3	2	3	-	-	-	-	-	-	-	2

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, White board illustration, and problem-based exercises	In-course Exam; Final Exam
CLO2	Lecture, group discussion and Multimedia presentation	Group Presentation, Assignment, In-course Exam; Final Exam
CLO3	Lecture, guided reading and problem-based learning (PBL): Identifying the problem to be solved	In-course Exam, and Final Exam
CLO4	Lecture, White board illustration, literature review, and problem-based exercises (PBE)	Group Presentation, In-course Exam, and Final Exam
CLO5	Lecture, group discussion, multimedia presentation literature review, and problem-based exercises	Assignment, In-course Exam, and Final Exam

Learning materials

i. Recommended readings

- a) An Introduction to the Principles of Physical testing of Leather. -Dutta S.S.
- b) Society of Leather Technologists and Chemists-Official Methods of Analysis-1996.

- c) Testing and Quality Assessment of footwear and Footwear Materials- B. Venkatappiah, CLRI 1999

ii. Supplementary Readings

- a) SATRA Owner's manual
- b) Lecture Notes on Leather- P.S. Venkatachalam

iii. Others: Handout/lecture material provided by the course teacher

Course Code: 0723-LPE-3204 Course Title: Testing of Leather products and Allied Materials lab Credits: 1.5

Rationale of the Course: Testing of Leather Products and Allied Materials Lab is a practical course in leather products engineering. This course focuses on the various practical aspects of physical testing of leather, leather products and allied materials. The course comprehends different tests for money bag, wallet, file folder, office bag, ladies' bag, luggage, brief case, leather jacket, trouser, skirt. Learners will be able to identify the suitable raw materials for the leather products industry and will be competent to control quality of leather products.

Course Contents

1. Determination of tensile strength, tear strength/Stitch tear strength/ Tongue tear strength/ Split tear Strength/ Grain crack strength of upper leather.
2. Determination of flexing endurance (Vamp flexing/ Bally flexing).
3. Determination of water vapour permeability of upper and lining leather and resistance to water penetration.
4. Determination of scuff resistance of leather.
5. Determination of colour fastness to circular rubbing.
6. Determination of heat resistance of finish film.
7. Determination of adhesion of finish using deadweight method.
8. Determination of perspiration resistance for upper and lining materials used in products.
9. Determination of pilling and abrasion of synthetic / fabrics materials.
10. Tests for accessories.
11. Typical tests for money bag, wallet, file folder, office bag, ladies bag, luggage, brief case, leather jacket, trouser, skirt.
12. Different tests for gloves.

Course Objectives: The objectives of this course are:

- a) To familiarize students with the various practical aspects of physical characteristic of leather, leather products and allied materials.
- b) To demonstrate various standard operation procedures involved in physical testing of leather, leather products and allied materials.
- c) To acquaint the students with different machineries involved in physical testing of leather, leather products and allied materials.

- d) To enhance the students' ability to analyze and critically evaluate different raw materials for specific leather products manufacturing.
- e) To enable students competent in the field of leather and leather products testing.

Course Learning Outcomes (CLOs)

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

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Describe and follow quality testing using international standard operating procedures for different leather products and materials.	C1, A1, P1
CLO2	Perform and demonstrate different tests according to different international SOP for upper leather, lining leather, accessories, reinforce materials, and other allied materials.	C2, C3, A2, P2
CLO3	Compare and identify the best leather and other raw materials for particular leather products.	C4, A3, P3
CLO4	Evaluate leather, leather products, and allied materials with standard quality parameters.	C5, A3, P3
CLO5	Interpret and measure the standard quality of different leather products.	C5, A4, P4

Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PL011	PL012
CLO1	3	3	-	-	1	-	-	-	2	-	-	-
CLO2	3	3	-	-	2	-	-	-	2	-	-	-
CLO3	3	3	-	3	3	-	-	-	2	-	-	-
CLO4	3	3	2	2	3	-	-	-	2	-	-	2
CLO5	3	2	2	2	3	-	-	-	2	-	-	2

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Demonstration, Hands-on practice, and Group work	Lab Performance, Continuous assessment: Report, Final Exam
CLO2	Lecture, Demonstration, Hands-on practice, and Group work	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO3	Lecture, Demonstration, Hands-on practice, and Group work	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO4	Lecture, Demonstration, Hands-on practice, and Group work	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO5	Lecture, Demonstration, Video presentation and Problem-based group discussion	Demonstration, Continuous assessment: Group presentation

Learning Materials

i) Recommended readings

- a) An Introduction to the Principles of Physical testing of Leather.-Dutta S.S.
- b) Society of Leather Technologists and Chemists-Official Methods of Analysis- 1996.
- c) Testing and Quality Assessment of footwear and Footwear Materials- B. Venkatappiah, CLRI 1999

ii) Supplementary Readings

- a) SATRA Owner's manual
- b) Lecture Notes on Leather- P.S. Venkatachalam

iii) Others: Handout/lecture material provided by the course teacher.

Course Code: 0723-LPE-3205 Course Title: Footwear Manufacturing Credits: 3.0

Rationale of the Course: Footwear Manufacturing is a core course for leather products engineers to manufacture footwear as a leather product. After completion of this course, students will be able to gather basic concepts of foot, last, and footwear as well as comprehensive theoretical knowledge to manufacture footwear with appropriate materials, proper size, and fit for different styles and requirements.

Course Contents

Foot and Last: Foot anatomy, importance of foot anatomy, foot arch, foot comfort, characteristic features of infant, children, and adult foot, biometry of human foot, types of foot, foot dynamics- weight-bearing foot, walking foot, running foot, common defects of foot and their remedy; last definition, types, and specification, the relationship between foot and last.

Types of Footwear: Oxford, derby, court, moccasin, sandal, casual, boot, sports, mule, clogs, safety footwear, occupational footwear, fashion footwear, etc.; bespoke footwear- meaning, advantages, and customer; properties of comfortable footwear.

Parts of Footwear: Upper - vamp, quarter, toe cap, apron, tongue, counter, backstraps, fastenings, toe puff, stiffener, eyelets, trims/ornaments; parts of lining; bottom parts- insole, insock, welt, rand, bottom filler, midsole, runner, sole, heel, shank piece, parts of sandals.

Shoe Sizing and Fitting: Principle of shoe sizing, history of shoe sizing, length size, shoe size classification- UK shoe sizing, Paris point, American shoe sizing, Centimeter scale, mondo point, comparison among different shoe sizing systems, conversion of sizes from one scale to another, standardize shoe sizes; fitting- definition and principles and different fitting systems.

Design and Pattern Making: Concept of design and pattern making, 2D-3D concept, marking, mean forme, standard forme, sectional pattern of different styles.

Cutting and Closing: Introduction, qualities required for clicker, materials, characteristics and variations in leather, methods of cutting, leather measurement systems; closing preparation, top line and edge treatments, stitch formations, type of seam, finishing off, punching, eyeleting and perforation.

Pre-lasting and Lasting: Pre-lasting operation- Definition, backpart molding, toe-puff attaching, insole molding, insole attaching, upper conditioning; lasting operation-Definition, principle of lasting, different techniques of lasting, shape retention, the need of machine lasting, upper preparation for machine lasting, adjustment of machine, machine parts and function and its parameters setting, problems finding in machine lasting and remedies, detail controlling of forepart, seat, and side lasting operation for different types of footwear, procedure for flat lasting and force lasting, string lasting, slip lasting, operational sequence in lasting line for oxford, derby, court shoe and sandal.

Bottom preparation and Finishing: Preparation of sole, heel, and top-piece attaching, sole press, aims and objectives of finishing and their utility, the relationship between heel pairing and heel scouring, edge trimming and setting, characteristics of bottom finishes, edge and heel finishes, upper leather dressing, cleaning and shoe lacing, heel attaching and top piece attaching by hand and machine, different types of edge trimming, forepart and waist trimming, heel scouring, heel front buffing, bottom finishing, upper leather cleaning and dressing, fitting the sock, shoe lacing.

Course Objectives: The objectives of this course are to provide:

- a. To introduce the students to the anatomy, types, and defects of human foot, and different footwear and lasts with their parts.
- b. To provide students with the concept of different shoe sizing systems along with their comparison, conversion, and fittings.
- c. To comprehend the designing and pattern-making processes for different styles of footwear
- d. To explore different aspects of footwear manufacturing from designing to finishing.

Course Learning Outcomes (CLOs)

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

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Outline the anatomy of human foot and recall the basic knowledge of foot, last, footwear, shoe sizing and fitting, and required operations of footwear manufacturing.	C1, A1
CLO2	Explain different shoe sizing and fittings and the basic operations of footwear manufacturing from designing to finishing.	C2, A2
CLO3	Apply different shoe sizing systems in shoe manufacturing from designing to finishing followed by different closing treatments, lasting operations, and constructions.	C3, A3
CLO4	Compare the advanced manufacturing process with the traditional one to upgrade the techniques.	C4, A4
CLO5	Relate different aspects of footwear manufacturing techniques according to the requirements.	C5, A4

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	-	-	-	-	-	-	-	-	-	-	-
CLO2	3	2	-	-	-	-	-	-	-	-	-	-
CLO3	3	2	3	2	2	-	-	-	-	-	-	-
CLO4	3	2	3	3	2	-	-	2	2	-	-	2
CLO5	2	3	3	3	2	-	-	2	2	-	-	2

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, multimedia presentation, whiteboard illustration, interactive discussion, group discussion	Assignment, In-course Exam; Final Exam
CLO2	Lecture, multimedia presentation, video presentation, whiteboard illustration	Assignment, In-course Exam; Final Exam
CLO3	Lecture, multimedia presentation, group discussion, interactive discussion, problem-based exercise	Group presentation, In-course Exam; Final Exam
CLO4	Lecture, multimedia presentation, interactive discussion, whiteboard illustration, case study	Assignment, Group presentation, In-course Exam; Final Exam
CLO5	Interactive discussion, multimedia presentation, whiteboard illustration	Final Exam

Learning Materials

i. Recommended Readings

- a) Venkatappaiah B.- Introduction to The Modern Footwear Technology.
- b) Miller R. G. (Editor)- Manual of Shoe Making.
- c) Korn J. (Editor) -Boot and Shoe Production.

ii. Supplementary Readings

- a) Ruth Spencer Crookenden -K Shoes -The first 150 years 1842-199
- b) Ruth Thomson -Making Shoes.

iii. Others: Handout/lecture material provided by the course teacher.

Course Code: 0723-LPE-3206 Course Title: Footwear Manufacturing Lab Credits: 1.5

Rationale of the Course: This course is designed to provide practical knowledge to the students about the manufacturing of different types of footwear. After completion of the course, students will be able to learn the complete manufacturing process practically for various types of footwear.

Course Contents

1. Identification of bones, nerves, and muscles from skeleton and model.
2. Foot measurement and foot impression-taking techniques.

