

**UNIVERSITY OF DHAKA
BANGLADESH**

**COURSE CURRICULUM
FOR
B. Sc. IN LEATHER PRODUCTS ENGINEERING**

(FOUR YEAR COURSE)



**Institute of Leather Engineering and Technology
University of Dhaka, Hazaribagh, Dhaka-1209.**

Introduction to the Program:

General Objectives of the Program (B.Sc in Leather Products Engineering)

The objective of the B.Sc in Leather Products Engineering program is to educate and prepare students with essential leather products engineering knowledge and skills needed to provide leadership to organizations and sustain in the competitive global market. This Program is designed to prepare students for careers in Product Development, Products Designing, Leather Products Manufacturing, Products Quality control and leadership in both the private and public sectors. Students acquire a comprehensive knowledge in the fundamentals of Leather Products Engineering including an ability to use analytical techniques, experimental and laboratory skills and modern engineering, and serve the society with innovations and developed products within a diverse environment.

ACADEMIC RULES AND REGULATIONS APPLICABLE FOR THE LEATHER PRODUCTS ENGINEERING DEPARTMENT OF THE INSTITUTE OF LEATHER ENGINEERING AND TECHNOLOGY:

1. The Institute of Leather Engineering and Technology (ILET), Hazaribagh, Dhaka shall be deemed to be an institute of the University of Dhaka.
2. The degree to be awarded by the University of Dhaka shall be designated as B. Sc. in Leather Products Engineering.
3. The Courses for the B. Sc. in Leather Products Engineering shall extend over four academic years.
4. The medium of instruction and examination shall be in English.
5. Every year there will be an admission test for new intakes. The rules and regulations and other necessary works for the admission purpose will be performed by the central admission committee of the University.
6. Candidates for admission to the first year B. Sc. in Leather Products Engineering shall be required to have passed the Higher Secondary Certificate in Science with Physics, Chemistry and Mathematics or its equivalent from a recognized Board or Institution. Foreign students with requisite qualification may be admitted with the approval of the University of Dhaka.
7. Admission to the first year B. Sc. in Leather Products Engineering programme shall be based on the results of S.S.C. and H.S.C. or its equivalent examinations and the admission test to be conducted based on current rules by the Central Admission Committee.
8. The detail syllabus for degree of Leather Products Engineering shall be approved by Academic Council of the University of Dhaka.
9. An Examination Committee for each year consisting of 4 (four) members of which 3 (three) shall be internal and 1 (one) from other departments of the Institute or the university or research organization shall be constituted by the departmental academic committee. Any full time teacher of the concerned department of the Institute shall be the chairman of the examination committee.
10. There shall be a Departmental Academic Committee consisting of all the full-time teaching staff to help academic matters.
11. Every year before the commencement of Academic session the list of part time teachers (if required) shall be prepared course wise and must be approved by the dean of the concern Faculty of Dhaka University. Dean will have the right to modify the list with the consultation with the concern head of the department and the Director of the institute.

12. The question paper setters and the examiners will be selected by the Examination Committee from a panel approved by the University.
13. The question papers shall be moderated by the Examination Committee.
14. No candidate shall be eligible for degree of B. Sc. in Leather Products Engineering unless he or she has undergone the approved courses of study for a minimum period of four academic years and maximum of six academic years.
15. There shall be 15, 1-class hour lectures for 1 credit of theory classes. There shall be 30 hour lectures for 1 credit of Practical classes. Each of the class duration is 50 minutes.
16. No student shall be allowed to study any other degree programme during his/her study in Institute of Leather Engineering and Technology.

CURRICULUM AND EXAMINATION RULES

17. The subjects to be studied and the scheme of examinations for B. Sc. in Leather Products Engineering courses are given in Annexure-A.
18. There shall be a final examination at the end of each academic year to be conducted by the University of Dhaka.
19. Two examiners, of whom one will be the course teacher and the others, shall be from other departments of the Institute or University or research organization. The average of two will be taken as final. In case of the difference of more than 20% marks between the two examiners, the script/scripts will be evaluated by a third examiner appointed by the Examination Committee from the approved panel and the average of nearest two marks will be taken as final. In the case of equal difference between the marks of three examiners the middle marks will be taken as final.
20. Final practical examinations will be conducted jointly by Four examiners, 3 (three) internal and 1 (one) external appointed by the examination committee.
21. Grades and grade points will be awarded on the basis of marks obtained in the written, oral or practical examinations and/or laboratory performance according to the following scheme:

Marks Obtained (%)	Grade	Grade Point
80-100	A ⁺	4.0
75-79	A	3.75
70-74	A ⁻	3.50

65-69	B ⁺	3.25
60-64	B	3.00
55-59	B ⁻	2.75
50-54	C ⁺	2.50
45-49	C	2.25
40-44	D	2.00
Marks Obtained (%)	Grade	Grade Point
<40	F	0.00
	I	Incomplete
	W	Withdrawn

A student obtaining 'D' or higher grade will be counted as credits earned by him/her. A student obtaining 'F' grade will not be counted towards his earned credits.

The GPA (grade point average) will be calculated according to the following formula:

$$\text{GPA} = \frac{\sum (\text{Grade points in a course} \times \text{Credits for the course})}{\text{Total credits taken}}$$

CGPA = Cumulative GPA for different years.

22. The total performance of a student in a given course is based on continuous assessment and course final examinations.

(i) For theory courses the assessment is made through in-course assessment, and final examinations;

(ii) The assessment of laboratory and / or field courses will be made through observation of the student at work, viva-voce, assignments and evaluation of practical reports.

An examination committee for each year shall be constituted at the beginning of the session.

The distribution of marks for a course will be as follows:

(a) Theory courses:

In-course assessment: 30% of total marks shall be taken as in-course assessment. 5% marks will be awarded on the basis of attendance as follows:

90% and above	5%
85% to less than 90%	4%

80% to less than 85%	3%
75% to less than 80%	2%
60% to less than 75%	1%
Less than 60%	0 (Zero)
(iii) Course final examination	70% of total marks
(iv) Continuous assessment for practical courses	40% of total marks
(v) Practical Final Examination	60% of total marks

(b) In-course assessment for theory courses: In-course assessment will be done by taking class tests.

- (i) Maximum duration of in-course tests will be one class hour.
- (ii) Questions for in-course tests may preferably be of multiple choice (MCQ) type. Students may also be evaluated using short questions as decided by the course teacher.
- (iii) At least one test for 2 credits hour courses and two tests for 3 or 4 credit hour courses will be taken.
- (iv) Course teachers must announce results within 4 weeks of holding the examination.
- (v) The course teacher will show the assessed in-course scripts to the students.
- (vi) Marks for in-course assessment must be submitted by the course teacher to the Chairman of the Examination Committee and Controller of Examinations before holding the final examination.

(c) Continuous assessment for Practical courses: Continuous assessment will be done on the basis of class performance, report writing and class attendance.

(d) Year-final examination (Theory & Practical courses):

- (i) Student having attendance 75% or more (Collegiate) are eligible to appear in the final examination.
- (ii) Students having attendance 60-74% are eligible for sitting in the final examination on payment of fees as decided by the University.
- (iii) Student having attendance less than 60% are not allowed to sit in the final examination.

(iv) The year final examination will be conducted centrally by Controller of examinations as existing system.

(v) The duration of theoretical examinations will be follows:

Credit	Duration of theory examination
4 credit theory course	4 hours
3 credit theory course	3 hours
2 credit theory course	2.5 hours

(vi) Duration of practical examinations will be from 4-6 hours irrespective of credit hours.

(vii) For final examinations, there will be two examiners: first examiner will be one of the course teachers and the second examiner will be from other departments of the Institute or University or Research organization. Evaluation will be made under the existing rule.

(viii) Marks for final examination will be evaluated by broad and short answer questions. Practice of giving options should be avoided as far as possible.

23. A student has to take the required courses for a particular year, appear at the annual examination and score a minimum specified GPA/CGPA to be promoted to the next year.

Promotion to the next year will be given if a student scores minimum GPA/CGPA as follows:

1st year to 2nd year: GPA 2.00 (D)

2nd year to 3rd year: CGPA 2.25 (C)

3rd year to 4th year: CGPA 2.25 (C)

(i) If students obtain a grade C+ or lower in a course in any year, he/she will be allowed to repeat the term

24. The requirements for the award of the Bachelor of Engineering degree are as follows of the Department:

(i) Completion of the courses for the minimum required credits in a maximum period of six academic years;

(ii) Appearing at the final examination in all the required courses;

(iii) Scoring a CGPA of 2.5, after considering the grades of improvement Examinations.

25. A student must complete his/her studies for a Bachelor's Degree within a maximum period of six academic years

26. Improvement/retake will be followed by:

- (i) final examination only once with the following batch for the purpose of grade improvement, but he/she will not be eligible to get a grade better than 'B+' in such a course. A student failing to improve his/her grade in a course can retain the earlier grade.
- (ii) Grade improvement will not be allowed in those courses in which a student obtains grade better than 'C+'.
- (iii) A student will be allowed to repeat a maximum of 20 credits in four years B.Sc. Program for grade improvement purpose.
- (iv) Improvement Examination will be taken only for term-final test. No improvement examination will be taken for in-course, practical course, field work, assignment and oral presentation.

27. Others:

- (i) A course in which a student has obtained 'D' or a higher grade will be counted as credits earned by him/her. Any course in which a student has obtained 'F' grade will not be counted towards his earned credits.
- (ii) A student who obtains 'F' grade in a course will be allowed to improve the grade two times with any following batches with a condition that he/she has to complete the Bachelor of Engineering Program within period of 6(six) academic years from the date of first admission.
- (iii) 'F' grade will not be counted for GPA calculation. But will stay permanently on grade sheet and Transcript. When a student will repeat a course in which he/she previously obtained 'F' grade, he/she will not be eligible to get grade better than 'B+' (grade point 3.25) in such a course.

28. Readmission will be followed by:

- (i) A student may seek re-admission provided he/she has at least 30% attendance in the present year and may continue studies as a regular student.
- (ii) On re-admission grade earned earlier by a student in the class of re-admission shall in general cease to exist and the student has to retake all courses and examination but in case if they do not get the opportunity to repeat the courses

due to late admission, marks of in-course assessment and laboratory performance assessment in the previous year may be retained by the students.

29. Drop out will be followed by:

A student failing to earn the yearly GPA for promotion from one year to next year after taking improvement / readmission in any year shall be dropped out of the program.

30. Dean's Award will be followed by:

As a recognition of excellent performance, the names of students obtaining an average CGPA of 3.75 or above in an academic year without appearing any improvement examination may be Published in the list of Dean's award of the Faculty.

31. The failed candidates may seek readmission into the concerned classes on payment of usual fees except university registration fee or may appear in the concerned examination irregular candidates provided they have passed in all practical subjects on payment of examination and center fees as fixed by the University. The marks obtained by the irregular candidates in the practical examinations; in-course assessment and the project work (if applicable) in the earlier session shall be counted in deciding the results of their examinations.

32. The University may from time to time revise, amend or change rules and regulations and scheme of examinations and syllabus. In the case of students already undergoing the course, the changes will take effect from the beginning of the following academic year after the changes are introduced and shall cover the part of the courses that remain to be completed.