3. Identification of various types of footwear and their different parts and components.
4. Handling and introduction of working tools of footwear.
5. **Court Shoe Manufacturing:** Preparation, OSH, mean and standard forme, sectional and bottom components pattern, cutting, closing, lasting, sole attaching, finishing, defects identification and remedy plan, and materials consumption.
6. **Oxford Shoe Manufacturing:** Preparation, OSH, mean and standard forme, sectional and bottom components pattern, cutting, closing, lasting, sole attaching, finishing, defects identification and remedy plan, and materials consumption.
7. **Derby Shoe Manufacturing:** Preparation, OSH, mean and standard forme, sectional and bottom components pattern, cutting, closing, lasting, sole attaching, finishing, defects identification and remedy plan, and materials consumption.
8. **Sandal Manufacturing:** Preparation, OSH, mean and standard forme, sectional and bottom components pattern, cutting, closing, lasting, sole attaching, finishing, defects identification and remedy plan, and materials consumption.
9. **Moccasin Shoe Manufacturing:** Preparation, OSH, mean and standard forme, sectional and bottom components pattern, cutting, closing, lasting, sole attaching, finishing, defects identification, and remedy plan and materials consumption.

Course Objectives: The learning objectives of this course are:

- a. To identify the different materials and components used in footwear production.
- b. To introduce the essential experimental knowledge and skills of different processes of footwear manufacturing
- c. To apply theoretical knowledge practically in the field of footwear industries and develop the sector technically as well as economically.

Course Learning Outcomes (CLOs)

Upon completion of this course, students will be able to -

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Outline the detailed pattern-making and manufacturing knowledge for different types of shoes and understand the structure of human foot, last and footwear.	C2.A1, P2
CLO2	Identify the machinery, equipment, and associated risk in footwear manufacturing.	C2, A2, P2
CLO3	Apply advanced technology and construction method for particular styles in manufacturing.	C3, A3, P3
CLO4	Discover the identified defects from its practical knowledge during pattern-making and manufacturing	C4, A4, P4
CLO5	Prepare a defect remedy plan to modify the existing process from footwear designing to manufacturing.	C5, A4, P4

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	-	-	-	2	-	-	-	3	-	-	-
CLO2	3	2	-	-	3	-	-	-	3	-	-	-
CLO3	3	3	2	-	3	-	-	-	2	-	-	-
CLO4	3	3	3	2	3	-	-	-	2	-	-	-
CLO5	3	3	3	3	3	-	-	-	2	-	-	-

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Demonstration, Panel-Discussion, Practical	Lab Performance, Final Exam
CLO2	Lecture, Demonstration, Panel-Discussion, Practical, Practical Problem-solving	Lab Performance, Final Exam
CLO3	Lecture, Demonstration, Group Discussion, Practical, Cooperative Learning, Practical Problem-solving, Videotapes, Debate	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO4	Lecture, Demonstration, Video presentation, Problem-based group discussion, Case studies, Problem-solving, Cooperative Learning.	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO5	Lecture, Demonstration, Video presentation, Problem-based group discussion, Problem-solving, Cooperative Learning.	Lab Performance, Continuous assessment: Viva, Report, Final Exam

Learning Materials

i. Recommended Readings

- a) Venkatappaiah B.- Introduction to The Modern Footwear Technology.
- b) Miller R. G. (Editor)- Manual of Shoe Making.
- c) Korn J. (Editor) -Boot and Shoe Production.

ii. Supplementary Readings

- a) Swayam Siddha -Product Knowledge.
- b) Thornton J. H. -Text Book of Footwear Materials.

iii. Others: Handout/lecture material provided by the course teacher.

Course Code: 0723-LPE-3207 Course Title: Supply Chain Management Credits: 3.0

Rationale of the Course: This course is designed as a core course to deliver SCM related knowledge to the students. It comprises understanding the basic structure of the leather products industry's supply chain, supply chain performance drivers, designing an agile supply chain network, demand forecasting, outsourcing decisions and lead time management.

Course Contents

Understanding the Supply Chain: Supply chain, supply chain 4.0, types of supply chains and examples, strategic, tactical, and operational decisions in supply chains, process view of a supply chain, the importance of supply chain flows, structure of supply chain in the leather products industry.

Supply Chain Performance and Drivers: Competitive and supply chain strategies, achieving strategic fit, expanding strategic scope, a framework for structuring drivers, Facilities, Inventory, Transportation, Information, Sourcing, Pricing, Obstacles to achieving fit.

Demand Forecasting in a Supply Chain: The role of forecasting in a supply chain, Characteristics of forecasts, Components of forecasts and forecasting methods, Basic approach to demand forecasting, Time series forecasting methods, Measures of forecast error.

Sourcing Decisions in a Supply Chain: The Role of Sourcing in a Supply Chain, Supplier Scoring and Assessment, Supplier Selection and Contracts, Design Collaboration, The Procurement Process, Sourcing Planning and Analysis, Making Sourcing Decisions in Practice.

Strategic Lead Time Management: Time-based competition, time-based process mapping, logistics pipeline management, lean thinking.

Designing the Distribution Network Design in the Supply Chain: The role of distribution in the supply chain, Factors influencing distribution network design, Design options for a distribution network, E-business and the distribution network, distribution networks in practice, a strategic framework for facility location, Multi-echelon networks, Gravity methods for location, Plant location models, Supply Chain Decisions Under Uncertainty in Practice.

JIT and Quick Response Logistics: The philosophy, logistics implication, Vendor Managed Inventory.

Agility and Agile Supply Chain: The concept of market winner and market qualifier, how to combine lean and agile mindsets (pareto curve, decoupling point).

Managing the Global Pipeline: The tradeoffs among the logistics costs, concepts of centralization, focused factories and postponement.

Advanced Planning and Scheduling in Supply Chain Management: Understanding and solving logistics and supply chain problems, advanced planner and scheduler.

Course Objectives: The objectives of this course are as follows:

- a) To describe the fundamentals of SCM including its role in an organization and integrating firms in a supply chain.
- b) To explain the various concepts in SCM like coordination, planning for uncertainty, supply contracts, logistics management, outsourcing and procurement management.
- c) To demonstrate various analytical methods and tools so that students can be able to measure and evaluate various facets of supply chain performance.
- d) To understand the practices in SCM that differentiate successful firms from others.
- e) To explore the challenges in SCM through a real industry project.

Course Learning Outcomes (CLOs)

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

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Identify and state the basic structure and functions of supply chain management for the leather products industry.	C1, A1
CLO2	State and describe the supply chain activities and their performance drivers for the leather products industry.	C1, C2, A2
CLO3	Apply different mathematical models along with modern tools for demand forecasting, sourcing decisions, lead time management, and overall planning in the supply chain and compare their results.	C3, C4, A3
CLO4	Design distribution network and agile supply chain network to manage the global pipeline.	C5, A3

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	-	-	-	-	-	-	-	-	-	-	-
CLO2	3	2	-	-	-	-	-	-	-	-	-	-
CLO3	3	3	-	3	3	-	-	-	-	-	-	-
CLO4	3	3	3	3	-	-	-	-	-	-	-	-

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Interactive discussion, lecture-discussion with multimedia, and whiteboard illustration	In-course Exam and Final Exam
CLO2	Interactive discussion, lecture-discussion with multimedia, and whiteboard illustration	Assignment, In-course Exam, and Final Exam
CLO3	Lecture discussion with multimedia, whiteboard illustration, and problem-based learning (PBL)	In-course Exam, and Final Exam
CLO4	Lecture discussion with multimedia, group discussion, literature review, demonstration, and problem-based exercises	Assignment, Group Presentation, and Final Exam

Learning Materials

i. Recommended Reading

- a) K. Shridhra Bhat, "Logistics and Supply Chain Management".
- b) S. Chopra and Mendil, "Supply chain management, strategy, planning and operation", Pearson Education, Asia, 2/2004.
- c) B.S. Sahay, "Supply Chain Management, for Global Competitiveness", Macmillan Bangladesh Limited, 1999.

ii. Supplementary Readings

a) G. Raguram and N. Rangarajan, “Logistics and Supply Chain Management-Cases and concept”, Macmillan

b) M. Hugos, Essentials of Supply Chain Management, Wiley.

iii. Others: Hand notes/Lecture materials will be provided by the course teacher.

Course Code: 0417-Hum-3208 Course Title: Employability Skills-II Credits: 1.5

Rationale of the Course: Employability skills are non-technical skills that contribute to an individual’s effective participation in the workplace. This course is designed to help students identify the knowledge and skills required for obtaining and keeping employment. Upon successful completion of the course, students are expected to have employability skills that will allow them to do effective presentations, write properly, be career-oriented, and have the ability to work independently skills in addition to personal and interpersonal skills, problem-solving and team-building skills that would allow them to present themselves anywhere in the world.

Course Content

Self-management skills: Basics of self-management, stress management, ability to work independently, emotional intelligence, role play on avoiding a stressful situation, self-reflection, strength and weakness analysis, self-motivation, goal setting, and time management.

Teamwork: Working across different ages irrespective of gender, race, religion or political persuasion, working as an individual and as a member of a team, knowing how to define a role as part of the team, applying teamwork to a range of situations e.g., futures planning, crisis problem solving, identifying the strengths of the team members, coaching and mentoring skills including giving feedback.

Problem-solving: Developing creative and innovative solutions, developing practical solutions, showing independence and initiative in identifying problems and solving them, solving problems in teams, applying a range of strategies to problem-solving, using mathematics including budgeting and financial management to solve problems, applying problem-solving strategies across a range of areas, resolving customer concerns in relation to complex projects issues.

Entrepreneurial skills: Presenting the power of entrepreneurship, exercise on interviewing an entrepreneur, and self-assessment of entrepreneurial qualities.

Writing concept note (CN) and proposal of a business plan: Prepare the contents of a CN and proposal, set scoring criteria for the CN and proposal, and prepare CNs and proposals for various types of leather products.

Writing business plan: Basic business plan guidelines, writing business plans for various types of leather products, break-even analysis, preparation of budget template, project work plan, and measurable project performance indicators.

Writing a technical and financial project proposal: Basic guidelines for technical and financial project proposal, write a technical and financial project proposal for different technical aspects of the leather products industry of Bangladesh.

Presentation skill development: Presentation and public speaking, rules for effective speaking, improving skills in non-verbal and verbal communication, the beauty of rhythm and voice modulation, presentation techniques, preparing the contents, tips for preparing attractive and powerful PowerPoint presentation, main challenges or barriers of presentation and public speaking, methods for overcoming the fear and obstacles during presentation, importance of rehearsals, common mistakes in presentation and public speaking, tips for smart speech, discussions on world-famous public speech with the audio-visual record, making interactive presentation slides and presenting the business plan/project proposal and self-assessment.

Course Objectives: The learning objectives of this course are:

- To develop an ability to gain key strategies and expressions for communicating with professionals and non-specialists.
- To enhance interpersonal and soft skills for professional development.
- To learn adaptability and become more approachable in the work environment.
- To develop essential skills required to increase productivity, efficiency, and effectiveness.
- To develop problem-solving, confidence-building, organizational, team working skills.
- To train them in time management, decision-making, and effective presentation skills.
- To prepare the students with all the employability skills as per the demand of the job market so that they have the appropriate skill sets that employers expect.

Course Learning Outcomes (CLOs)

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

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Describe professionalism and self-management skills required to opt appropriately in the working environment.	C1
CLO2	Explain the interpersonal and soft skills required for professional development.	C2
CLO3	Coordinate and carry out teamwork and problem-solving activities to develop enhanced productivity, efficiency, and effectiveness.	C3, P2, P3
CLO4	Compare and execute different types of communication and other essential interpersonal soft skills.	C4, P4, A3
CLO5	Design and review project proposals for leather products manufacturing industries.	C5

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	3	-	-	1	-	-	-	3	3	-	3
CLO2	3	3	-	-	1	-	-	-	3	3	-	3
CLO3	3	3	3	-	1	-	-	-	3	3	-	3
CLO4	3	3	-	-	1	-	-	-	3	3	2	3
CLO5	3	3	3	2	1	-	-	-	3	-	3	3

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Interactive discussion, lecture discussion with multimedia, and Group work.	Continuous Assessment, Group Presentation, and Final Exam
CLO2	Interactive discussion, lecture discussion with multimedia, white board/ flip chart illustration, metaplan, and Group work.	Continuous Assessment, Group Presentation, Viva, and Final Exam
CLO3	Interactive discussion, lecture discussion with multimedia, and Group work.	Continuous Assessment, Group Presentation, and Final Exam
CLO4	Interactive discussion, lecture discussion with multimedia, white board/ flip chart illustration, metaplan, and Group work.	Continuous Assessment, Group Presentation, Viva, and Final Exam
CLO5	Interactive discussion, lecture discussion with multimedia, and Group work.	Continuous Assessment, Assignment, Group Presentation, and Final Exam

Learning Materials

i. Recommended Readings

- a. An Introduction to Employability Skills-Arvind M Nawale, Mahesh M Nivargi, Manisha B Gahelot.
- b. The Complete Book of Business Plan- Secrets to Writing Powerful Business Plans- Joseph A. Covello and Brian J. Hazelgren.
- c. The Complete Presentation Skills Handbook-Suzy Siddons.

ii. Supplementary Readings

- a. The Journey-Book on Secrets of Employability Skills-Dr. Hari Prasad. N, Dr. Soundria. S. M
- b. Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds-Carmine Gallo.

iii. Others: Handout/lecture material provided by the course teacher.

Course Code: 0723-LPE-3209 Course Title: Leather and Non-Leather Products Merchandising Credits: 2.0

Rationale of the Course: This course will deliver the most important knowledge about the key roles of merchandisers and merchandising process involved in the leather products industry through which the students will be able to prepare themselves for being a good merchandiser. This course will disseminate knowledge about merchandise planning, prototype preparation, costing and negotiation with buyers, order confirmation process, shipment management and visual merchandising.

Course Contents

Introduction to Leather Products Merchandising: Merchandising, merchandiser, functions and roles of merchandiser, terminologies used in merchandising, defining customers, fashion seasons, market positioning, merchandise range, categories of leather products merchandising, process flow of merchandising, global leather products market, fashion shows in merchandising.

Merchandise Planning: The importance, problems and key factors of planning, stock turn and stock intake planning, prototype, QS (Quotation sample), SS (Size sets), CS (confirmation sample) approval from buyer; Purchase Order and Performa Invoice.

Prototype Preparation: Specification sheet check, preparation, coordination and confirmation of pattern cutting, detailed drawings and mini- markers; Preparation, coordination and confirmation of patterns; Checking of assembled leather products according to specification sheet and accepted leather products assembly techniques; Procedure and method of prototype sent for test report.

Costing and Negotiation with Buyer: Pricing and costing, costing and pricing procedure, LO calculation procedure, SOT (standard operating time), SAM (Standard Allowed Minute), method of TNA (Time and Action), FOB calculation, negotiation with buyer.

Order Confirmation: “Production capacity VS order quantity”, product order, CAPA based order confirmation, P.O checking procedure.

Coordination and Management: Procedure and method of order execution, procedure of shipping and documentation, method of coordination with shipping and documentation department; Merchandiser roles in production department, planning department, quality department.

Visual Merchandising: Introduction to visual merchandising, virtual and dynamic visual merchandising, functions of a visual merchandiser, elements of visual merchandising, types of visual merchandising displays, visual merchandising techniques, problems in visual merchandising.

Course Objectives: The objectives of this course are as follows:

- a) To disseminate knowledge about the basics of merchandising.
- b) To equip students with knowledge and theories of merchandise plan, prototype preparation, costing and negotiation.
- c) To introduce students how to create pre-production plan and manage production follow-up.
- d) To coordinate and manage leather products shipment.
- e) To disseminate knowledge about visual merchandising.

Course Learning Outcomes (CLOs)

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

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	State the basic concepts of leather products merchandising.	C1, A1
CLO2	Interpret the stages of merchandising, prototype preparation, costing, and negotiation with the buyer.	C2, A2
CLO3	Understand the order confirmation system and apply it using modern tools.	C2, C3, A2
CLO4	Analyze and investigate the problems in merchandising activities and design and apply appropriate techniques, using modern tools to solve the problems.	C3, C4, C5, A3
CLO5	Analyze the components of visual merchandising and design appropriate visual merchandising in the retail merchandising system.	C5, A3

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	-	-	-	-	-	-	-	-	-	-	-
CLO2	3	-	-	-	-	-	-	-	-	-	-	-
CLO3	3	3	3	-	3	-	-	-	-	-	-	-
CLO4	3	3	2	2	3	-	-	-	-	-	-	-
CLO5	3	3	3	3	-	-	-	-	-	-	-	-

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Interactive discussion, lecture-discussion with multimedia, and whiteboard illustration	In-course Exam and Final Exam
CLO2	Interactive discussion, lecture with multimedia, and whiteboard illustration	In-course Exam and Final Exam
CLO3	Lecture with multimedia, whiteboard illustration, and problem-based learning (PBL)	In-course Exam, and Final Exam
CLO4	Lecture with multimedia, group discussion, literature review, demonstration, and problem-based exercises	Assignment, Group Presentation, In-course Exam, and Final Exam
CLO5	Lecture with multimedia, group discussion, literature review, demonstration, and problem-based exercises	Assignment, Group Presentation, and Final Exam

Learning Materials

i. Recommended Reading

- a) A J Chuter, Introduction to clothing production management.
- b) Gini Stephens Frings (1999): Fashion: From concept to consumer, Prentice-Hill Inc.
- c) Grace I kunz, Merchandising: Theory, Practice and Principles.

ii. Supplementary Readings

- a) Harry B. Watton (1992.). New Product Planning, Prentice Hall Inc.
- b) M Krishan Kumar-Apparel Merchandising

iii. **Others:** Hand notes/Lecture materials will be provided by the course teacher.

Course Code: 0723-LPE-3210 Course Title: Field Tour-III Credit Value: 1.0

Rationale of the Course: This course will provide the students with a practical perspective of the concepts and theories that are taught to them. It will also introduce students with knowledge about modern technology, and machinery used in the leather products industry.

Course Content

In 2nd Year 2nd Semester, students will visit a reputed leather products industry limited. Discuss with the company supervisor about any project or assignment/tasks. Try to understand the systems in your work place – Processes, Organization, Administrative. Record all the work done or knowledge gained. Maintain logbook and give feedback to guide teacher.

Course Objectives

- c. To build a learning intervention that is intertwined with practical, hands-on skill enhancement knowledge to ensure that student's learning is not focused solely on theoretic approaches.
- d. To make a good relationship with various leather products companies and increase their networking opportunities.

Course learning outcomes (CLOs)

At the completion of this course students will be able to:

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Provide a description of the operations, workstations, plants, machines, assembly lines, and management involved in the leather products industry and engage in discussions with knowledgeable professionals.	C2, A3, P2
CLO2	Improve abilities in collaborating effectively with others, expressing ideas clearly and concisely, and working efficiently in a group setting.	C2, A3
CLO3	Prepare technical documents and give verbal presentations on completed industrial tour work.	C3, C4, A4

Mapping course learning outcomes (CLOs) with program learning outcomes (PLOs)

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	-	-	-	3	-	-	-	-	3	-	2
CLO2	2	-	-	-	-	-	-	-	2	2	-	2
CLO3	2	-	-	-	-	-	-	-	-	3	-	2

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Class Lecture, Display and Demonstration	Presentation and viva, Report Evaluation
CLO2	Class Lecture, Display and Demonstration,	Presentation and viva, Report Evaluation
CLO3	Discussion, Discussion and Motivation, Self-study	Presentation and viva, Report Evaluation

Learning Materials

i. Recommended Readings

- a) Writing the Winning Thesis or Dissertation: A Step-by-Step Guide - By Allan A. Glatthorn, Randy L. Joyner.
- b) Relevant books, handbooks, patents and manuals.

Course Code: 0723-LPE-4101 Course Title: Non-Leather Products Manufacturing
Credits: 3.0

Rationale of the Course: Non-Leather Products Manufacturing course is designed to understand the mechanism, properties, versatile applications and environmental concerns of various inevitable non-leather materials like textile materials, coated fabrics, denim fabrics, lining materials etc. The course will deal with the concept of faux leather/vegan leather/artificial leather with its increasing demands, future developments and emerging trends and technologies exploring new dimensions of products manufacturing.

Course Content

Faux leather/vegan leather/artificial leather: Principle, production process, importance, ethical and environmental concern, industrial application, materials used to make vegan leather such as polyurethane, polyvinyl chloride and properties, advantages and disadvantages, future developments and emerging trends and technologies.

Textile materials for products manufacturing: Textile materials with characteristics and properties, advantages and disadvantages, industrial application, commercial quality; Fabric science- composition, fabric construction and model, identification, commercial names of fabric; leather and textile material interaction, industry trends and innovations.

Coated fabrics: Introduction, classification, backers and coating materials, direct coating and transfer coating, poromerics, PVC coated fabrics, PU coated fabrics, rubber coated fabrics with properties and applications, manufacturing techniques, advantages and disadvantages.

Denim fabrics: Culture of denim- from origins to fashion staple, significance, chemical composition, various finishes, production techniques, advantages and disadvantages, applications.

Lining materials for products: Properties, applications of lining materials, drill cloth, sugar coated fabrics and other synthetic lining materials, different lining leather.

Adhesives for products: Theories of Adhesion, properties, purpose, selection of suitable adhesives, nitrile rubber-based adhesives, acrylic copolymers-based adhesives, polychloroprene based adhesives, isocyanate-based adhesives, polyamide-based adhesives.

Leather products dressing materials: Introduction, objectives, finish identification of leather, selection of dressing system and materials, different products and shoe dressing materials.

Course Objectives

- a) To impart a comprehensive understanding of future developments and emerging trends and technologies in the artificial leather industry
- b) To provide knowledge and understanding of different non-leather materials and their mechanism, properties and versatile applications with environmental concerns.
- c) To familiarize students with different lining materials, adhesives and dressing materials.