33. In the case of any dispute in interpretation of the rules and regulations regarding the degree programme of B.Sc. in Leather Products Engineering, the decision of the Academic Council of University of Dhaka shall be final.

INSTITUTE OF LEATHER ENGINEERING AND TECHNOLOGY

DEPARTMENT: LEATHER-PRODUCTS ENGINEERING

FIRST YEAR

Sl. No.	Course No.	Course name	Credit		Marks Distribution					Total Marks
			Theory	Practical	Theory			Practical		
					A* 70%	B* 25%	C* 5%	A* 60%	B** 40%	
01.	LPE-101	Manufacturing Technology of Leather-Products-I	3	-	70	25	5	-	-	100
02.	LPE-102	Manufacturing Technology of Leather-Products-I Practical		4				60	40	100
03.	LPE-103	Physical Chemistry	3	-	70	25	5	-	-	100
04.	LPE-105	Inorganic Chemistry	3	-	70	25	5	-	-	100
05.	LPE-107	Organic Chemistry	3	-	70	25	5	-	-	100
06.	LPE-108	Chemistry Practical	-	4	-	-	-	60	40	100
07.	LPE-109	Physics	3	-	70	25	5	-	-	100
08.	LPE-110	Physics Practical	-	2	-	-	-	60	40	100
09.	LPE-112	Engineering Drawing	-	2	-	-	-	60	40	100
10.	LPE-113	Computer and Information Engineering	3	-	70	25	5	-	-	100
11.	LPE-114	Computer and Information Engineering Practical	-	2	-	-	-	60	40	100
12.	LPE-115	Mathematics-I	3	-	70	25	5	-	-	100
13.	LPE-117	Business and Communicative English for Engineers	3	-	70	25	5	-	-	100
Total			24	14	560	200	40	300	200	1300

A* = Course final examination; B*= In-course assessment ; C*= Attendance B** =Continuous assessment

For Theoretical courses 1 Credit = 15 class

For Practical courses 1 Credit = 30 class

SECOND YEAR

Sl. No..	Course no.	Course name	Credit		Marks Distribution					Total Marks
					Theory			Practical		
			Theory	Practical	A*	B*	C*	A*	B**	
					70%	25%	5%			
						30%				
01.	LPE-201	Manufacturing Technology of Leather Products-II	3	-	70	25	5	-	-	100
02.	LPE-202	Manufacturing Technology of Leather Products-II Practical		4				60	40	100
03.	LPE-203	Applied Chemistry and Chemical Engineering	3	-	70	25	5	-	-	100
04	LPE-204	Applied Chemistry and Chemical Engineering Practical		4				60	40	100
05	LPE-205	Materials Science and Technology	3	-	70	25	5	-	-	100
06	LPE-207	Mathematics-II	3	-	70	25	5	-	-	100
07	LPE-209	Statistics	3	-	70	25	5	-	-	100
08	LPE-211	Mechanical Engineering for Leather Products Manufacture	3	-	70	25	5	-	-	100
09	LPE-212	Mechanical Engineering for Leather Products Manufacture Practical	-	2	-	-	-	60	40	100
10	LPE-213	Electrical and Electronic Engineering	3	-	70	25	5	-	-	100
11	LPE-214	Electrical and Electronic Engineering Practical	-	2	-	-	-	60	40	100
12	LPE-215	Industrial Management for Leather Products Manufacture	3	-	70	25	5	-	-	100
13	LPE-218	Computer Graphics Design	-	2	-	-	-	60	40	100
Total			24	14	560	200	40	300	200	1300
A* = Course final examination; B*= In-course assessment ; C*= Attendance B** =Continuous assessment										
For Theoretical courses 1 Credit = 15 class										
For Practical courses 1 Credit = 30 class										

THIRD YEAR

Sl. No..	Course no.	Course name	Credit		Marks Distribution					Total Marks
			Theor y	Practical	Theory			Practical		
					A* 70%	B* 25%	C* 5%	A* 60%	B** 40%	
01.	LPE-301	Manufacturing Technology of Leather Products-III	3	-	70	25	5	-	-	100
02.	LPE-302	Manufacturing Technology of Leather Products-III Practical		4				60	40	100
03	LPE-303	Analytical Chemistry for Leather Products Manufacture-I	3	-	70	25	5	-	-	100
04	LPE-304	Analytical Chemistry for Leather Products Manufacture Practical	-	2	-	-	-	60	40	100
05	LPE-305	Leather Technology-I	3	-	70	25	5	-	-	100
06	LPE-306	Leather Technology-I Practical	-	2	-	-	-	60	40	100
07	LPE-307	Testing of Leather Products and Allied Materials	3	-	70	25	5	-	-	100
08	LPE-308	Testing of Leather Products and Allied Materials Practical	-	2	-	-	-	60	40	100
09	LPE-309	Computer Aided Design and Pattern Making	3	-	70	25	5	-	-	100
10	LPE-310	Computer Aided Design and Pattern Making Practical	-	2	-	-	-	60	40	100
11	LPE-311	Footwear Technology	3	-	70	25	5	-	-	100
12	LPE-312	Footwear Technology Practical	-	4	-	-	-	60	40	100
13	LPE-313	Industrial and Production Engineering for Leather Products Manufacture	3	-	70	25	5	-	-	100
14	LPE-315	Managerial Economics	3	-	70	25	5	-	-	100
Total			24	16	560	200	40	360	240	1400
A* = Course final examination; B*= In-course assessment ; C*= Attendance B** =Continuous assessment										
For Theoretical courses 1 Credit = 15 class										
For Practical courses 1 Credit = 30 class										

FOURTH YEAR

Sl. No..	Course no.	Course name	Credit		Marks Distribution					Total Marks
			Theory	Practical	Theory			Practical		
					A* 70%	B* 25%	C 5%	A* 60%	B** 40%	
01.	LPE-401	Manufacturing Technology of Leather Products-IV	3	-	70	25	5		-	100
02.	LPE-402	Manufacturing Technology of Leather Products-IV Practical		4				60	40	100
03.	LPE-403	Analytical Chemistry for Leather-Products Manufacture-II	3		70	25	5			100
04.	LPE-405	Design and Pattern Making	3	-	70	25	5		-	100
05.	LPE-406	Design and Pattern Making Practical		2				60	40	100
06.	LPE-407	Polymer Science and Engineering	3	-	70	25	5			100
07.	LPE-408	Polymer Science and Engineering-Practical		2				60	40	100
08.	LPE-409	Environmental Science and Pollution Control	3	-	70	25	5		-	100
09.	LPE-410	Environmental Science and Pollution Control-Practical	-	2	-	-		60	40	100
10.	LPE-411	Leather Technology-II	3	-	70	25	5		-	100
11.	LPE-412	Leather Technology-II-Practical	-	4	-	-		60	40	100
12.	LPE-413	Production Planning and Quality Control	3	-	70	25	5			100
13.	LPE-415	Entrepreneurship and Business Development	3		70	25	5			100
14	LPE-416	Project Work and Seminar	-	2	-	-	-	75+	-	100
								25		
15.	LPE-418	Industrial Training [2 Months]	-	2	-	-		50		50
16.	LPE-420	Course Viva	-	2	-	-	-	50	-	50
Total			24	20	560	200	40	500	200	1500
A* = Course final examination; B*= In-course assessment ; C*= Attendance B** =Continuous assessment										
For Theoretical courses 1 Credit = 15 class										
For Practical courses 1 Credit = 30 class										

LPE-101: MANUFACTURING TECHNOLOGY OF LEATHER PRODUCTS-I

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the Course: This course begins with a look at the essential hand tools, equipments, machines, materials, embellishments, accessories and techniques that are needed to make different types of leather products. How to prepare different types of patterns and stitch are also included.

Course Objectives:

The objective of this course is to provide the best interpretation of modern leather products manufacture based on current scientific knowledge. The learning objectives of this course are

- To provide basic knowledge about different types of machines used for leather products making.
- To identify genuine leather and artificial leather.
- To acquire cutting techniques of leather and other materials
- To introduce different types of lining and reinforcement materials
- To learn various features of different seams.
- To obtain a comprehensive knowledge in the development of different types of pattern, etc.

Course Contents:

Introduction: Leather, hides and skin. Tanning process, vegetable tanning, oil tanning, mineral tanning, chrome tanning, dyeing, types of finishing, physical characteristics of different types of leather. Different parts and their properties of leather

Historical background & development of leather-products: Introduction, history of leather products, fashion, aspect of fashion, types of fashion, cultural influence in fashion, design, norms of design, leather products as apparel, types of leather product, specific leather for manufacturing of specific leather products, classification of leather goods.

Tools and equipment for leather-products manufacture: Introduction, cutting tools-knives rulers, shears or scissors, skiver, hammer, mallet, wooden block, engraving tools, stitching awl, masking tape, polisher, sander, nails, escutcheon pins, or tacks, hand saws, drill, rubber gloves, jewer's pliers, snap setter, rotary punch, drive punches, swivel knife, overstretch tool, dauber, awl, miter box, C-clamps, edge beveller, chisels, specific function of tools, other tools and equipment for modern leather-products manufacturing.

Pattern making: Introduction, Concept of pattern making, Classification of pattern, Indication of pattern, Copied pattern, commercial pattern, Ready to wear garments pattern, Transferring the pattern, free hand drawing, 3D-2D concept, allowance, two dimensional drawing, pattern making for hand bags, personal leather goods and belts. raw materials, tools and equipments. Rectangular pattern cutting, circular pattern cutting, different shaped Pattern making. Pattern joining.

Cutting operations for leather products : Introduction. Automatic cutting, defining cutting operations, Classifying cutting systems for leather goods, manual die cutters, NC die cutters, automatic die cutters, universal die cutters, advantages of automatic die cutting systems, die-less cutting system, specifications and architecture of cutting systems. advantages of continuous cutting systems, special cutting procedure for certain leather products .works to be done before cutting, during cutting and after cutting, qualification of a good cutter, pattern placement. cutting norms, wastage determination, types of wastage, principle of hand cutting, straight line, broken line cutting, advantage and limitation of cutting techniques used for the production of leather-products.

Splitting: Introduction, types and techniques of splitting, parts and function of splitting machine. Trouble shooting of splitting, procedure of splitting, process control of splitting, acceptance criteria of splitting. thickness adjustment, sharpening of blade, control during splitting and skiving.

Skiving : Introduction, types of skiving, parts and function of skiving machine. Trouble shooting of skiving, procedure of skiving, process control of skiving, acceptance criteria of skiving. Thickness adjustment, angular cutting, sharpening of bell knife. Adjustment of bell knife and pressure foot.

Hand stitching: Introduction, type of hand stitching, stitch marker, sewing needles, lacing needle, thimble stitching awl, thread, pliers, techniques of hand stitching.

Learning Outcomes: After completion of this course students will be able to –

- Identify genuine and artificial leather
- Know right accessories for right leather products
- Understand the concept of hand tools needed for leather products making
- Learn about various folding techniques for different lines
- Demonstrate and apply knowledge of basic leather products designing, including pattern making.
- Interpret the Features of Different types of seam etc.

References:

1. Anne & Jane Cope-Leatherwork
2. Carr & Latham-The Technology of Clothing Manufacture
3. Kirsten Jorgensen-Making Leather Clothes
4. Ben and Elizabeth Morris-Making Clothes in Leather
5. Sylvia Grainger-Leatherwork
6. Mary and E.A. Manning-Leatherwork
7. Francesca Sterlacei-Leather Apparel Design
8. Martin M. Shoben & Janet P. Ward-Pattern Cutting and making Up
9. Moseley, G.C-Leather Goods Manufacture
10. Batsford-Fashion with Leather
11. Hamlyn-Leatherwork –A step-by-step Guide.
12. Jane E. Garner-The Complete Handbook of Leather crafting.

**LPE-102: MANUFACTURING TECHNOLOGY OF LEATHER PRODUCTS-I
PRACTICAL**

Class per week	Credit	Marks
2	4	Continuous assessment : 40, Course final examination 60

Introduction to the Course: Practical demonstration is at all times the most effective method of conveying operative details to the receptive mind. This course provides the students a practical guide to make different types of leather products. Use of different types of tools and accessories, equipments and machines are included in this course. Preparation of patterns, techniques of cutting, splitting, skiving and construction of seams and folding techniques on different lines are also introduced.

Course Objectives: The learning objectives of this course are:

- To develop practical knowledge and skill in different machines used for leather products making.
- To compare between genuine leather from artificial leather.
- To acquaint with different types of embellishments, accessories, hand tools, lining and reinforcement materials.
- To learn different cutting techniques of leather.
- To familiarize with various folding techniques for different lines.
- To make different types of pattern.
- To construct different types of seam etc.

Course Contents:

Introduction of tools and their uses and tooling techniques.

Hand cutting Exercise on pattern paper:

Cutting practice with hand knife on Cutting Practice Sheet 01, Cutting Practice Sheet 02, Cutting Practice Sheet 03, Cutting Practice Sheet 04, Cutting Practice Sheet 05, Cutting Practice Sheet 06, Cutting Practice Sheet 07 and Cutting Practice Sheet 08.

Hand Cutting Practice on Synthetics/ Artificial Leather/ Coated fabrics:

Cutting practice on synthetics/ artificial leather/ coated fabrics with different types tin pattern and templates.

Machine Cutting Practice on Synthetics/ Artificial Leather/ Coated fabrics/Leather:

Cutting practice on synthetics/ artificial leather/ coated fabrics/leather with different types of single edge and double edge dies. Introduction on different types of sewing machine and its parts and function. Introduction on sewing machine needle, its parts and function. Sewing Practice on

different shaped line of supplied paper without thread with various machine. Sewing Practice on different shaped figure of supplied paper/ synthetics/leather with thread.

Upper Preparation:

Skiving- open raw edge skive, close raw edge skive, lapped skive, folded skive, lasting skive, corner skive, matrix skive, splitting, eyeleting, embossing, perforating.

Edge treatment:

Raw edge, Burnishing, Edging, Folding/ Beading (convex curve, concave, curve). Binding: i) English /U-Binding/Slipper binding/Flat Binding/channel binding. ii) French /Paris/ Hand turnover binding iii) Italian Binding. Slip beading, Bagged edge/Rolled Top line, Ghillie top line, collars, gimping and punching.

Seams:

Closed seam-plain closed seam, Brooklyn seam, French/Silked seam, Reversed Closed Seam, Welted seam, piped seam, Blind seam, Lapped seam-simple, welted ,piped.
Decorative seam: i) cable stitching. ii) Glove iii) Fancy and mock stitching.

Joining techniques: Hand stitching, thong or lacing technique, button or repeat attaching.

Pattern cutting: Introduction of pattern cutting technique, consideration of allowance, lining construction, working pattern making.

Learning Outcomes:

- This course will provide the opportunity of the basic practical skills to create fashion-forward, trendy, stylish and elegant leather products.

References:

1. Anne & Jane Cope-Leatherwork
2. Carr & Latham-The Technology of Clothing Manufacture
3. Kirsten Jorgensen-Making Leather Clothes
4. Ben and Elizabeth Morris-Making Clothes in Leather
5. Sylvia Grainger-Leatherwork
6. Mary and E.A. Manning-Leatherwork

7. Francesca Sterlacei-Leather Apparel Design
8. Martin M. Shoben & Janet P. Ward-Pattern Cutting and making Up
9. Moseley, G.C-Leather Goods Manufacture
10. Batsford-Fashion with Leather
11. Hamlyn-Leatherwork –A step-by-step Guide.
12. Jane E. Garner-The Complete Handbook of Leather crafting.

LPE-103: PHYSICAL CHEMISTRY

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the course: This is a course in basic Physical Chemistry for undergraduate student. With the development of a variety of exciting new areas of research involving computational chemistry, nano- and smart materials, and applications of the recently discovered graphene, there can be no doubt that physical chemistry is a vitally important field. It is also perceived as the most daunting branch of chemistry, being necessarily grounded in physics and mathematics as well as kinetics, thermodynamics and osmosis.

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

- Converting raw hides and skins into finished leather many chemical reactions are occurred in different steps in industrial process.
- Understanding chemical reactions, physical and chemical change of hides and skins during process.

Course Contents:

Dilute solution: Colligative properties- lowering of vapor pressure, elevation of boiling point, depression of freezing point, osmotic pressure and osmosis, deduction of their chemical formula & molecular weight from Raoult's Law, their experimental determination.

Thermodynamics: Work, heat, energy, internal energy and enthalpy, some thermodynamic terms, first law of thermodynamics, reversible and irreversible processes, isothermal and

adiabatic expansion of ideal gas, molar heat capacity at constant pressure and constant volume and their relation, second law of thermodynamics, spontaneous process, entropy, entropy changes for ideal gas, Carnot's cycle, free energy and work function, Gibbs-Helmholtz's equation.

Photochemistry: Laws of photochemistry, quantum yield, decomposition of hydrogen halide, photosensitized reaction, fluorescence and phosphorescence, luminescence, chemiluminescence.

Surface chemistry: Adsorption, de-sorption and absorption, physical and chemical adsorption, types of adsorption isotherms, adsorption of gas by solid, adsorption of solid from solution, application adsorption.

Colloid: Classification, general methods of preparation and purification, general properties (Physical, colligative, kinetic, optical and electrical properties) of sol, protective action and application of colloid, emulsion, types and preparation of emulsion, emulsifier, stability of emulsions.

Chemical kinetics: Rate of reactions, order and molecularity, determination of order of reactions, temperature dependence of reaction rate, simple theories of reaction rate, energy of activation, collision theory of reaction rates, complex reactions: (i) reversible or opposing reactions, (ii) side reactions or parallel reactions, (iii) consecutive reactions.

pH and its determination : pH and buffer solutions, standard buffers, methods of determining the pH, accuracy of pH measurements, colourimetric determination of pH, universal indicators, potentiometric determination of pH, hydrogen electrode as pH indicating electrode, advantages and disadvantages of hydrogen electrode, glass electrode as pH indicating electrode, factors affecting pH measurements with the glass electrode, advantages and disadvantages of glass electrode, pH meters- potentiometric, portable pH meters.

Learning Outcomes: After completion of this course the students will be able to explain:

- Colligative properties, Raoult's law and related problems
- Thermodynamic laws, solve problems on enthalpy changes, heat of reactions, Carnot cycle, entropy, etc.

- Laws of Photochemistry, Photoluminescence and Chemiluminescence, Quantum Yield, Photosensitized reactions.
- Adsorption processes with reference to Langmuir Freundlich and other isotherms and their application.
- Detail mechanism, preparation and properties of colloid formation, Implication of HLB values of surfactants and selection of surfactants.
- Rate equation of chemical reactions with graphical plots and significance, half-life of chemical reactions, activation energy and its significance, role of catalysts in chemical reactions, related problems.
- pH and its implications, determination of pH applying potentiometric method, different type of electrodes and their uses.

References:

1. G. M. Barrow- Physical Chemistry.
2. W. J. Moore- Physical Chemistry.
3. Bahl And Tuli- Essentials Physical Chemistry.
4. Sharma and Sharma- A Text Book of Physical Chemistry.
5. S. Glasstone-Text Book of Physical Chemistry.
6. P. W. Atkins- Physical Chemistry.
7. Robert A. Alberty- Physical Chemistry.
8. Taylor and Taylor- Elementary Physical Chemistry.
9. Moron and Lando- Fundamentals of Physical Chemistry.
10. Donald H. Andrews- Introductory Physical Chemistry.
11. Ira N. Levine- Physical Chemistry.
12. J. Bruce Brackenridge & Robert M. Rosenberg- The Principle of Physical Chemistry.
13. Palit- Elementary Physical Chemistry.
14. B. D. Khosla- Physical Chemistry.
15. N. Kundu & S. K. Jain- Physical Chemistry.
16. Samuel H. Maron & Carl F. Prutton- Principle of Physical Chemistry.
17. Joseph H. Noggle- Physical Chemistry.
18. M. Mahbulul Haque & M. Ali Nawab- Principle of Physical Chemistry.

LPE-105: INORGANIC CHEMISTRY

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the course: Inorganic chemistry represents the traditional core of chemistry, with a history traceable over thousands of years. Inorganic Chemistry is not an isolated branch of chemistry. This core science is fully integrated with other areas of chemistry such as organic, physical and analytical chemistry. It deals with the chemistry of all non-organic compounds, and mainly involves the chemistry of metals and especially transition metals. It covers a broad range of subjects, among which are atomic structure, periodic properties of the elements, chemical bonding, acid-base reactions, chemical reactions, crystallography, coordination compounds, ceramics, and the various subdivisions of electrochemistry (electrolysis, battery science, corrosion, semiconduction, etc.). Inorganic and organic chemistry often overlap, such as, chemical bonding applies to both disciplines, electrochemistry and acid-base reactions have their organic counterparts, catalysts and coordination compounds may be either organic or inorganic.

Course Objectives

- In the present text the descriptive materials have been reduced to the minimum and emphasis will be given to conceptual approach of inorganic chemistry.
- This course serves as a cursory to understand the basic concepts involved in inorganic chemistry including periodic properties, acid-base reactions, redox reaction, chemical bond, transition metals and coordination chemistry that will prepare the student for advanced coursework in chemistry.
- It explores the unknown world of atoms and molecules and different types of bond exist among them.
- The course will provide a foundation for further education in chemistry directed towards materials, energy technology and process chemistry.

Course Contents:

Periodic classification: Periodic classification of the elements, general survey of the elements including transition and rare earth elements, periodic nature as related to atomic structure, group properties, periodic nature of some important properties.

Oxidation and reduction reaction: Classification of chemical reactions with special reference to oxidation and reductions, oxidation number and oxidation state, difference between oxidation number and valance, oxidizing agent and reducing agent, equations involving oxidation-reduction reactions.

Acid-Base concept: Early concepts, Arrhenius concept, Bronsted-Lowry concept of acid and bases, Lewis acids and bases, acid and base strength, pH and pH scale, buffer solution and its mechanism, hard and soft acids and bases, acid base indicator.

Transition metal: General chemistry of transition elements with reference to Chromium, Titanium, Zinc, Iron, Cadmium, Nickel, Cobalt, chemical natures and application with special reference to leather production.