Course learning outcomes (CLOs)

Upon completion of the course, the students will be able to-

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Describe the principles, role and importance of different artificial leather	C1, A1
CLO2	Analyze the mechanism of different types of textile materials, coated fabric and denims used in products manufacturing	C3
CLO3	Compare and analyze the different features of lining materials, dressing materials and adhesives	C3, C4
CLO4	Critically evaluate the environmental concern caused by non-leather appliance in our real-life application.	C5

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2										
CLO2	3	3	3	2								
CLO3	3	3	3	3								
CLO4	3					3	3	2	2			3

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Multimedia presentation, White Board Illustration	In-course Exam; Final Exam
CLO2	Lecture, Lecture discussion with multimedia, White Board Illustration, Video Presentation, Group Discussion, Interactive discussion	Oral presentation, Group Presentation, In-course Exam; Final Exam
CLO3	Lecture, Lecture discussion with multimedia, White Board Illustration, Video Presentation, Interactive discussion, Problem based learning	Assignment, Oral Presentation, In-course Exam and Final Exam
CLO4	Lecture, Multimedia presentation, White Board Illustration, Video Presentation, Interactive discussion, Problem based learning	Assignment, Oral Presentation, Group Presentation, In-course Exam, and Final Exam

Learning Materials

i. Recommended Readings

- a) Hannelore Ebrle-Clothing Technology
- b) Dr. Davidsohn J. & Davidsohn A - Polishes - Their Raw Materials and Manufacture.
- c) Dr. (Mrs.) Ganga Radhakrishnan & Dr. Ponswarry Rajalingam-Polymeric Materials for Footwear.

ii. Supplementary Readings

- a) Billmeyer F.W. Jr- Text Book of Polymer Science.
- b) P Winding C.C & Hiatt G.D- Polymeric Materials.

iii. Others: Handout/lecture material provided by the course teacher.

**Course Code: 0723-LPE-4102 Course Title: Non-Leather Products Manufacturing Lab
Credits: 1.5**

Rationale of the Course: Non-Leather Products Manufacturing Lab is a hands-on course that is designed to integrate non-leather materials with leather creating versatility for new products development. This course will deal with value-added product manufacturing through the creative use of non-leather materials. By placing certain relationships between leather and non-leather in a innovative environment, one can easily explore and manufacture product like wallet, ladies' bag, purse, file folder and decorative items etc.

Course Content

1. Introduction of different artificial leather, non-leather materials, textile fabrics, denims, coated fabrics, dressing materials etc.
2. Manufacturing of products (wallet, purse, decorative items, bag etc.) from scrap

3. Manufacturing of ladies' bag combining leather with non-leather materials (coated fabric, different types of fabric, jute, cotton, denim, traditional shital pati etc.).
4. Manufacturing of ladies' skirt combining leather with non-leather materials (coated fabric, different types of fabric, jute, cotton, denim, traditional shital pati etc.).
5. Manufacturing of jacket combining leather with non-leather materials (coated fabric, different types of fabric, jute, cotton, denim, traditional shital pati etc.).
6. Manufacturing of decorative items with non-leather (jute, cotton, denim, mat, traditional shital pati, denim fabrics, coated fabrics, etc.).
7. Manufacturing of file folder with non-leather (jute, cotton, denim, mat, traditional shital pati, denim fabrics, coated fabrics etc.).
8. Manufacturing of ladies' bag with non-leather (jute, cotton, denim, mat, traditional shital pati, denim fabrics, coated fabrics etc.).

Course Objectives

- a) To introduce students with different artificial leather, non-leather materials, dressing materials etc.
- b) To explore the creativity of students by making them utilize leather scrap and develop value added product.
- c) To enable students manufacture different products with non-leather materials.
- d) To provide students with manufacturing techniques different products combining leather with non-leather materials.
- e) To aid in cost evaluation and leather-non leather consumption in product manufacturing.

Course Learning Outcomes (CLOs): Upon completion of the course, the students will be able to:

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Identify and distinguish different types artificial leather, non-leather materials, dressing materials etc.	C1, C2
CLO2	Apply leather waste scrap to manufacture wallet, purse.	C3
CLO3	Demonstrate the manufacturing of ladies bag, ladies skirt and jacket through design making, pattern making, manufacturing procedure and interpret material consumption and waste evaluation with leather and non-leather materials combination	C3, C5
CLO4	Construct ladies bag, file folder and decorative items with non-leather materials exhibiting practical proficiency	C3, P4

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	1									
CLO2	3	3	2	2					3		2	3
CLO3	3	3	2	2								
CLO4	3	3	3						3		2	3

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Demonstration, Group discussion, Video presentation	Continuous assessment: Quiz, Report,
CLO2	Lecture, Hands-on practice, Process oriented learning	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO3	Lecture, Hands-on practice, Process oriented learning, Problem based learning and Group work	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO4	Lecture, Hands-on practice, Process oriented learning, Problem based learning and Video presentation	Lab Performance, Continuous assessment: Viva, Group Presentation Report, Final Exam

Learning Materials

i. Recommended Readings

- a) Clothing Technology- by Hannelore Ebrle
- b) Sarpouse J.H.-Leather Technicians Handbook.

ii. Supplementary Readings

- a) Jane E. Garner-The Complete Handbook of Leather crafting

iii. Others: Lecture material/ Lab manual provided by the course teacher.

Course Code: 0723-LPE-4104 Course Title: Computer Aided Design Credits: 1.5

Rationale of the Course: Computer Aided Design for leather products course imparts practical knowledge of designing various types of leather products (small, medium, heavy leather goods and leather garments) with computer aided design (CAD) software. It provides students with pattern grading and pattern making knowledge using CAD software, digitizer and plotters.

Course Content

- Designing and pattern making techniques of the following items with CAD software:
 - Leather Goods: Leather Mobile cover, Leather Key rings (Triangular, Rectangular, Circular, Pentagon, Polygon, etc.), Leather ladies' bag, Address-card holder with leather material, Leather Money Bag, Leather Vanity Bag, Leather Belts for Gents, Executive Bags, Laptop Bags, File Folder, Travel Bags, Tote Bags
 - Leather Garments:
 - Men's wear preparation and grading techniques: Block preparation, Bolero type waistcoat, Gilet type waistcoat
 - Women's wear preparation and grading: Block preparation, Ladies jacket, Skirt grading.
- Different size modifications for various types of leather garments.
- Designing different types of footwear and grading of footwear pattern.

Course Objectives

- a) To provide the basic concept of designing leather goods, leather garments. Students will learn about computer aided design (CAD) software and working principles of this software.
- b) To introduce practical knowledge designing various types of leather products.
- c) To impart knowledge of grading techniques of leather products.

Course Learning Outcomes (CLOs)

After completion the course students will be able:

CLOs	Course Learning Outcomes (CLOs)	Learning level
CLO1	Describe the pattern making process and design of pattern.	C1, P1, A1
CLO2	Show both manual and software-based designing of leather products.	C3, P2
CLO3	Solve different manufacturing problems.	C4, P4
CLO4	Adapt both manual and software-based grading.	P4
CLO5	Develop various types of leather products design.	C5, P7

Mapping of Course Learning Outcomes (CLOs) with Programs Learning Outcomes (PLOs)

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3		3	2								2
CLO2	3		2		3							
CLO3	3	2		3	2				2			2
CLO4	3	3			3				2			2
CLO5	3		2		2							

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Demonstration, Hands-on practice.	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO2	Lecture, Demonstration, Hands-on practice	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO3	Lecture and Demonstration through Software	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO4	Lecture and Demonstration through Software	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO5	Lecture, Demonstration through software and Hands on practice	Demonstration, Continuous assessment: Group presentation

Learning Materials

i) Recommended Reading:

- a) Cutting & making up- Martin M. Shoben.
- b) Leather Apparel Design – Francesca Sterlacchi.
- c) Clothing Technology- Europa Lehrmittel.

ii) Supplementary Readings:

- a) Pattern Cutting for Women's Outerwear- Gerry Cooklin.
- b) Metric Pattern Cutting for Children's Wear and Baby Wear- Winifred Aldrich.

iii) Others: Handout/lecture material provided by the course teacher.

Course Code: 0723-LPE-4105 Course Title: Industrial Utility and Maintenance

Credits: 3.0

Rationale of the Course: The course is designed to teach students the fundamentals of industrial utilities and issues with functionality caused by deposition, corrosion, and biofouling. This course will provide students with knowledge of the maintenance of various machinery of leather and leather products industries, total productive maintenance, and also laboratory safety and maintenance.

Course Contents

Air conditioning, Psychrometric chart and psychrometric processes: Comfort condition, Principle of air conditioning, Application in leather and leather products industry; Refrigeration equipment, Refrigerant; Calculation of simple air conditioning system, Distribution system, Humidifier, De-humidifier, Cooling tower; Use of psychrometric chart and psychrometric process.

Materials handling equipment: Issues and importance of material handling, selection, and classification of material handling equipment, various types of conveyors equipment-belt, screw, chain, flight, bucket elevator, pneumatic, hydraulic, cranes, and forklifts; Application of material handling equipment in leather products industries.

Machine erection, lubrication and maintenance: Floor preparation, foundation, machine fixation, leveling, lubricant, types, general properties, functions, lubrication system; Types of maintenance, planning and organizing maintenance, preparation of maintenance schedule.

Maintenance of cutting machine: Introduction, parts and functions, process control of cutting, adjustments of die cutting machine, regular maintenance operations of die cutting machine, troubleshooting of die cutting machine; laser cutting machine-introduction, basic operation procedure, safety cautions, regular maintenance, and troubleshooting of laser cutting machine.

Maintenance of splitting, skiving, sewing machine: Tools and equipment required for splitting, skiving, and sewing operations, regular maintenance, preventive maintenance, cleaning the hook race and feeding systems, spare parts replacement, and troubleshooting.

Total productive maintenance (TPM): Introduction, objectives of TPM, benefits of TPM, OEE (Overall Equipment Efficiency), six big losses analysis, 4M+E analyze, pillars of TPM, step by

step to successful TPM, difficulties faced in TPM implementation, case studies on operational performance in leather products industry of Bangladesh.

Course Objectives: The objectives of this course are as follows:

- a. To introduce the different industrial utilities and their proper maintenance.
- b. To impart knowledge on different machine parts and their functions for leather and leather products production.
- c. To provide in-depth knowledge on the maintenance and their applications of leather and leather products machinery.