Co-ordination chemistry: Coordination or complex compounds, ligands or co-ordinating groups, coordination number, coordination sphere, chelate complexes, application of chelates, nomenclature of coordination compounds, isomerism-structural, geometrical, optical, optical isomerism in 6-coordinate complexes, Werner's coordination theory, effective atomic number (EAN), limitation of EAN rules, valence bond theory (VBT) of structure of inorganic complex with simple examples, crystal field theory (CFT), application of crystal field theory color of transition metal complexes.

Chemical Bond: Introduction, octet rule or rule of eight, ionic or electrovalent bond, covalent bond dipole moment, polarization of ions, Fajan's rule, co-ordinate bond, metallic bond, hydrogen bond, Van der Waal's forces.

Inorganic Salts used for Tannings: Chromium salts, its behavior in solution, oxidation rate, complex form of trivalent Ti.

Learning Outcomes:

After completing the lectures the students are benefited in the following ways

- Students create critical thinking and the development of the spirit of inquiry in their minds.
- These factors are essential for the acquisitions of higher studies and specialized knowledge for useful practical applications of chemical principles.

- The students will have sufficient knowledge on the basic concept of inorganic chemistry so that they can be able to explore their knowledge in future specially in chemistry.

References:

1. G. F. Lipotrot- Modern Inorganic Chemistry.
2. F. Albert Cotton, Geoffrey Wilkinson, Paul L. Gaus- Basic Inorganic Chemistry.
3. Esmarch S. Gilreath- Fundamental Concepts of Inorganic Chemistry.
4. S. Z. Haider- Introduction to Modern Inorganic Chemistry.
5. H. J. Emeleous & A. G. Sharpe- Modern Aspects of Inorganic Chemistry.
6. R. D. Madan- Modern Inorganic Chemistry.
7. A. K. De- A Text Book of Inorganic Chemistry.
8. Manas Chanda- Atomic Structure and Chemical Bond.
9. K. N. Upadhyaya- A Text Book of Inorganic Chemistry.
10. R.D.Madan, Tuli, Basu, Sharma- Advanced Inorganic Chemistry.

LPE-107: ORGANIC CHEMISTRY

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the course: Organic chemistry is the study of "living" things—not in the same way that biology is the study of life. Rather, organic chemistry takes a look at what composes the living things, and how they're structured. Organic chemistry breaks down living things not only into organs seen in organisms, but goes a step further to break down those organs into atoms and molecules. It focuses mainly on carbon, which is highly essential to maintaining life, and particularly zeroes in on the hydrocarbon, which is a molecule composed of hydrogen and carbon. Hydrocarbons not only compose what we're made of, but also what we consume, including carbohydrates, proteins, steroids, fats, and more. As a matter of fact, it may be surprised to know that everyday things, such as leather, paint, dye, adhesive and plastic are all composed of hydrocarbons.

Course Objectives:

- The course will provide the important topics in Organic chemistry characteristic reactions, isomerism, functional groups including aromatic compounds, phenols, carboxylic acids and its derivatives, aldehydes & ketones, amines, and ester synthesis.
- This helps students to gain experience to predict the functional group transformations, simple reaction mechanisms, and the synthesis of organic molecules by multi-step synthesis strategies.
- In addition of that, the course will also help students to understand the leather based reaction.

Course Contents:

Characteristic reactions and reaction mechanism of organic compounds: Types of organic reactions, fundamentals of organic reaction mechanism (Fission of bond, carbonium ion, carbanion), factors affecting organic reaction, attacking reagents and its role (electrophile and nucleophile), broad concept of the mechanism of substitution, elimination and addition reactions, reaction kinetics, energy requirements of organic reaction, mechanism of different reactions, nucleophilic substitution: SN^1 and SN^2 reactions, electrophilic substitution reaction, free radical substitution reaction, addition reaction:- nucleophilic, electrophilic and free radical addition reaction, elimination reaction:- E_1 and E_2 reactions.

Isomerism: Classification of isomerism, classification of stereoisomerisms, optical isomerism:- plane polarized light, specific rotations, isomerism of substance containing one and two asymmetric carbon atoms, D.L. and R.S. configuration. Geometric isomerism- condition for geometric isomerism, determination of configuration of cis-trans isomerism.

Functional groups: Different functional groups of organic compounds, reactivity of functional groups, activation and de-activation of functional groups, positioning of functional groups and its importance on chemical and physical nature of organic compounds.

Monocyclic aromatic hydrocarbon: Benzene, structure of benzene, Kekule structure, nomenclature, stability of benzene ring, resonance energy, delocalization, aromaticity-conditions and theories, substitution of benzene ring, mechanism of aromatic substitution.

A. A thorough study of the following benzene derivatives: Structure, preparation, reactivity and uses of -

- i) Halogen compounds- fluoro and chloro- chemicals.
- ii) Hydroxy compounds- phenol, β -naphthol, cresol, anthrasol.
- iii) Nitro compounds-nitro benzene and its derivatives.

B. A through study of the following class of compounds-

- i) Aldehydes and Ketones (Formaldehyde, acetaldehyde, glutaraldehyde, acetone).
- ii) Aliphatic mono and di-carboxylic acids (Formic acid, acetic acid, acrylic acid, oxalic acid and succinic acid) and their important derivatives (Amide, ester, etc.).

Atmospheric Pollutants: Organic solvent vapours, isocyanate vapours, rubber fume.

Renewable Resources and green footwear: Upper and lining materials, sole units, insole boards, sewing threads and adhesives, packaging.

Safety audit checking: walking or working areas, storage lofts, second floor, etc, stairs and ladders, egress, occupational health and environmental control. Occupational noise exposure, hazardous materials, general environmental controls.

Management of emergency situations: basic first aid, spillage of chemicals, fires, machinery safety.

Learning Outcomes: Students will gain an understanding of

- the hybridization and geometry of atoms and the three-dimensional structure of organic molecules the fundamental properties.
- reactivity and stability of an organic molecule based on structure, including conformation and stereochemistry an understanding of nucleophiles, electrophiles, electronegativity, and resonance the prediction of mechanisms for organic reactions.
- use their understanding of organic mechanisms to predict the outcome of reactions?
- design syntheses of organic molecules?
- the atmospheric pollutants, renewable resources, green footwear, safety audit checking and management of emergency situation in the leather products industries.

References:

1. Morrison and Boyd- Organic Chemistry.
2. B. S. Bahl and Arun Bahl- Organic Chemistry.

3. I. L. Finar- Organic Chemistry.
4. Andrew Streitwieser, Clayton H. Heathcock, Edward M. Kosower- Introduction to Organic Chemistry.
5. Philip Mathews- Advanced Chemistry.
6. Amend, Mundy, Arnold- General Organic and Biological Chemistry.
7. Solomons- Organic Chemistry.
8. Stanley H. Pine- Organic Chemistry.
9. Michael B. Smith- Organic Chemistry.
10. P. S. Kalsi- Organic Reactions and Their Mechanism

LPE-108: CHEMISTRY PRACTICAL

Class per week	Credit	Marks
2	4	Continuous assessment : 40, Course final examination 60

Introduction to the course: The aim of this course is to analyze inorganic salts, organic compounds and preparation of some inorganic compounds and quantitative analysis by titration. The qualitative analysis of single salt consists of preliminary research and analysis of cation and anion separately. The analysis and identification of unknown organic compounds constitutes a very important aspect of experimental organic chemistry.

Course Objectives: The general concept of the practical part of this course is:

- Train students the fundamental laboratory skills.
- This includes the practical work of qualitative and quantitative analysis techniques with some simple inorganic preparations which are required for experimental chemistry.
- The students will acquire skills to observe and record scientific experiments.
- They will familiarize themselves with the laboratory equipment, various chemicals, and set up various instruments to ensure safe.

Course Contents:

Inorganic:

1. Qualitative analysis of inorganic mixtures containing not less than four radicals including the interfering and insoluble radicals by classical or semi-micro methods; Preliminary and Confirmation tests for the following ions: -

a) Anions: Chloride, bromide, iodide, sulphide, sulphite, sulphate, carbonate, nitrate, nitrite, formates, oxalates, acetates.

b) Cations: Lead, copper, zinc, cobalt, calcium, sodium, barium, magnesium, nickel, aluminium, chromium, manganese, iron, tin, arsenic, bismuth, potassium, ammonium, silver, mercury, cadmium, zirconium, titanium.

2. Volumetric analysis:

(A) Acidimetry-Alkalimetry:

- i) Preparation of standard solutions of sodium thio-sulphate, sodium carbonate, oxalic acid.
- ii) Standardization of hydrochloric acid with standard sodium carbonate solution
- iii) Determination of degree of alkalinity.

(B) Oxidation -Reduction Titration:

- i) Preparation and standardization of KMnO_4 using standard $(\text{COOH})_2$ or sodium oxalate.
- ii) Determination of ferrous (II) ion using $\text{K}_2\text{Cr}_2\text{O}_7$ solution as primary standard titrant.

(C) Iodometric Titration:

- i) Standardizing sodium thiosulphate solution using dichromate solution.

3.Organic Practical:

Qualitative analysis: Identification of organic compounds containing one functional group out of the following compounds: ethyl alcohol, isopropyl alcohol, phenol, acetone, acetaldehyde, formaldehyde, formic acid, acetic acid, oxalic acid, benzoic acid, aniline and nitrobenzene.

Analysis should include the following:

- i) Physical examination
- ii) Melting point and boiling point
- iii) Detection of sulphur, nitrogen and halogen in an organic compound
- iv) Solubility in the following solvents only-
 - a) Water

- b) 5% solution on $\text{NaHCO}_3/\text{NaOH}$ and HCl acid
- c) Conc. H_2SO_4
- d) Acetone
- e) Isopropyl alcohol
- f) Detection of different functional groups: $-\text{OH}$, $>\text{C}=\text{O}$, $-\text{CHO}$, $-\text{NH}_2$, $-\text{NO}_2$, COOH .
- v) Detection of different functional groups: $-\text{OH}$, $>\text{C}=\text{O}$, $-\text{C}=\text{O}$, $-\text{CHO}$, $-\text{NH}_2$, $-\text{COOH}$

4. Inorganic crystal Preparation Practical:

- a) Inorganic Preparation: Alum, ferrous ammonium sulfate, potassium carbonate, basic chromium sulphate, potassium permanganate, chrome yellow.

Learning Outcomes: Students will gain an understanding of:

- the use of an analytical balance graduated cylinders, graduated pipettes, and volumetric pipettes, thermometers and temperature probes, pH meters.
- quantitative and qualitative analysis of Inorganic salts and organic compounds and prepare some inorganic compounds.

References:

1. A. I. Vogel -Elementary Practical Organic Chemistry, Part -1: Small Scale Preparation.
2. A. I. Vogel-Elementary Practical Organic Chemistry, Part-2: Qualitative Organic Analysis.
3. A. I. Vogel-Elementary Practical Organic Chemistry, Part-3: Quantitative Organic Analysis
4. A. I. Vogel- A Text Book of Practical Organic Chemistry, ELBS 6th Edition.
5. A. Jabbar Mian and M. Mahbulul Haque-Practical Chemistry.
6. N. Haque and M. Uddin -Practical Chemistry Introduction.
6. H. Dupont Durst, George W. Gokel-Experimental Organic Chemistry.
7. M. Latimer, E. Powell -A Laboratory Course of General Chemistry.
8. Alan Sherman, J. Sherman, Russikoff-Laboratory Experiment of Basic Chemistry.
9. J. B. Yadav-Advanced Practical Physical Chemistry.
10. Gert G. Schlessinger -Inorganic Laboratory Preparations.
11. A. Khalique- A Text Book of Practical Chemistry.
12. A. Faraday -Practical Physical Chemistry.

13. G. Svehla- Vogel's Qualitative Inorganic Analysis.
- 14.N. K. Vishnoi -Advanced Practical Organic Chemistry.
- 15.Hein, Best, Miner-Foundation of Chemistry in the Laboratory.

LPE-109: PHYSICS

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the course: Physics is one of the most fundamental branches of all sciences which is the basis of our scientific knowledge of the physical world. Physics course is offered to all the undergraduate students of the Institute of Leather Engineering and Technology. This course is designed to cover most of the core scientific fundamentals of physics, basic electrical and mechanical engineering principles. Main contents of this course are elasticity, surface tension, heat and thermodynamics, optics, static and current electricity, and modern physics. This course will help the students to identify, formulate and solve problems related to their core subjects.

Course Objectives: Objectives of this course are to:

- Provide a broad training in physics and demonstrate the students on various skills including; expertise with core physics concepts and their applications to relate the physical phenomenon with the practical problems in engineering purposes, proficiency in problem solving, critical thinking, and analysis.
- In future it will help the students to function effectively in laboratory environment and pursue independent research towards the development of new devices and products using sophisticated physical concepts.

Course Contents

Elasticity: Rigid body, perfectly elastic body, plastic body, stress and strain, elastic limit and elastic fatigue, Hooke's law and different elastic constants-moduli of elasticity, poisson's ratio, determination of elastic constants factors affecting elasticity.

Surface Tension: Surface energy and surface tension, excess of pressure inside a spherical liquid drop, capillarity.

Optics: Light and light sources, electromagnetic spectrum, prism and dispersion of light, power of a lens, defects of images, spherical aberration, astigmatism, coma, curvature and distortion., chromatic aberration, optical instruments: compound microscope, polarizing microscope, camera and photographic techniques, spectrophotometer, Interference of light, Fresnel's bi-prism, Newton's rings, diffraction of light: Fresnel and Fraunhofer diffraction, diffraction gratings, resolving power of a grating, polarization, polarized and unpolarized light, polarization by reflection and refraction, Brewster's law, double refraction, nicol prism, polarization by scattering, scattering of light, optical rotation, polarimeter.

Transmission of heat: Conduction, convection and radiation, thermal conductivity of solids and liquids, coefficient of thermal conductivity, good and bad conductor of heat, determination of thermal conductivities of bad conductors- Lee's method.

Radiation: Electromagnetic theory of radiation, black body radiation, emissive power and absorptive power, Kirchoff's law of radiation and its experimental verification, displacement law, Stefan Boltzmann law, quantum theory of radiation, Plank's law, Raleigh-Jeans's law, Planck's radiation pyrometers, temperature of the sun, solar constant.

Static electricity: Electric charge, Coulomb's law, electric field- calculation of the electric field strength due to a point charge, intensity of electric fields, electric dipole, electric flux and Gauss's law, potential and field strength, equipotential surface, potential due to a point charge, capacitor and dielectrics, combination of capacitors in series and parallel, dielectrics and Gauss's law, three electric vectors, energy storage in an electric field.

Current electricity: Electromotive force, electric current and current density, electric circuits, resistance, resistivity and conductivity, Ohm's law, energy transfer in an electric circuit- Joules law. Combination of resistances, Kirchoff's laws, Wheatstone bridge, varying current, growth and decay of currents in LR, CR and LCR circuits, magnetic field due to a current, Ampere's law, magnetic induction for a solenoid, magnetic induction near a long wire, Ampere's circuital law, electromagnetic induction-Faraday's laws, Lenz's law, Leus's law and the law of conservation of energy, Fleming's right hand rule, eddy current, self and mutual induction, unit

of inductance. Alternating currents- concept of r.m.s. and average values of alternating current and voltage, A-C circuits containing LR, CR and LCR in series, calculation of expression for current and power, power factor, resonance.

Modern physics: The atomic structures, atom models, orbital energy, radioactivity, laws of radioactive disintegration, half life and mean life, laws of successive disintegration, alpha, beta, gamma and X-ray and their applications, photoelectric effect, Compton effect, Plank's radiation formula, Einstein's photon theory.

Learning outcomes: Successful completion of this course will help students with following outcomes

- Work efficiently in leather, leather products, and footwear industries where proper application of engineering knowledge requires the basics of physics.
- Skills for a successful career as well as to collaborate with other to solve problems with critical thinking and effective communication.
- Entrance to entry level research and development positions in industry.
- Recognition for students in other majors who wish to enhance their understanding and mastery of a broader range of subjects than is provided in their core courses alone.
- Ability to communicate their ideas with others and function effectively in multidisciplinary terms.
- Start career as a practicing engineer in fields such as design, research, development, testing, manufacturing, operations, and service systems.

References:

1. C. L. Arora -B.Sc. Physics, Vol-I & II.
2. Charles Kittel/Herbert Kroemer -Thermal Physics.
3. Resnick/Halliday/Krane-Physics, Vol I & II.
4. Alvin Hudson/Rex Nelson-University Physics.
5. Arther Beiser-Concepts of Modern Physics.
6. David Halliday/Robert Resnick/Jearl Walker-Fundamentals of Physics.
7. Harvey E.White/Francis A. Jenkins-Fundamentals of Optics.
8. D.W.Tenquist/R. M. Whittle/J. Yarwood-University Optics.
9. S.C.Arrora/S. Domkundwar-A Course in Heat & Mass Transfer.
10. Marcelo Alonso/Edward J. Finn-Physics.

LPE-110: PHYSICS PRACTICAL

Class per week	Credit	Marks
1	2	Continuous assessment : 40, Course final examination 60

Introduction to the course: Physics is one of the most fundamental branches of all sciences which is the basis of our scientific knowledge of the physical world. Physics practical course is offered to all the undergraduate students of the Institute of Leather Engineering and Technology. This course is designed to cover experiments and laboratory apparatus related to some of the core scientific fundamentals of physics and basic electrical engineering principles. For instance, modulus of rigidity, Young's modulus, acceleration due to gravity, thermal conductivity, specific heat, electrochemical equivalent, mechanical equivalent of heat, post office box, galvanometer, ammeter, voltmeter, Ohm's law, refractive index, diffraction grating, wavelength of light, magnetometer, velocity of sound. It will help the students to be able to design and conduct experiments, as well as to analyze and interpret data. It will also help the students to identify, formulate and solve problems related to their core subjects.

Course Objectives: Objectives of this course are to

- Provide a broad training in physics with laboratory experiments and demonstrate the students on various skills including; expertise with core physics concepts and their applications to relate the physical phenomenon with the practical problems in engineering purposes, proficiency in measurements and dimensioning, critical thinking and data analysis.
- In future it will help the students to function effectively in laboratory environment and pursue independent research towards the development of new devices and products using sophisticated physical concepts.

Course Contents:

1. Determination of the radius of curvature of a lens by Newton's ring method (wavelength of light to be given).
2. Determination of the refractive index of a material of a given prism by a spectrometer.
3. Determination of the grating constant of a plane diffraction grating.
4. Determination of the specific sugar solution (at six different concentrations) with the help of a polarimeter.

5. Determination of the value of M and H by magnetometer.
6. Verification of the laws of combination resistance by P.O. Box (at least three different resistance, are to be used).
7. Determination of the resistance of a galvanometer by half deflection method.
8. Determination of the figure of merit (current sensitivity) of a galvanometer.
9. Measurement of low resistance by ammeter and voltmeter.
10. Verification of Ohm's law.
11. Determination of the value of low resistance by the method of fall of potential.
12. Determination of the electrochemical equivalent (ECE) of copper-by copper voltameter.
13. Determination of the J (mechanical equivalent of heat) by electrical method.
14. Determination of the temperature coefficient of resistance of a coil.
15. Graphical representation of the variation of the elongation of the given wire with load and determination of the Young's modulus of the material of the wire by Searle's apparatus.
16. Determination of the modulus of rigidity of a cylindrical wire by dynamic method.
17. Determination of the value of "g" by Kater's reversible pendulum.
18. Determination of the thermal conductivity of rubber.
19. Determination of the thermal conductivity of bad conductor by Lee's method.
20. Determination of the specific heat of a liquid by the method of cooling.
21. Determination of the velocity of sound at N.T.P by resonance column.
22. Determination of the frequency of a tuning fork by Meld's experiment (use either transverse or longitudinal arrangement).

Learning Outcomes: Successful completion of this course will help students with following outcomes:

- Work efficiently in leather, leather products, and footwear industries where proper application of engineering knowledge requires the basics of physics.
- Ability to design and conduct experiments, as well as to analyze and interpret data.
- Entrance to entry level research and development positions in industry.
- Recognition for students in other majors who wish to enhance their understanding and mastery of a broader range of subjects than is provided in their core courses alone.
- Ability to communicate their ideas with others and function effectively in multidisciplinary terms.

- Start career as a practicing engineer in fields such as design, research, development, testing, manufacturing, operations, and service systems.

References:

1. C. L. Arora -B.Sc. Physics, Vol-I & II.
2. Charles Kittel/Herbert Kroemer -Thermal Physics.
3. Resnick/Halliday/Krane-Physics, Vol I & II.
4. Alvin Hudson/Rex Nelson-University Physics.
5. Arther Beiser-Concepts of Modern Physics.
6. David Halliday/Robert Resnick/Jearl Walker-Fundamentals of Physics.
7. Harvey E.White/Francis A. Jenkins-Fundamentals of Optics.
8. D.W.Tenquist/R. M. Whittle/J. Yarwood-University Optics.
9. S.C.Arrora/S. Domkundwar-A Course in Heat & Mass Transfer.
10. Marcelo Alonso/Edward J. Finn-Physics

LPE-112: ENGINEERING DRAWING

Class per week	Credit	Marks
1	2	Continuous assessment : 40, Course final examination 60

Introduction to the course: Engineering Drawing is a performance based practical course. It makes in students the idea of planning of productions, precision of measurement and dimension, difference in 2D and 3D drawing etc.

Course Objectives:

- To draw orthographic views (2D) from isometric view (3D) with precision;
- To perform Development Drawing;
- To perform the product design and layout drawing

Course Contents:

Introduction, Drawing equipment and the use of instruments; Basic drafting techniques and standards; Geometrical curves including plane curves; Cycloid, Hypocycloid, and the Involute. Intersections at various positions of geometrical bodies such as prisms, pyramids, cylinders and

cones. Development of surfaces of prisms. Pyramids, cylinders, cones, drum, gear-box guard, knife-guard, coating machine, hand spray, spray coater, roller coater, etc. Freehand sketching of machine and engine components; Locking arrangements; Foundation bolts; Stuffing box; Shaft couplings; Foot-step bearing; Pulleys; Engine connecting rod. Concept of working drawing of component parts of machines and engines; Size, description, dimensions, and specifications; limit dimensioning and geometric tolerance; limits; Fits and tolerances, conventional symbols. Sectioning of machine and engine components; Orthographic projections and standard practices Isometric views with particular reference to piping and ducting; Layout drawing of a modern tannery.