Course Learning Outcomes (CLOs)

After completion the course students will be able:

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Define different terms and state various principles used in industrial utility and maintenance	C1, A1
CLO2	Explain the field of industrial utility and maintenance and also describe its role in leather and leather products manufacturing.	C2, A2
CLO3	Explain and apply various types of maintenance strategies and their purposes in various leather and leather products manufacturing machineries.	C3, A2
CLO4	Apply the most common techniques of machine tools and their maintenance in leather and leather products industrial field.	C3, A2
CLO5	Solve the routine maintenance problems of leather and leather products industries including inputs, outputs and safety considerations.	C4, A3

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	-	-	-	-	-	-	-	2	-	-	-
CLO2	3	-	-	-	-	-	-	-	2	-	-	-
CLO3	3	1	2	-	-	-	-	-	2	-	-	-
CLO4	3	2	3	-	2	3	-	-	2	-	-	1
CLO5	2	2	3	-	2	3	-	-	2	-	-	2

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, multimedia presentation, literature review and problem-based exercises	Group Presentation, Assignment, oral presentation, In-course Exam and Final Exam
CLO2	Lecture, group discussion and problem-based exercises, literature review.	Group Presentation, In-course Exam and Final Exam
CLO3	Lecture, multimedia presentation and problem-based learning: Identifying the problem to be solved	Assignment, Group Presentation, In-course Exam and Final Exam
CLO4	Lecture, multimedia presentation, group discussion, demonstration, and problem-based exercises	Group Presentation, Case study, Assignment, In-course Exam and Final Exam
CLO5	Lecture, multimedia presentation, group discussion, demonstration, and problem-based exercises	Group Presentation, Case study, Assignment, In-course Exam and Final Exam

Learning Materials

i. Recommended Readings

- a) Pivecka J. - Practical Handbook on Shoe Production
- b) Joel Levitt - Handbook of Maintenance Management (Volume 1) Second Edition

ii. Supplementary Readings

- a) Assomac-The Innovation Notebooks for The Leather Goods Industry

iii. Others: Handout/lecture material provided by the course teacher

Course Code: 0723-LPE-4106 Course Title: Industrial Utility and Maintenance Lab
Credits: 3.0

Rationale of the Course: This course is designed to provide students with practical knowledge of industrial utilities and maintenance of machinery used in leather and leather products industries. Students will become competent in comfortable working condition, material handling, understanding operating procedures of various machinery and their upkeep as well.

Course Content

1. Study about lab safety and precautions.
2. Study the use of different material handling equipment like belt-conveyor, wooden horses, forklifts, etc.
3. Study the use of different lubricants and hydraulic oils which are directly used in leather products manufacturing machineries

4. Check and fill the hydraulic oil up to the level of the machine of swing arm and travelling head hydraulic press.
5. Inspection and sharpening of the band saw of the leather splitting machine.
6. Inspection and sharpening of the circular cutter of the skiving machine.
7. Check and adjustment of the operating parameters of different pneumatic cutting, laser cutting, sewing, and finishing machine of products manufacturing.
8. Check and adjustment of different operating parameters of preparatory, manufacturing and assembling machinery.
9. Investigation and replacement of the spare parts of sewing, cutting, skiving, splitting and other products manufacturing machinery.
10. Inspection of the operating condition of the central pneumatic compressor.

Course Objectives: The objectives of this course are as follows:

- a. To demonstrate different types of materials handling equipment used in leather products industry.
- b. To develop skills in the applications of different lubricants and hydraulic oils for different machinery.
- c. To generate skills in routine maintenance of different types of machinery used in leather products manufacturing.
- d. To familiarize students with replacing the spare parts of different leather products machinery.

Course Learning Outcomes (CLOs)

After completion the course students will be able:

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Demonstrate different types of materials handling equipment and the use of different lubricants and hydraulic oils.	C1, C2, P1
CLO2	Perform the operating and maintenance procedures of leather products manufacturing machinery.	C3, A2, P2
CLO3	Analyze different problems and difficulties created in operating and maintaining leather products machinery in production.	C4, A2, P3
CLO4	Solve the problems of different machinery to ensure the effective production output.	C4, A3, P3

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	-	-	-	1	-	-	-	-	-	-	-
CLO2	3	-	-	1	2	-	-	-	2	-	-	-
CLO3	3	2	-	2	3	-	-	-	2	2	-	-
CLO4	3	3	-	2	3	-	-	-	3	2	-	1

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Demonstration, and Problem-based exercises presentation.	Viva, Assignment, Report evaluation, Final exam
CLO2	Lecture, Group discussion, Hands on practice, and Multimedia presentation	Lab Performance, Final Exam
CLO3	Lecture, Demonstration, Group discussion, Multimedia presentation	Lab Performance, Assignment, Report evaluation, Final exam
CLO4	Multimedia presentations, group discussions, Demonstrations, and Problem-based exercises	Lab Performance, Assignment, Report evaluation, Final exam

Learning materials

i. Recommended Readings

- a) Sharphouse-Leather Technicians Hand Books.
- b) Pivecka J.- Practical Handbook on Shoe Production.
- c) BOOthroyd G.- Assembly Automation and Product Design.

ii. Supplementary Readings

- a) Miller R.G. (Editor) – Manual of Shoe Making.

iii.Others: Handout/lecture material provided by the course teacher

Course Code: 0411-Hum-4107 Course Title: Cost and Management Accounting

Credits: 3.0

Rationale of the Course: This course provides knowledge of cost behavior and terminology, cost elements, accounting system, and costing techniques. The course emphasizes on analysis of cost behavior, evaluation performance and business economics. At the end of the course, students will have a thorough understanding of the areas of cost ascertainment, cost control and cost management in a complicated manufacturing environment of leather products industry.

Course Contents

Cost Accounting

Introduction: Meaning, scope, objectives, advantages, financial accounting vs cost accounting, factors influencing the design of a cost, limitations, characteristics of an ideal cost accounting system, installation of costing system-steps, difficulties, measures to overcome the difficulties, cost unit, methods of costing types, development of cost accounting.

Cost Behavior and Terminology: Basic cost behavior patterns, economic, accounting and other cost patterns, product costing concept need for knowledge of cost behavior, methods of estimating cost relationship.

Cost Elements and Accounting System: Costing for materials, costing for labour, and costing for overheads; job order costing, contract costing and process costing.

Costing Techniques: Standard costing, costing of by-products and joint products, direct costing. Costing of leather products, material, labour, power and overhead expenses, foreign exchange mechanisms, exchange rates; foreign exchange exposure management – risks, strategies to reduce risk, budget: types of budgets, budgeting, and control in leather products industries.

Management Accounting

Introduction: Definition, difference between financial accounting and cost accounting, relationship with financial accounting, uses in planning and control.

Analysis of Cost Behaviour: Variable, fixed and mixed, cost-volume-profit analysis. Analysing cost for pricing and short-run decision: BEP analysis, cost for decision making, differential cost analysis.

Evaluation Performance: Variance analysis, financial statement, analysis, and interpretation.

Business Economics: The roles of engineers in business and corporation, time value of money, simple and compound interest, types of investment; Types of economic analysis: present, future and annual worth analysis, cost-benefit analysis, internal rate of return analysis; Incremental analysis depreciation: Straight line depreciation, declining balance method, MACRS, sum of years method etc., after tax cash flow analysis, inflation and its impact on economic decision, capital budgeting and rationing, sensitivity analysis.

Course Objectives: The objectives of this course are as follows:

- a. To know about terminology, cost elements, cost accounting, and behavior
- b. To impart adequate knowledge on cost accounting systems, costing techniques, and management accounting.
- c. To deliver the problem-solving know-how in the areas of cost and management accounting in a complicated manufacturing environment.

Course Learning Outcomes (CLOs)

After completion the course students will be able:

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Outline and explain the different concepts of managerial accounting, cost accounting, and business economics.	C1, C2, A1
CLO2	Identify and explain different types of cost behavior, and costing techniques to control the product and related costs.	C2, C3, A2
CLO3	Analyze overhead costing according to nature, behavior, function and control, and methods of distribution of factory overhead to the production department.	C4, A3
CLO4	Evaluate cost-volume-profit analysis for pricing and short-run decision.	C5, A3
CLO5	Create a profit plan, standard costing, and relevant costs for decision-making.	C6, A4

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	-	-	-	-	-	-	-	-	-	-	-
CLO2	3	-	-	-	-	-	-	-	-	-	-	-
CLO3	3	2	-	2	1	-	-	-	-	-	2	-
CLO4	3	2	-	2	2	-	-	-	-	-	2	-
CLO5	3	3	2	3	1	-	-	-	-	-	3	-

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Interactive discussion, lecture discussion with multimedia, and white board illustration	In-course Exam and Final Exam
CLO2	Interactive discussion, lecture discussion with multimedia, and white board illustration	In-course Exam and Final Exam
CLO3	Lecture discussion with multimedia, white Board illustration, and problem-based learning (PBL): Identifying the problem to be solved	Assignment, In-course Exam, and Final Exam
CLO4	Lecture discussion with multimedia, group discussion, literature review, demonstration, and problem-based exercises	Assignment, Group Presentation, In-course Exam, and Final Exam
CLO5	Lecture discussion with multimedia, group discussion, literature review, demonstration, and problem-based exercises	Assignment, Group Presentation, In-course Exam, and Final Exam

Learning Materials

i. Recommended Readings

- a) Accounting Principles, Kieso and Kimmel.
- b) Managerial accounting (Text Book) Garrison, R. H., & Noreen, E. W. (7th / Latest edition) Boston: Irwin/McGraw-Hill.
- c) Cost Accounting: A Managerial Emphasis, Horngren CT, 15th / Latest edition publisher Pearson.

ii. Supplementary Readings

- a) Cost Accounting (Text Book), S.P Iyengar, Latest Edition, 2017-2018, Sultan Chand & Sons
- b) Theory & Practice of Costing (Reference Book), Basu & Das, Latest, 2018-19

iii. Others: Handout/lecture material provided by the course teacher.

Course Code: 0723-LPE-4109 Course Title: Total Quality Management Credits: 3.0

Rationale of the Course: This course emphasizes the TQM framework, barriers, and benefits resulting in beneficial effects on organizational development in the competitive business. After

completion of the course, students will learn about strategic lead time management and quality systems and be able to lead a team, production line, and a business organization.

Course Contents

Introduction: Modern concept of quality and its measurement, quality redefined, identification of quality characteristics: quality of design conformance and performance, Deming's principles on quality and productivity, quality costs and their interpretations, basic concepts of TQM, TQM framework.

Statistical Quality Control: Control and measurement of quality, elementary SPC tools: Control charts, Process capability analysis, Design of experiments, Acceptance sampling plans: OC curves, single and double sampling plane, rectifying inspection, AOQ.

TQM Principles: Quality statements, Customer focus, Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement, PDCA cycle, 5S, Kaizen, Supplier partnership, Partnering, Supplier selection, Supplier Rating.

TQM Tools and Techniques I: The seven traditional tools of quality, New management tools, Six-sigma: Concepts, methodology, applications in Leather/Footwear/Leather Products industries; Benchmarking, Benchmarking processes, FMEA, Stages, Types.

TQM Tools and Techniques II: Quality circles, Quality Function Deployment (QFD) Taguchi quality loss function, PM Concepts, improvement needs, Performance measures, BPR; application of TQM tools in Leather/Footwear/Leather Product industries, BSTI, ASTM.

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

Strategic Lead Time Management: Time based competition, time-based process mapping, logistics pipeline management. Lean thinking, Lean operations, Push-pull production concepts, KANBAN, Kaizen, Toyota approach, Seven elements of JIT system for planning and control.