Learning Outcomes: From the practice of the course a student can perform to

- Draw orthographic views (2D) from isometric view (3D) with precision;
- Perform Development Drawing;
- Perform the product design and layout drawing of a modern Footwear Industry.

References:

1. Spencer and Hill-Technical Drawing
2. Mandal., Dr. Amalesh Chandra and Islam., Dr. Md. Quamrul-Mechanical Engineering Drawing
3. Giesecke, F.E. and et al, “Technical Drawing”, 7th Edition, 1985, McMillan Publishing Co., Inc., New York.
4. French, T.E., Vierck, C.J. and Foster, R.J., “Engineering Drawing and Graphic Technology”, 14th Edition, 1993, McGraw Hill International Edition, U.S.A.
5. Dhawan.,R.K.; “Engineering Drawing”
6. Parkinson.,A.C.; “A First Year Engineering Drawing”
7. Verma.,C.L.; “Engineering Drawing”
8. Gupta.,R.B.; “A Text Book of Engineering Drawing”

LPE-113: COMPUTER AND INFORMATION ENGINEERING

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the course: This course discusses the fundamental knowledge of computer and Information Technologies. It covers computer hardware as well as with computer software with the internal mechanism of hardware and the development process of a software system and its classifications. Additionally, it also discusses the basic of a computer network with its classification and the peripheral devices used in networking. It also describes the Internet and the basic of mobile and wireless communication technology.

Course Objectives:

The course is designed to aim at imparting a basic level computer knowledge for the students. After completing the course the incumbent is able to understand how a computer operates,

- How does everything work on the computer?
- How does a computer process and store data?
- Moreover, students will learn the basic knowledge on a computer network and other associated things related computers.
- The computer for basic purposes of preparing his personal/business letters, viewing information on Internet (the web), sending emails, using internet banking services etc.

Course Contents:

Introduction to computer: History and development of computer, types of computers, Scope of computer, impact of computers on society and technology, working principle of a computer system, single and multi-user systems.

Hardware: Organization and architecture, motherboards & microprocessors, memory units: primary memory, secondary memory, Input/ Output device, other peripheral devices like pointing devices, display devices, printing devices etc

System software: Operating system concepts, importance, components and basic functions of DOS, Windows and LINUX operating systems.

Application software: Desktop publishing: Desktop publishing includes effective page layout techniques, ways to add graphics, manipulating text and print. Word processing: Word processing software includes creating documents, printing documents, changing the appearance of text or lines of text, changing page formats and other writing tools. Spreadsheets: Spreadsheets software includes basic concepts of spreadsheets, making basic worksheets entries, entering formulas to perform calculations, altering column options, working with ranges versus all of the worksheets, basic print options, file commands and basic graphing. Database: Database management system, database concepts, creating a database file structure, entering and editing data, displaying, organizing and printing data, modifying the data structure, creating queries and building and printing custom reports or forms.

Maintenance: Power supply stability, grounding, effects of surge, sag current and its protection, classification of stabilizer and UPS, effect of static charge on computer devices, handling of computers cards and chips, computer viruses and protections, operating system setting, disk-partitioning, software troubleshooting and maintenance.

Computer networks: Concepts of network, different types of network, study of LAN concepts and operation, hardware and software for networks, data transmission, network architectures, protocols and standards are examined, as well as install and uninstall network components and peripheral devices, study of connectivity between LAN and wide area networks.

Internet: Worldwide web including navigating the internet, task-oriented skill sessions on logging on, Internet services: Telnet, FTP, e-mail, www, internet, Intranet etc.

Mobile and wireless Communication: 1G, 2G, 2.5G and 3G mobile, GSM and CDMA, bluetooth, WiFi Max etc.

Learning Outcomes:

- Makes students aware of the computer and information Technologies, their internal mechanism and classifications.
- Teaches the basic of the Internet, mobile, and wireless communications.
- Describes the software development process and networking.

References:

1. S. Frence- Computer Science.

2. Warford- Computer Science.
3. Peter Norton – An Introduction to Computer Science
4. L. Rosch- Hardware Bible, Baraddy Publishing, Indianapolis.
5. Clive Finkelstein – An Introduction to Information Engineering
6. Ian Macdonald - Information Engineering
7. James Martin - Information Engineering: Introduction

LPE-114: COMPUTER AND INFORMATION ENGINEERING PRACTICAL

Class per week	Credit	Marks
1	2	Continuous assessment : 40, Course final examination 60

Introduction to the course: This course reifies the fundamental knowledge of computer and information Technologies to the students. It teaches Office Word, Excel and PowerPoint to the students. After completing the course, students can able to write reports in a more better and organized way, can make power point presentation, and finally become capable of performing excel operations for their different purposes. It also teaches students how to use the internet in a better way and how to be safe while using social networking and browsing the internet.

Course Objectives: This course teaches to students:

- Office Word, Excel and Power Point.
- Describes the basic of preparing his personnel/business letters, viewing information on Internet (the web), sending emails, using internet banking services etc.

Course Contents:

Operating system: Students will learn how to operate a computer in two basic environments- dos and windows and to install DOS, windows operating system. Word processor: students will learn to use a popular word processor to create a camera-ready test file complete with figures, columns and tables. Spread sheet: students will learn how to use a popular spread sheet to maintain a minor book keeping, statistical and graphical analysis off data. Database: students will learn how to design a database structure/table. Computers assemble: students will assemble a computer. Internet: e-mail access, browsing, downloading.

Learning Outcomes:

- Students learn how to operate a computer in two basic environments- dos and windows and to install DOS, Windows operating system.
- Students learn to use a popular word processor to create a camera-ready test file complete with figures, columns, and tables.
- Students learn how to use a popular spreadsheet to maintain a minor book keeping, statistical and graphical analysis of data.
- Students learn how to design a database structure/table.
- Students assemble a computer. Internet: e-mail access, browsing, downloading.

References:

1. S. Frence- Computer Science.
2. Warford- Computer Science.
3. Peter Norton – An Introduction to Computer Science
4. L. Rosch- Hardware Bible, Baraddy Publishing, Indianapolis.
5. Clive Finkelstein – An Introduction to Information Engineering
6. Ian Macdonald - Information Engineering
7. James Martin - Information Engineering: Introduction

LPE-115: MATHEMATICS-I

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction: Mathematics-I course is primarily concerned with developing the students' understanding of the concepts of matrix and calculus that providing experience with its methods and applications. The course emphasizes a multi representational approach to calculus and system of linear equations, with concepts, results, and problems being expressed geometrically, numerically, analytically, and verbally. The connections among these representations also are important. Broad concepts and widely applicable methods are emphasized.

Technology should be used regularly to reinforce the relationships among the multiple representations of functions, to confirm written work, to implement experimentation, and to assist in interpreting results. Through the use of the unifying themes of derivatives, integrals, limits, approximation, and applications and modeling, the course becomes a cohesive whole rather than a collection of unrelated topics. These themes are developed using all the functions listed in the prerequisites.

Specific Objective:

- Learn to find the determinant of a matrix, inverse matrix, and use them to solve the system of linear equations.
- Learn to find the vectors properties and use them in applications.
- Learn to find and use limits of functions, continuity & derivatives of functions.
- Learn to find the derivatives of elementary algebraic functions and trigonometric functions.
- Learn to use derivatives for graphing algebraic and trigonometric functions and to solve optimization problems.
- Learn to evaluate definite and indefinite integrals and use them in applications.

Course Contents:

Algebra: Determinant, matrix, inequalities.

Vector algebra and vector calculus: Introduction, scalar and vector products, solutions of vector equations, applications of vectors in geometry, vector calculus: vector function of scalar variables, differentiation of vector functions: grad, div and curl of functions, line, surface and volume integrals: green, gauss and stokes theorems-verification and applications.

Differential calculus: Functions of real variable and their graphs, limit, continuity and derivative, physical meaning of derivative of a function, evaluation of indeterminate forms of limit, L' Hospital's theorem, 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, functions of two and three variables, partial and total derivatives, Euler's theorem, concavity and convexity of a function.

Integral calculus: Definition of integration, integration by the method of substitution, integration by parts, standard integrals, method of successive reduction, definite integral, its properties and use in summing series, Walli's formulae, improper integral, beta function and gamma function, area under a plane curve in Cartesian and polar coordinates, area of the region enclosed by two curves in Cartesian and polar coordinates, Trapezoidal rule, Simpson's rule, area, lengths of curves in Cartesian and polar coordinates, parametric and pedal equation, intrinsic equation, volumes of solids of revolution, volume of hollow solids of revolution by shell method, area of surface of revolution.

Learning Outcomes: Upon successful completion of this course students will be able to:

- Use computational techniques and algebraic skills essential for the study of systems of linear equations, matrix algebra, vector spaces, eigenvalues and eigenvectors, orthogonality and diagonalization. (Computational and Algebraic Skills).
- Critically analyze and construct mathematical arguments that relate to the study of introductory linear algebra. (Proof and Reasoning).
- Use technology, where appropriate, to enhance and facilitate mathematical understanding, as well as aid in solving problems and presenting solutions (Technological Skills).
- Communicate and understand mathematical statements, ideas and results, both verbally and in writing, with the correct use of mathematical definitions, terminology and symbolism (Communication Skills).
- Work collaboratively with peers and instructors to acquire mathematical understanding and to formulate and solve problems and present solutions (Collaborative Skills).
- Interpret a function from an algebraic, numerical, graphical and verbal Perspective and extract information relevant to the phenomenon modeled by the function.
- Verify the value of the limit of a function at a point using the definition of the limit.
- Calculate the limit of a function at a point numerically and algebraically using appropriate techniques including L'Hospital's rule.
- Find points of discontinuity for functions and classify them.
- Interpret the derivative of a function at a point as the instantaneous rate of change in the quantity modeled and state its units.
- Interpret the derivative of a function at a point as the slope of the tangent line and estimate its value from the graph of a function.
- Sketch the graph of the derivative from the given graph of a function.
- Compute the value of the derivative at a point algebraically using the (limit) definition

- Interpret the tangent line geometrically as the local linearization of a function.
- Compute the expression for the derivative of a composite function using the chain rule of differentiation.
- Differentiate a relation implicitly and compute the line tangent to its graph at a point.
- Differentiate exponential, logarithmic, and trigonometric and inverse trigonometric functions.
- Obtain expressions for higher order derivatives of a function using the rules of differentiation.
- Interpret the value of the first and second derivative as measures of increase and concavity of a functions.
- Identify the extreme a of a function on an interval and classify them as minima, maxima or saddles using the first derivative test.
- Understand the consequences of Rolle’s Theorem and the Mean Value theorem for differentiable functions.
- Interpret the definite integral geometrically as the area under a curve.
- Interpret differentiation and anti-differentiation as inverse operations (Fundamental Theorem of Calculus, part 1).
- Use substitution to find the anti-derivative of a composite function nadapply basic optimization techniques to selected problems arising in various fields suchas physical modeling , economics and population dynamics and engineering.