Lean Manufacturing: Introduction, Stability of Lean System, Just in Time, JIDOKA (Automation with a Human Touch), Worker Involvement and Systematic Planning Methodology.

Course Objectives: The objectives of this course are as follows:

- a. To provide the fundamentals of total quality management related to leather products industry.
- b. To develop core knowledge of various TQM principles, tools and techniques.
- c. To familiarize the concept of international quality standards and recognition in the leather products industry.
- d. To introduce students with the basics of strategic lead time management and lean manufacturing techniques.

Course Learning Outcomes (CLOs)

After completion the course students will be able:

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	State the different principles of quality management and statistical analysis with the help of various measuring principles.	C1, A1
CLO2	Explain different principles of TQM tools and their field of applications in leather products manufacturing.	C2, A2
CLO3	Apply the TQM tools and standards to measure different quality parameters for leather and leather products.	C3, A3
CLO4	Solve the technical problems associated with quality using various TQM analysis tools.	C4, A3

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	-	-	-	-	-	-	-	-	-	-	-
CLO2	3	-	-	-	2	-	-	-	-	-	-	-
CLO3	3	2	-	1	3	-	-	-	-	-	-	1
CLO4	3	2	-	2	3	-	-	-	2	-	-	2

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Multimedia presentation, demonstration and problem-based exercises	Group Presentation, In-course Exam; Final Exam
CLO2	Lecture, group discussion and problem-based exercises	Group Presentation, In-course Exam; Final Exam
CLO3	Lecture, guided reading and problem-based learning (PBL): Identifying the problem to be solved	Assignment, Group Presentation, In-course Exam, and Final Exam
CLO4	Lecture, multimedia presentation, group discussion, literature review, demonstration, and problem-based exercises	Group Presentation, In-course Exam, and Final Exam

Learning Materials

i. Recommended Readings

- a) Dale H. Besterfield, et al., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint, 2006.
- b) Suganthi, L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.

ii. Supplementary Readings

- a) James R. Evans and William M. Lindsay, "The Management and Control of Quality", (6th Edition), South-Western (Thomson Learning), 2005.

iii. **Others:** Handout/lecture material provided by the course teacher.

Course Code: 0723-LPE-4110 Course Title: Quality Management Lab Credits: 1.5

Rational of the Course: This course provides practical based education on quality management systems and preparation of industrial inspection. In this course students will learn quality management activities like preparation of spec sheet, BOM sheet, MRP sheet etc. By ending of this course students will be able to manage the industrial activities effectively.

Course Content

Spec sheet development: Various leather goods and garments like wallets, bags, purses, card holders, jackets, trousers, waist coats, skirts, etc.

Computerized layout design: Various leather goods and garments like wallets, bags, purses, card holders, jackets, trousers, waist coats, skirts, etc.

BOM sheet development: Various leather goods and garments like wallets, bags, purses, card holders, jackets, trousers, waist coats, skirts, etc.

Production planning: Various leather goods and garments like wallets, bags, purses, card holders, jackets, trousers, waist coats, skirts, etc.

Production scheduling: Various leather goods and garments like wallets, bags, purses, card holders, jackets, trousers, waist coats, skirts, etc.

Resources allocation, machine loading and optimization: Various leather goods and garments like wallets, bags, purses, card holders, jackets, trousers, waist coats, skirts, etc.

Time study and motion study: Various leather goods and garments like wallets, bags, purses, card holders, jackets, trousers, waist coats, skirts, etc.

Development of MRP sheet: Various leather goods and garments like wallets, bags, purses, card holders, jackets, trousers, waist coats, skirts, etc.

Course Objectives

- a) To prepare students for the development of spec sheet and computerized layout design.
- b) To provide skill on the BOM sheet and production planning for the leather products industry.
- c) To familiarize students with production scheduling, resources allocation, machine loading and optimization.
- d) To impart skill on the application of time study, motion study as well as MRP sheet.

Course Learning Outcomes (CLOs)

After completion the course students will be able:

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Demonstrate different aspects of production planning and quality control tools used in TQM.	C2, A2
CLO2	Operate tools and software for the measurement and control the products quality.	C3, P2
CLO3	Analyze different problems and difficulties created in operating those tools in real world application.	C4, A2, P3
CLO4	Solve the problems to ensure maximum quality of a product.	C4, A3, P3

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3				2							
CLO2	3				3				2			
CLO3	3	3		2	2				2	2		
CLO4	3	3		2	2				3	2		2

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Demonstration, Hands-on practice, and Group work	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO2	Lecture, Demonstration, Hands-on practice, and Group work	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO3	Lecture, Demonstration, Hands-on practice, and Group work	Lab Performance, Continuous assessment: Viva, Report, Final Exam
CLO4	Lecture, Demonstration, Hands-on practice, and Group work	Lab Performance, Continuous assessment: Viva, Report, Final Exam

Learning Materials

i) Recommended Readings

- a) Dale H. Besterfield, et al., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint, 2006.
- b) Suganthi, L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.

ii) Supplementary Readings

- a) James R. Evans and William M. Lindsay, “The Management and Control of Quality”, (6th Edition), South-Western (Thomson Learning), 2005
- iii) **Others:** Handout/lecture material provided by the course teacher.

Course Code: 0723-LPE-4111 Course Title: Industrial Project Management

Credits: 3.0

Rationale of the Course: The course has been designed to improve the understanding of the students about the modern project management of the leather products manufacturing industry. The course deals about the basic concept of modern project management, managing project risk, project appraisal, scheduling resources and costs, resource allocation, project Crashing and managing project teams.

Course Contents

Project Management: Defining the project scope, major characteristics, project life cycle, establishing project priorities, creating the work breakdown structure, integrating the WBS with the organization, coding the WBS for the information system, responsibility matrices, project communication plan.

Managing Project Risk: Risk management process, identification, assessment, response development, contingency planning, opportunity management, contingency funding and time buffers, risk response control, change control management.

Project appraisal: Introduction; major components: market feasibility, different feasibility; investment criteria: net present value, payback period, discounted payback period, internal rate of return, benefit cost ratio.

Scheduling Resources and Costs: Overview of the resource scheduling problem, types of resource constraints, classification of a scheduling problem, network technique: PERT, CPM, resource allocation methods: assumptions, time-constrained project: smoothing resource, demand, resource-constrained projects; computer demonstration of resource-constrained scheduling, splitting activities, benefits of scheduling resources, assigning project work, multi-project resource schedules, using the resource schedule to develop a project cost baseline.

Resource allocation: Introduction, various resources of a project, resources leveling, resource constraints, problems related to resources leveling and resource constraints.

Project Crashing: Rationale for reducing project duration; options for accelerating project completion: options when resources are not constrained and are constrained; project cost–duration graph: explanation of project costs; constructing a project cost–duration graph: determining the activities to shorten, a simplified example; practical considerations: using the project cost–duration graph, crash times, linearity assumption, choice of activities to crash revisited, time reduction decisions and sensitivity; what if cost, not time, is the issue?

Managing Project Teams: The five-stage team development model, situational factors affecting team development, building high-performance project teams, managing virtual project teams, project team pitfalls.

Course Objectives: The learning objectives of this course are:

- a) To provide the comprehensive concept of project management, managing project risk, project appraisal, scheduling resources and costs, resource allocation, project crashing, managing project teams.
- b) To impart knowledge on how to manage project in the leather products industry supply chain.
- c) To enhance students' ability to analyze and critically evaluate the key strategies and expressions for managing industrial project.

Course Learning Outcomes (CLOs)

After completion the course students will be able:

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Describe the principle of project management with risk management strategies	C1, A1
CLO2	Explain the concept of project appraisal, scheduling resources and costs, and resource allocation	C2
CLO3	Coordinate and carry out teamwork with project crashing, different development models and situational factors affecting team development.	C3, P2
CLO4	Design and review industrial projects for leather products manufacturing industries.	C5

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	3			2				3	2		2
CLO2	3	3			2				3	2		2
CLO3	3	2	3	3	3	2			3	3	3	3
CLO4	3	2	3	2	3	2			3	3	3	3

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Interactive Discussion, Lecture discussion with multimedia, Interactive Discussion, White Board Illustration, Group Discussion	In-course Exam, Final Exam, Assignment
CLO2	Lecture, Lecture discussion with multimedia, Interactive Discussion, White Board Illustration, Video Presentation	In-course Exam, Final Exam, Group Presentation, Oral Presentation, Assignment
CLO3	Lecture, Lecture discussion with multimedia, White Board Illustration, Interactive Discussion, Case study, Problem based learning	In-course Exam, Final Exam, Group Presentation
CLO4	Lecture, Problem based learning, White Board Illustration	Group Presentation

Learning Materials

i. Recommended Readings

- a) A guide to the project management body of knowledge (PMBOK® guide). -- Fifth edition

ii. Supplementary Readings

- a) Erik W. Larson, Clifford F. Gray-Project Management- The Managerial Process, 6th Edition

iii. Others: Handout/lecture material provided by the course teacher

Course Code: 0723-LPE-4201 Course Title: Wastewater and Solid Waste Management Credits: 3.0

Rationale of the Course: Wastewater and Solid Waste management is intended to disseminate knowledge on different methods of existing and advanced effluent treatments and leather industry solid waste management. The course provides up-to-date knowledge on the integrated waste management of leather products industries.

Course Contents:

Principal industries attributed for water pollution: Types of water pollution – physical, chemical and biological pollution. Hazardous effects of water pollution on land, ground water, surface water, aquatic life, and sea. Ecological system and water pollution.

Tannery effluents: Source of liquid wastes in tanneries, effluent from beam house, tanning, and post-tanning operations, their nature, most toxic ingredients in tannery wastewater, chemistry and characteristics of environmental parameters-total solids, total dissolved solids, volatile matters, DO, BOD₅, COD, TOC, TDS, ammonia, nitrogen, protein content, chlorides, alkalinity, pH, sulphide, total coliform count, polyphenol, and metal contents.

Treatment of industrial wastewater: Principles of physical treatments: screening, mixing, equalization, sedimentation, filtration; principles of chemical treatment: coagulation, flocculation, precipitation, ion exchange, use of alkali, neutralization, flotation, oxidation/reduction, distillation; objectives of biological wastewater treatment and various processes.

Primary treatment: Main objectives of primary treatment- primary treatment units- collection system of discharged waste water in tanneries-screening- equalization of waste water.

Secondary treatment: Principles of biological treatment, different processes involved in secondary treatment system- lagoon treatment- aeration system-trickling filter- systematic design of these systems- bio-technology in effluent treatment, activated sludge process - its modifications, RBC, oxidation ditch, aerated lagoon, bio-filter, anaerobic baffled reactor, UASB reactor. Waste stabilization pond, design and operation of biological nitrification, de-nitrification system, and floating aquatic plant system.

Tertiary treatment: UV treatments, ozonolysis, chlorination, reverse osmosis. Concept of CETP and ETP, and disposal of sludge.

In-plant management for pollution reduction: House-keeping, segregation of waste streams, reduction of water use, chemical use, recycling and reuse of chemicals and water, water footprint.