References:

1. R. V. Churchill and J. W. Brown -Complex Variables and Applications.
2. S. S. Sastry -Inductory Methods of Numerical Analysis.
3. Finney and Thomas-Calculus and Analytical Geometry.
4. Mohammad & Bhattacharjee-Differential Calculus.
5. M. R. Spiezel- Advanced Calculus.
6. R. A. Sardar -Differential Calculus.
7. Bali N. P. Ashok Saxena and Sriman Narayana - A Text Book on Engineering Mathematics.
8. P. Kandasamy, K. Thilagavathi and K.Gunavathi - Engineering Mathematics, Vols. I and II.
9. S. Narayanan, T. K. Manicavachagam Pillay and G. Ramanaiah - Advanced Mathematics for Engineering Students, Vols. I and II.

10. Kreyszig- Advanced Engineering Mathematics.
11. H. T. H. Piaggio -Differential Equations.

LPE-117: BUSINESS AND COMMUNICATIVE ENGLISH FOR ENGINEERS

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the Course: What sounds true about the incalculable potency of language is that it can hold the whole gamut of human culture. Likewise, what is creditably measurable by the linguistic phenomena is attributable to the fact that there appeared a form of English that can retain a myriad of components from science, technology, economy and business. The people’s insight in a context of technologically-affluent society is inextricably tied up with Business English. Apart from understanding the functioning of the linguistic phenomena, it goes impossible to inherit, analyze and assess the up-to-date trends in modernist culture. Conscious about the aforementioned factors in connection with English, three departments under Institute of Leather Engineering & Technology (ILET), namely Department of Leather Engineering; Department of Leather Products Engineering; and Department of Footwear Engineering offered a language course for the learners entitled Business and Communicative English for Engineers.

Specific Objective: The course is identical with certain objectives hereinafter following namely:

- Generating awareness among the learners about the art of Business English; and
- Enabling them to adopt the communicative English skillfully and purposively as an effective means of expression.

Course Contents:

Introduction to English grammar and its usage: Basic English Grammar and its standard usage.

English language: Its function as a primary means of communication to the technologists in writing, speaking, listening and reading.

Writing: Planning – technique, style and form, paragraph headings context, vocabularies writing for specific purposes.

Technical writing: Technical and industrial report including various types of technical reports with emphasis on preparation, data collection and research, organization style format graphics technical descriptions and report writing. Proposal for new equipment increasing production, description of visits

Business / commercial Writing: Job application, Business Letters

Speaking and Listening: Effective communication between speaker and listener through presentation. Use of visual aids.

Reading and Understanding: Technical and scientific books and journals.

Style of Letters: Full blocked, Semi-blocked, Blocked

Parts of Writing Official Letters: Techniques of writing (Heading, Reference, date, inside address, topic, greetings, complementary closing, Signature, Supplements.

Types of Format Documentation (In English)

Application with Curriculum Vitae (C.V), Appointment letter, Joining Report, Letter of enquiry, orders, cancellation, Letter of compensation and complaint, Letter to the print and Electronic media, Application for opening a Bank Account, Application for Bank Solvency Certificate,

Application for Bank Loan, Office note, Memorandum, Notice Writing.

Listening: Phonetics and phonology, Sound practice.

Learning Outcome: The expected outcome is that the students after a perusal of the course will be able to :

- Research and writing, in different forms and resources—archives, libraries, collections, criticisms, histories, databases, and more.
- Provide students with a field for exercising skills of disciplined and independent inquiry that transfer to all walks of life.
- Provide students with a uniquely practical and creative grasp of the English language.

- Pursue the creative writing option produce independent verbal and artistic works and assemble them.

References:

1. Orient Longman- English for Engineers' and Technologist, Vol. 1 and Vol. 2.

LPE-201: MANUFACTURING TECHNOLOGY OF LEATHER PRODUCTS- II

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the Course : This course is one of the basic courses of B. Sc. in Leather Products Engineering. There are lot of emphasis on developing thorough understanding of various facts, concepts, principles and practices involved in leather products manufacturing. The course is designed on tutorial exercises as fruitful outcomes would enrich the graduates. Visits to some of the small, medium and large-scale leather products industries may also be arranged to provide real picture of the leather goods sector in the country.

Course Objectives :

The learning objectives of this course are :

- To know the different terms of finished leather.
- To know the different cutting techniques.
- To know the different technology which involve the manufacturing procedures of leather products.

Introduction: Finished Leather, Composition of finish film, Classification of finished leather, Theory of film formation. Finishing defects. Edge coloring, Edge dyeing machines, Manual dyeing machine, Semiautomatic-automatic dyeing machines, Dyeing machine for perforations.

Machine Cutting: Introduction, Arm type clicking press, parts and their function of arm type clicking machine, procedure, process control, acceptance criteria, Trouble shooting, of arm type

clicking press, Traveling head press, Beam press, Technology modules on automatic die cutters, advantage of automatic die cutting system, specification and architecture of cutting systems.

Preparation phase: Introduction, Preparation operations, Applying eyelets, rivets, studs and similar details, preparing belt loops, Splitting for equalizing the leather, performances and levels of automation for splitting. Skiving process. Edge folding, First level edge folding machine, Second level edge folding machine, Third level edge folding machine, performances levels of automation of edge folding.

Embossed printing: Introduction, Printing and cutting of small component part. Printing perforating watchstraps. Process control, procedure and acceptance criteria of embossing.

Attaching: Introduction, Applying cement adhesives, Process control, procedure and acceptance criteria of embossing.

Sewing machines: Types of sewing machine and their properties, Parts of sewing machine and their functions. feeding system. Feeding mechanism. Theory of stitch formation.

Needle: Definition, Parts of needle and their functions, Needle identification---needle size, needle point, needle system; Selection of sewing needle.

Thread: Introduction, Thread twist—‘Z’ and ‘S’ twist, Properties of thread, Thread sizing, Thread and needle relationship.

Joining techniques: Definition of stitch, seam, sewing; types of stitch and their properties. Types of seam **a)** Constructional seam---- Plain / open seam, closed seam, taped seam, top-stitched seam, flat-felled seam, chanel / slot seam, flat / zipper / zig-zag / butted seam, French / silked seam, Brooklyn seam, welted seam, piped seam.

b) Decorative seam-----Lacing / Thonging, cable stitching, glove stitching, moccasin stitch.

Money bag : Introduction, types & use, raw materials, perspective drawing, list of components, measurement instruction, total pattern making, leather consumption, splitting and skiving instruction, construction and assembling.

Lunch bag : Introduction, types & use, raw materials, perspective drawing, list of components, measurement instruction, total pattern making, leather consumption, splitting and skiving instruction, construction and assembling.

Photo Frame : Introduction, types & use, raw materials, perspective drawing, list of components, measurement instruction, total pattern making, leather consumption, splitting and skiving instruction, construction and assembling.

File folder : Introduction, types & use, raw materials, perspective drawing, list of components, measu4.

Learning Outcomes:

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

- Provides the basic theoretical knowledge about leather products manufacturing.
- Skill development in total pattern making, leather consumption, splitting and skiving instruction, construction and assembling.
- Acquire a comprehensive knowledge in the fundamentals of Leather Products (Money bag, Lunch bag, Photo Frame, File Folder) manufacturing.

References:

1. Anne & Jane Cope-Leatherwork
2. Carr & Latham-The Technology of Clothing Manufacture
3. Kirsten Jorgensen-Making Leather Clothes
4. Ben and Elizabeth Morris-Making Clothes in Leather
5. Sylvia Grainger-Leatherwork
6. Mary and E.A. Manning-Leatherwork
7. Francesca Sterlacei-Leather Apparel Design
8. Martin M. Shoben & Janet P. Ward-Pattern Cutting and making Up
9. Moseley, G.C-Leather Goods Manufacture
10. Batsford-Fashion with Leather
11. Hamlyn-Leatherwork –A step-by-step Guide.
12. Jane E. Garner-The Complete Handbook of Leather crafting.

LPE-202: MANUFACTURING TECHNOLOGY OF LEATHER PRODUCTS- II PRACTICAL

Class per week	Credit	Marks
2	4	Continuous assessment : 40, Course final examination 60

Introduction to the Course: This is a practical course. To learn how to manufacture the leather goods, different techniques and tooling system which involve the manufacturing procedure of leather products. Visits to some of the small, medium and large-scale leather products industries may also be arranged to provide real picture of the leather goods sector in the country.

Course Objectives:

- To know the tooling techniques.
- To know the decorative techniques of leather.
- To know the different techniques of leather products manufacturing.(pattern making, marking, attaching, folding, stamping, stitching, finishing operation etc.)

Course Contents:

Introduction of tools and their uses and tooling techniques:

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

Joining techniques: Hand stitching, thong or lacing technique, button or rivet attaching.

Pattern cutting: Introduction of pattern cutting technique, consideration of allowance, lining construction, working pattern making.

Manufacturing of the following Leather-Products:

- a) Coin Purse
- b) Key Case
- c) Card Holder
- d) Wallet
- e) Photo frame

- f) File folder
- g) Lunch bag
- h) Waist belt

Learning Outcomes: Upon successful completion of this course students will be able to:

- Interpret the skill to design and develop a new diversified product (Coin Purse, Key Case, Card Holder, Wallet , Photo frame, File folder, Lunch bag, Waist belt)
- Develop new and sustainable manufacturing method for the competitive global market.
- Identify different faults in manufacturing process.
- Built effective managing capacity.

References:

1. The leather working hand book by Valerie Michael.
2. The Complete Hand Book of Leather Crafting----Jane E. Garnes
3. Essentials of sewing.
4. Manual of shoe making by Millar.
5. Clothing technology.
6. The technology of clothing manufacture by H. Carr and B. Lathan.
7. Textbook of footwear manufacture by J. H. Thornton.
8. Footwear materials and process technology by Harvey.
9. Leather crafting: Procedures and Projects by Raymond Cherry.
10. Leathercraft by W.A. Attwater.

LPE-203: APPLIED CHEMISTRY AND CHEMICAL ENGINEERING

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the Course: This course is designed to provide the basic concepts of fatty oils and fats, waxes and understanding related to extraction and refining method of vegetable oils, mechanism of soap and detergent and their manufacturing process. It also covers glue and

gelatin, adhesives and different cosmetics. Moreover, fundamental of material balance, principles of energy conversion and conservation, fluid mechanics are also discussed.

Course Objectives :

The learning objectives of this course are :

- To understand basic concept and mechanism of fat, oil and waxes.
- To know the extraction and refining method of vegetable oils.
- To introduce the cleansing mechanism of soap, raw materials of soap manufacturing.
- To learn about different types of manufacturing process of different cosmetics.
- To understand the fundamental of material balance, energy balance, fluid mechanics etc.

Course Contents:

Oils, Fats and waxes:

Oils and its classification, animal fats, characteristics and uses of fatty oils and fats, waxes and its classification, saponification value, acid value, iodine value of oils, fats and waxes, extraction and refining method of vegetable oils, rancidity of oils, hydrogenation of vegetable oils.

Soaps and Detergents:

Cleansing mechanism of soap, raw materials of soap manufacturing, Batch-kettle process and modern process of soap manufacture, detergent and its classification, manufacture of ABS detergent, glycerine and its manufacture.

Glue, Gelatin and Adhesives:

Introduction, characteristics and uses of glue and gelatin, adhesives and its uses, gelatin manufacture and by products, animal glue.