Solid waste management: Sources of solid waste in leather and leather products industries, trimming of finished leather, cutting, skiving, waste from upper, buffing dust, shaving dust, waste from lining materials- PVC, PU, Cotton, waste from reinforcement materials-PVC, PU, rubber, PVA, cotton, metals, eyelets, textile, laces, paper, inner box, wooden pallets, cartoon, adhesives, waste from post-consumer; integrated waste management: prevention, reduction, reuse, recycling, energy recovery and disposal.

Course Objectives: The objectives of this course are as follows:

- a) To provide the basic concepts of wastewater treatment, its design and management after defining the significance of terms and parameters used in wastewater engineering.
- b) To imply technical issues and the management of resources and solid waste, appropriate methods for storage, collection, transfer, treatment and disposal methods.

Course Learning Outcomes (CLOs)

After completion the course students will be able:

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	State the basic terminologies and sources related to wastewater and solid wastes.	C1, A1
CLO2	Explain the characteristics of different wastes generated from leather and leather products industries.	C2, A2
CLO3	Apply the basic principles of wastewater and solid waste treatment with recovery of possible resources.	C3, A2
CLO4	Analyze and design effective treatment plants for both liquid and solid wastes for leather and leather products industries.	C4, A3

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	-	-	-	-	-	-	-	-	-	-	-
CLO2	3	1	-	1	-	-	-	-	-	-	-	-
CLO3	3	2	2	2	2	-	2	-	-	-	-	-
CLO4	3	2	3	2	3	-	3	-	-	-	-	-

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Multimedia presentation, white board illustration, problem-based exercises, group discussion	Quiz, In- course exam; Final Exam
CLO2	Lecture, multimedia presentation, Problem based Learning (PBL): Identifying the problems to be solved	Assignment, Group presentation, In-course exam, Final exam
CLO3	Lecture, multimedia presentation, group discussion, analyze and compare through various case-studies	Assignment, In-course Exam, Final Exam
CLO4	Lecture, multimedia presentation, group discussion, analyze and compare through various case-studies	Assignment, In-course Exam, Final Exam

Learning Materials

i. Recommended Readings

- Metcalf and Eddy, H. "Tchobanoglous, G. and Burton, F.L. (Ed), Waste water Engineering, treatment, disposal and reuse", 3rd edn. Tata-McGraw Hill Publishing, New Delhi 1991.
- Metcalf and Eddy, "Wastewater Engineering, Treatment and Reuse", Tata McGraw Hill, New Delhi, 2003.
- Gilbert M. Masters, "Introduction to Environmental Engineering and Science", 2nd edition, Pearson Education (2004).

ii. Supplementary Readings

- Besselievie, B.E. and Schwartz, M. "The Treatment of Industrial wastes", 2nd edition, McGraw Hill.
- Infogate, GTZ, "Treatment of Tannery Waste Water", GmbH, Frankfurt, Germany, 2002.

iii. Others: Handout/lecture material provided by the course teacher

Course Code: 0723-LPE-4202 Course Title: Waste Management Lab Credits: 1.5

Rationale of the course: The course is designed to develop the skills to measure the basic environmental parameters related to wastewater and solid waste management. It provides the comprehensive practical knowledge to design and develop modern waste management approaches.

Course Contents

1. Determination of dissolved oxygen (DO) in water.
2. Determination of biological oxygen demand (BOD) of industrial wastewater.
3. Determination of chemical oxygen demand (COD) industrial wastewater.
4. Determination of chloride content in wastewater sample by Volhard method.
5. Determination of total solids (TS, TSS, VSS, and FS) in wastewater/ sludge samples.
6. Determination of NO₃⁻ content in wastewater sample.
7. Determination of MLVSS, MLSS, SVI, and VSS/SS ratio of a given sludge sample.
8. Preparation of glue and gelatin from raw trimmings, fleshing waste, wet blue trimmings, shaving dust
9. Experimental study on de-chroming and chrome recovery process.
10. Extraction of fat from solid waste of the leather industry.

Course Objectives: The objectives of this course are as follows:

- a. Graduates will learn to analyze industrial wastewater, which will help them to implement the appropriate industrial wastewater treatment facility in the industries.
- b. Analysis of heavy metals and solids will help students to understand the ecological movement of these materials in the ecosystem.
- c. To enrich students’ skills about proper disposal and waste management approaches for leather and leather products industries.

Course learning outcomes (CLOs)

After completion the course students will be able:

CLOs	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Describe the analytical tools and techniques for measuring the environmental parameters.	C2, A1, P2
CLO2	Perform different experiments for the determination of different environmental pollutants using modern analytical tools and instruments.	C3, A2, P2
CLO3	Analyze and evaluate the experimental results to monitor the environmental quality of tannery effluents and solid wastes.	C4, C5, A4, P4
CLO4	Design and implement strategic approaches for wastewater and solid waste management.	C6, A4, P4

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	1	-	-	-	-	1	-	-	-	-	-
CLO2	3	2	-	-	2	-	2	-	2	-	-	-
CLO3	3	2	2	3	2	-	3	-	2	-	-	-
CLO4	3	2	3	3	3	-	3	-	2	-	2	2

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Interactive Lectures, Group Discussions, Demonstrations, Hands-on practice, and Group work	Quiz, Viva Voce, Report evaluation, Final Exam
CLO2	Interactive Lectures, Demonstrations, Hands-on practice, and Group work	Presentation, Report evaluation, Final Exam
CLO3	Interactive Lecture with illustration, Demonstration, Hands-on practice, and Group work	Quiz, Viva Voce, Report evaluation, Final Exam
CLO4	Lecture, Demonstration, Hands-on practice, and Group work	Report evaluation, Final Exam

Learning materials

- i. **Recommended readings:**
 - a) Society of Leather Technologists & Chemists - Official Methods of Analysis
 - b) Fifield and Haines-Environmental Analytical Chemistry.
- ii. **Supplementary Readings**
 - a) P. K. Sarker - Analytical Chemistry for Leather Manufacture.
- iii. **Others:** Lecture notes and Lab procedure provided by the course teachers.

Course Code: 0723-LPE 4203 Course Title: Production Planning and Quality Control
Credits: 3.0

Rationale of the Course: The course emphasizes production systems, facility location, and efficient production layout. This course will pronounce how to conduct an analysis of demand forecasting for production, and inventory management. Moreover, students will learn in detail knowledge of work and method study and its application in leather products production.

Course Contents

Introduction to production management: Production, production system, functions of manufacturing firms, basic production management function, the strategies of decision making in

leather products industry, concept of productivity and calculations, multi-factor productivity, key variables for improved labor productivity, ethics, social responsibility, and sustainability.

Facility planning and layout design: Strategic importance of layout decisions, layout design considerations, types of layouts, warehousing and storage layouts, problems related to layouts, staffing and balancing work cells, assembly-line balancing, line-balancing heuristics.

Inventory management: Basic ideas of inventory, functions of inventory, types of inventories, managing inventory, ABC analysis, terms used in inventory management, cycle counting, inventory models, basic economic order quantity (EOQ) model, quantity discount model, probabilistic models and safety stock, probabilistic demand and example.

Demand forecasting: Basic concept of forecasting, types of forecasts, strategic importance of forecasting for leather products industry, steps in forecasting, overview of qualitative methods, and quantitative approaches, time-series forecasting, common measures of error, least squares method for demand forecasting, multiple-regression analysis, monitoring and controlling forecasts, tracking signal, adaptive smoothing.

Capacity planning: Definition, design capacity, effective capacity, determinants of effective capacity, capacity requirement, developing capacity alternatives, evaluating alternatives.

Operation scheduling and sequencing: Basic concepts of short time scheduling, scheduling flow, forward and backward scheduling, scheduling criteria, Gantt charts, assignment method, sequencing jobs, FCFS, SPT, EDD, LPT, critical ratio, Johnson's rule for sequencing, linear programming, transportation model, network analysis, critical Path Method (CPM), programme evaluation and review technique (PERT).

Work study: Method study, Purpose and Techniques used, and Procedure. Precautions when introducing new methods, Relationship with work measurement. Work measurement, purpose and techniques used, Rating, Elements, Break points, Basic time, Use of allowances. Activity sampling, definition, purpose and procedures, use of pilot study, Interpretation of results. Production studies, machine utilization, operator performances.

Course Objectives: The objectives of this course are as follows:

- a. To provide the basic concepts on production systems, production layout, and quality control.
- b. To impart knowledge on inventory, demand forecasting, operation scheduling, and sequencing for production management.
- c. To disseminate in-depth knowledge for the implementation of tools and techniques related to work and method studies.

Course Learning Outcomes (CLOs)

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

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	State and follow the basic concept of production systems, capacity planning, and facility planning.	C1, A1
CLO2	Estimate and prepare layout design and inventory management system of the leather products industry.	C2, C3, A2
CLO3	Compare and interpret the demand forecasting method, capacity planning and operation scheduling procedure for the production system.	C4, A3
CLO4	Evaluate and justify work-study and method-study techniques for productivity improvement	C5, A3

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	1	-	-	-	-	-	-	-	-	-	-
CLO2	3	2	2	-	2	-	-	-	-	-	-	-
CLO3	3	3	2	2	2	-	-	-	-	-	-	2
CLO4	3	3	-	3	3	-	-	-	2	-	-	2

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecture, Multimedia presentation, demonstration and problem-based exercises (PBE)	In-course Exam; Final Exam
CLO2	Lecture, group discussion and Multimedia presentation	Group Presentation, In-course Exam; Final Exam
CLO3	Lecture, group discussion, guided reading and problem-based learning (PBL): Identifying the problem to be solved	Assignment, Group Presentation, In-course Exam, and Final Exam
CLO4	Lecture, group discussion, literature review, and problem-based exercises (PBE)	In-course Exam, and Final Exam

Learning materials

i) Recommended Readings

- Jay Heizer, Barry Render, Chuck Munson- Operations Management: Sustainability and Supply Chain Management (13th Edition).
- Jay Heizer, Barry Render- Operations Management (11th Edition).
- Gideon Halevi- Handbook of Production Management Methods.

ii) Supplementary Readings

- Nicholas J. Aquilano and Richard B. Chase- Production and Operations Management.
- Edward S. Pound, Jeffrey H. Bell, and Mark L. Spearman- Factory Physics for Managers: How Leaders Improve Performance in a Post-Lean Six Sigma World.

iii) Others: Handout/lecture material provided by the course teacher

Course Code: 0723-LPE-4204 Course Title: Capstone Project Credits: 3.0

Rationale of the Course: The course is designed to encourage students to think critically, solve challenging problems, and develop skills such as oral communication, research skills, teamwork, and goal setting. It teaches them to successfully complete the projects within financial and ethical boundaries and to be able to gain an insight of the latest trends and applications ongoing in the respective fields and to communicate with society and professionals both in verbal and written form in a successful manner.

Course Contents

Experimental and theoretical investigation of various problems related to Leather, Environmental Science and related Engineering will be carried out. The topic should provide an opportunity to the student in developing initiative, creative ability and engineering judgment. Individual study will be required. At the end of term, the student is expected to complete the preliminary literature review/survey, select the topic for study, complete theoretical study and basic research methodology on the topic and submit an individual detailed report for evaluation.

Course Objectives: The objectives of this course are as follows:

- a. To make the students capable of taking new professional challenges.
- b. To ensure utilization of gathered knowledge in solving new real-life problems.

Course Learning Outcomes (CLOs)

After completion the course students will be able:

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Identify, analyze and formulate a leather engineering problem and use project management skill for obtaining its solution considering potential of social and environmental impact on leather sector.	C1, C5
CLO2	Apply the industrial state of the art leather technology for verifying, validating, detecting accuracy and develop a leather engineering based real-life problem into an engineering solution using modern tools.	C3
CLO3	Demonstrate the concept of professional ethics, confidentiality, leather and related industrial sector standards and explain the impact of leather engineering solutions on society and environment.	C2
CLO4	Deliver designed project findings through oral presentations, demonstrations, and written technical report format.	C2, C3

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	2	-	-	-	-	-	2	-	2	-
CLO2	-	-	-	2	3	-	-	-	-	-	-	2
CLO3	-	-	-	-	-	3	2	2	-	-	-	-
CLO4	2	-	-	-	-	-	-	-	-	3	-	2

Rank: 3-High match, 2-Medium match, 1-Low match

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Discussion, Discussion and encouragement, Self-study, Discussion and Motivation, Final report, proofreading	Project defense and report evaluation by external as well as internal
CLO2	Discussion, Lecture, Discussion and Motivation, Final report, proofreading	
CLO3	Lecture, Final report, proofreading	
CLO4	Discussion and demonstration, Routine discussion, Final report, proofreading	

Learning Materials

Recommended Readings

- a) Writing the Winning Thesis or Dissertation: A Step-by-Step Guide - By Allan A. Glatthorn, Randy L. Joyner.
- b) Relevant books, scientific journals, handbooks, patents and manuals

Course Code: 0723-LPE-4206 Course Title: Comprehensive Viva Credits: 2.5

Rationale of the Course: Comprehensive viva is designed to judge the student's overall academic performance in the studied courses.

Course Content

The comprehensive viva voce examination should be based on both theoretical and practical knowledge. It is based on all the courses the students have studied, the basic science, and core courses of leather products engineering.

Course Objectives: The objectives of this course are as follows:

- a) To familiarize students with formal interviews.
- b) To judge students' performance based on the subject knowledge.

Course Learning Outcomes (CLOs)

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

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Present personal etiquette in front of a formal interview panel	C3, A2, P2
CLO2	Demonstrate communicative skills to an interview panel	C3, A2, P2
CLO3	Deliver the acquired knowledge effectively to the interview panel	C3, A2, P2

Mapping of CLO with PLO

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	-	-	-	-	-	-	-	3	-	3
CLO2	3	2	-	-	-	-	-	-	-	3	-	3
CLO3	3	3	3	-	-	-	-	-	-	3	-	3

Rank: 3-High match, 2-Medium match, 1-Low match

Learning Materials

All the books of all the semesters and the journals, databases, real problems of leather and leather products sector.

Course Code: 0723-LPE-4208 Course Title: Internship Credits: 3.0

Rationale of the Course: The internship course is designed to involve students to the real work environment in the industry. Students will be able to familiarize themselves with the state-of-the-art production technologies, innovation, diversified materials and products.

Course Content:

Introduction, factory environment, factory layout, material handling, R&D, cutting, closing, lasting, finishing department, OHS, quality control, and waste management.

Course Objectives: The objectives of this course are as follows:

- a. To expose students to the real working environment and get acquainted with the organization structure, business operations, and administrative functions.
- b. To have hands-on experience in unit operation and unit processes involved in the footwear manufacturing process.
- c. To familiarize with the cutting-edge technology in footwear manufacturing.
- d. To enhance industry-academia collaboration and cooperation.

Course learning outcomes (CLOs)

At the completion of this course students will be able to:

	Course Learning Outcomes (CLOs)	Learning Level
CLO1	Demonstrate knowledge and skills in the type of manufacturing process, distribution, and supply chain and their parameters.	C2, A2
CLO2	Utilize technical resources and perform in the actual working environment.	C3, A2
CLO3	Analyze, and evaluate layout, process, production, and efficiency.	C4, C5 A3
CLO4	Generate technical documents and deliver oral presentations.	C5, A3

Mapping course learning outcomes (CLOs) with program learning outcomes (PLOs)

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	2	-	-	-	-	-	-	-	-	-	2
CLO2	3	2	3	-	-	-	-	-	-	-	-	2
CLO3	3	2	2	-	-	-	-	-	-	3	-	2
CLO4	2	2	2	-	-	2	-	-	-	-	-	2

Rank: 3-High match, 2-Medium match, 1-Low match.

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Class Lecture, Display, and Demonstration,	Participation and performance, Presentation, Report Evaluation
CLO2	Class Lecture, Display, and Demonstration,	
CLO3	Discussion, Self-study, and Motivation	
CLO4	Class Lecture, Display, and Demonstration,	

Learning Materials

Recommended Readings

- a) Writing the Winning Thesis or Dissertation: A Step-by-Step Guide - By Allan A. Glatthorn, Randy L. Joyner.
- b) Why (and How) to Take a Plant Tour by David M. Upton and Stephen E. Macadam, published on Harvard Business Review.

Part D

20. Grading/Evaluation

1. Grading Scale: The letter grade system shall be used to assess the performance of the student and shall be as follows:

Marks Obtained	Grade	Grade point	Grade Description
80% or above	A+	4.00	Grade A: Excellent performance; all course objectives achieved; objectives met in a consistently outstanding manner.
75% to less than 80%	A	3.75	
70% to less than 75%	A	3.50	
65% to less than 70%	B+	3.25	Grade B: Very good performance; significantly more than the majority (at least two-thirds) of the course objectives achieved; objectives met in a consistently thorough manner.
60% to less than 65%	B	3.00	
55% to less than 60%	B-	2.75	
50% to less than 55%	C+	2.50	
45% to less than 50%	C	2.25	Grade C: Satisfactory performance; at least majority of the course objectives achieved; objectives met satisfactorily.
40% to less than 45%	D	2.00	
Less than 40%	F	0.00	Grade F: Failed in the course
Incomplete	I	-	
Withdrawn	W	-	

2. Grades: In the points-based grading system, there is a total number student can earn in a particular course, based on class attendance, in-course exam and final exam scores for a theoretical course and for a practical course it will be the summation of marks obtained from class attendance, lab reports, class test, viva and final exam. Thus, grade point of a particular course is the

summation of possible marks distribution. Provided that, a fraction number in grading calculation shall be considered as the next higher consolidated number.

3. Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA): GPA obtained in all the courses passed/completed by a student in a Semester. 'F' grades will not be counted for GPA calculation. GPA of a Semester will be calculated as follows:

$$\text{GPA} = \frac{\sum(\text{Grade points in a course} \times \text{Credits for the course})}{\text{Total credits of a semester}}$$

The Cumulative Grade Point Average (CGPA) gives the cumulative performance of the student from first semester up to any other semester to which it refers and is computed by dividing the total grade points accumulated up to the date by the total credit hours.

$$\frac{\sum(\text{GPA} \times \text{Credits in a semester})}{\sum(\text{Total credits of all semester})}$$

Both GPA and CGPA will be rounded off to the second place of decimal for reporting.

For promotion from First Year to Second Year, a student requires to earn a minimum CGPA (calculated for first and second semesters combined) of 2.00. For promotion from second to third year and third to fourth year, a student requires to earn a minimum CGPA of 2.25. Students who failed in courses, but have earned the required CGPA will be promoted to next year on probation. Those on probation shall appear at the retake examination and must pass the failed course(s) to be allowed to continue studies in the next year.

4. Course Withdrawal: If a student is unable to complete any semester (Semester-I &/or Semester-II) due to illness, accident or any other valid reason etc., he/she may apply to the Registrar through the Director of the institute for total withdrawal from the Semester before the start of semester final examination.

5. Incomplete (I) courses: *Incomplete 'I' grade is indicative of a situation where a student, for non-academic reasons beyond his control, is unable to complete the full requirements of the course for not being able to sit for the Semester Final Examination.* Students who fail a course are also said to have an incomplete course. Meanwhile, the student concerned will be promoted to the next semester. Provided that, for promotion from First Year to Second Year, a student requires to earn a minimum CGPA (calculated for first and second semesters combined) of 2.00. For promotion from second to third year and third to fourth year, a student requires to earn a minimum CGPA of 2.25. If a student has incomplete course, he/she can clear through retake examination in next two semester. Any incomplete or failed course prevents a student from receiving a degree. A student can't earn the degree if they have any incomplete or failed courses.

6. Retake: A student will be allowed maximum of two chances to clear F grade/grades with the immediate next batches by complying with the time requirement for the degree including final year (4th year). He/she shall repeat the course(s) like a regular student with prior application to the Director of the institute. A student getting F grade in any theory course (courses) has to attend only the final examination for that (those) course (courses). In that case, the maximum grade obtainable in any course by the student shall be B⁺.

7. Grade Improvement: A student may sit for improvement exam for courses where grade obtained is less than or equal to C⁺ (grade point-2.50) and the best grade that a student can be

awarded is B⁺. A student will not be allowed for grade improvement if he or she passes and the final semester result is published. However, if the grade is not improved the previous grade will remain valid.

8. Dropout/ Re-admission: A student failing to get promotion may seek re-admission to study with the following batch. In the case of re-admission, all previously earned grades for the two semesters of that year will be cancelled. For re-admission, he or she has at least 30% (thirty percent) attendance in the previous semester or year. A student may take re-admission only 2 times. If required, a student may take re-admission in the same class, but the Degree must be completed within 6 years. Re-admission will be allowed only after the approval of the Academic Committee of ILET. A student failing to get minimum required CGPA even after taking re-admission twice will be dropped out of the program.

Course Learning Outcomes (CLOs) Attainment Report

Course Learning Outcomes (CLOs)	Assessment										
	SFE (Summative) 80%				CA (Formative) 20%						CLO Attainment (%)
	Incourse/Class Test/Mid-Semester (30%)		Final Examination (60%)		MCQ/MQ / Quiz (10%)		Assignment/ Case Study (5%)		Presentation (5%)		
	AM	AC	AM	AC	AM	AC	AM	AC	AM	AC	
CLO1:											
CLO2											
CLO3											
CLO4											
CLO5											
CLO6											
CLO7											

AM: Actual Marks = (Given Marks/Total Given Marks of Component) × (% of the Course)

AC: Assessment Contribution; M=Average Marks in % and W = Weightage=C/T

$$\text{Attainment (A)} = \sum_{i=1}^M (M_i \times W_i)$$

Or Marks of CLO1 = (% marks distributed Assessment Type1×% Overall) +(% marks distributed Assessment Type-2×% Overall) +(% marks distributed Assessment Type-3×% Overall) +.....