Cosmetics:

Introduction, types of cosmetics, hair products (shampoo, hair straightener), face powder, cleansing cream and lotion, lipstick, eye makeup, preshave, shaving & aftershave preparation.

Material balance:

Fundamental of material balance: Types of balances, steady state and unsteady state operations, principle and procedure of material balance, material balance calculations of problems without chemical reactions.

Material balance on reactive system: Stoichiometry, stoichiometric equation, stoichiometric coefficient, stoichiometric ratio, stoichiometric proportion, limiting and excess reactant, recycle, purge and by-pass, mass balance involving chemical reactions.

Energy balance:

Principles of energy conversion and conservation, form of energy, total energy balance, heat of reaction, heat of combustion, heat of formation, theoretical and excess air of combustion, energy balance calculation without and with chemical processes.

Absorption:

Principle of absorption, operational and constructional features of packed absorption tower, mass balance equation of packed absorption tower, tower packings and their characteristics.

Refrigeration:

Introduction, vapor-compression refrigeration cycle, absorption refrigeration cycle, refrigerants, refrigerants classification, refrigerants properties and uses.

Fluid mechanics:

Introduction, fluid flow and its measurement, laminar flow, turbulent flow, Reynold's number, Euler's differential equation of hydrostatic pressure, basic equation of hydrostatic equilibrium and its application, fluid machinery- pumps.

Learning Outcomes:

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

- Understand the basic concept and sources of raw materials of fat, oil and waxes.
- Differentiate between fat, oil and waxes. Characterization and properties of fat, oil and waxes.
- Know the extraction and refining method of vegetable oils.
- Interpret the cleansing mechanism of soap, raw materials of soap manufacturing.
- Learn about different types of manufacturing process of different cosmetics.
- Identify different faults in manufacturing process.

References:

1. W. J. Moore- Physical Chemistry.
2. Bahl and Tuli- Essentials Physical Chemistry.
3. Sharma and Sharma- A Text Book of Physical Chemistry.
4. S. Glasstone-Text Book of Physical Chemistry.
5. P. W. Atkins- Physical Chemistry.

6. M. Mahbubul Haque & M. Ali Nawab- Principle of Physical Chemistry.
7. McCabe and Smith- Introduction to unit operation
8. Perry- Handbook of chemical engineering.
9. Fogler- Element of chemical reaction engineering
10. A text book of engineering Chemistry –M.M. Uppal.

LPE-204: APPLIED CHEMISTRY AND CHEMICAL ENGINEERING PRACTICAL

Class per week	Credit	Marks
2	4	Continuous assessment : 40, Course final examination 60

Introduction to the Course: This course is designed to develop and improve the practical skill of students. The students have the opportunity to prepare several industrially important raw materials and products. This course will assist students to know the characteristics and properties of oils and fats, waxes and understanding related to extraction and refining method of vegetable oils, mechanism of soap and detergent and their manufacturing process. In addition, various analytical techniques are specially focused in this course.

Course Objectives :

The learning objectives of this course are :

- To improve the practical knowledge and analytical skills in applied chemistry.
- To introduce learners with analysis of Industrial raw materials.
- To help them understand the importance of some specific chemical reactions.
- To familiarize with different analyzing techniques of industrial products.
- To understand specific instrumental analysis for analytical purposes.

Course Contents:

Lab I: Analysis of Industrial Raw materials:

1. Water
2. Sulphur
3. Oil seeds
4. Cellulose raw materials
5. Raw hides and skins
6. Different types of Leather
7. Effluent of raw hides and skins
8. Sea salt
9. Chrome powder

Lab II: Analysis of Industrial Products:

1. Soap
2. Acids and alkaline
3. Fish oils
4. Hydrogenated fats
5. Animal fats and oils
6. Wet-blue hides and skins
7. Crust Leather
8. Different type of finished Leather

Lab III: Instrumental analysis

1. study of kinetics of chemical reactions using:
 - a) Polarimeter
 - b) Conductance bridge
 - c) Spectrophotometer
 - d) Chemical analysis
2. Electrochemical measurements: P^H measurements
3. Spectrophotometric analysis
4. Chromatographic analysis

Learning Outcomes: অত্ৰ চুবন নশধ ষপ চুবভড় দযয়ক্ষডন ডুচয়ধনশাচড় ংভরর থন তথরন চষ:

- Understand the fundamentals of raw materials of fat, oil and waxes.
- Interpret the mechanism of soap manufacturing.
- Know the extraction and refining method of vegetable oils.
- Utilize various analytical techniques.
- Identify different faults in manufacturing process.

References:

1. W. J. Moore- Physical Chemistry.
2. Bahl and Tuli- Essentials Physical Chemistry.
3. Sharma and Sharma- A Text Book of Physical Chemistry.
4. S. Glasstone-Text Book of Physical Chemistry.
5. P. W. Atkins- Physical Chemistry.
6. M. Mahbubul Haque & M. Ali Nawab- Principle of Physical Chemistry.
7. McCabe and Smith- Introduction to unit operation
8. Perry- Handbook of chemical engineering.
9. Fogler- Element of chemical reaction engineering
10. A text book of engineering Chemistry –M.M. Uppal.

LPE-205: MATERIALS SCIENCE AND TECHNOLOGY

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the Course: The curriculum for undergraduate program in Materials Science and Technology leading to the award of B.Sc. in Leather Products Engineering degree is in accordance with the criteria set forth by University of Dhaka so that each student can gather basic to advanced knowledge on manufacturing requirements, properties and application of different polymeric materials, polymer modification techniques, coated fabrics and their applications in leather goods and footwear manufacturing, adhesive used in leather goods and footwear manufacturing, dressing materials used in leather goods manufacturing, (sole, insole, and heel) materials used in footwear manufacturing, other materials like reinforcement, thread, needle, and accessories used in leather goods manufacturing.

Course Objectives:

- To provide an overview of materials science and technology related with leather goods and footwear as a basis for understanding how structure/property/processing/application relationships are developed and used for different types of materials in leather products manufacturing.
- To understand the polymeric materials and their properties and applications in leather products manufacturing.
- To know how the polymer modification techniques help to modify the properties of polymer.
- To learn about the properties, applications and manufacturing requirements of different types of artificial leather/synthetic materials used in leather goods and footwear manufacturing.
- To garner the properties, applications and manufacturing requirements of several footwear materials like sole, insole, heel, last, shank, toe puffs and stiffeners.
- To understand the properties, applications and manufacturing requirements of dressing materials, polishes, and accessories used in leather goods manufacturing.

Course Contents:

Polymeric Materials used for leather-products manufacture: Introduction, properties and applications of polymeric materials-- PVC, ABS, PS, PU, PP, EVA, PE, Nylon, Acrylics, fibre reinforced plastics type of materials and their quality, materials for quality assurance.

Modifications of polymeric materials for different Leather Products components: Polymer blending, high polymer blends, plasticization, other additives, fillers, antioxidants, flame-retardants, stabilizers, colorants and pigments, post reactions of polymers.

Moulding techniques and equipment: Moulding techniques and equipment used in fabrication of polymer products such as injection moulding, calendaring, reaction injection moulding (RIM), DVP, blow moulding etc.

Outer materials:

Leather: Calf leather, side leather, full grain leather, corrected grain leather, patent leather, printed side leather, suede leather, split leather, nubuck leather

Coated Fabrics: Coated fabrics: Introduction, types of coated fabrics, backers and coating materials used in coated fabrics, direct coating and transfer coating, polymeric, PVC coated fabrics, PU coated fabrics, rubber coated fabrics and their properties & application in leather products industry, comparison between leather and synthetics, Manufacturing techniques of different types of coated fabrics, advantages and disadvantages of coated fabrics compared to leather.

Lining Materials: Drill Cloth, Sugar Coated Fabrics & other synthetic lining materials, Different lining Leather.

Adhesives: Introduction on adhesive formulations, different adhesive formulations, mechanism of adhesion, kinetics of adhesives, thermal, chemical, mechanical, electrical, rheological characteristics of adhesives. Factors affecting of adhesion, surface preparation for optimum adhesion, Methods of application of adhesives, Curing of hot melt adhesives, curing of liquid adhesives, Function of primer and hardener in adhesion, Links of adhesion and their bonding, faults, their cause and remedy of adhesion.

Sole, insole and heel Materials: Raw materials, kinds of sole, ideal qualities for sole, PVC, PU, TPR, Micro cellular rubber, crepe sole, leather sole, EVA, polystyrene, nylon, polyethylene, insoles- raw materials, kind of insoles, ideal qualities for insoles, heels: definition, different materials for heels, Wood heels, plastic heels, ABS, EPDM, injection moulded heels- mould design, raw materials selection- injection moulding and finishing, welts, runners for different types of shoes.

Other Materials for Leather Products and Footwear: Last, Shank, Toe puffs& Stiffener, Reinforcement Materials, Thread, Needle, Zipper, Eyelet, Buckles, Bottom filler, leather board.

Leather Products dressing materials: Introduction, objectives of products dressing, finish identification of leather, selection of dressing system and materials, Different products & shoe dressing materials; cleaner, waxes-abrasives wax, repairing wax, burnishing wax, polishing wax, fillers, renovators, etc.

Polishes: Raw materials for the wax foundation-Definition and classification of wax substance, vegetable waxes, animal waxes, other animal waxes, hydrogen waxes, montan wax and similar waxes, synthetic waxes of different structure. Fats, fatty acids and resin used for the wax foundation of emulsified polishes, wax-like fats, non wax-like raw materials.

Water- free polishes: Water- free polishes-The wax foundation, Gloss and binding value, Correct blending of waxes, choice of solvent, Replacement of turpentine, The actual manufacturing procedure, The melting process, Adding the solvent, Measuring the solvent, The thinning operation, special prosecutions, The filling operation, Essential points to observe, Some faults which should be avoided, Some recipes.

Water-containing chemicals: The water-containing finishing creams and some recipes, White polishes.

Learning Outcomes: Students will be able to:

- Understand the identification characteristics and applications of various polymeric materials.
- Know the polymer modification techniques.

- Assess the properties, applications and manufacturing requirements of various lining and adhesive materials for leather goods manufacturing.
- Understand the properties, applications and manufacturing requirements of different types of soling materials (sole, insole, heel, last, shank, toe puffs, stiffeners, bottom filler etc.) used in footwear manufacturing.
- Learn the properties, applications and manufacturing requirements of different types of dressing materials and polishes used in leather products manufacturing.

References:

1. Dr. Davidsohn J. & Davidsohn A - Polishes - Their Raw Materials and Manufacture
2. Billmeyer F.W. Jr- Text Book of Polymer Science
3. Gowariker V.R-Polymer Science
4. Arora M.G & Singh M- Polymer Chemistry
5. P Winding C.C & Hiatt G.D- Polymeric Materials
6. Dr. (Mrs.) Ganga Radhakrishnan & Dr. Ponswarry Rajalingam- Polymeric Materials for Footwear
7. L.H.Sperling -Introduction to Physical Polymer Science
8. A.J. Harvey.-Footwear materials & Process Technology.
9. SomeNath Ganguly- Comprehensive footwear Technology.

LPE-207: MATHEMATICS-II

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction: Mathematics-II combines different interesting and cardinal branches of Mathematics. Coordinate geometry is one of the central part of mathematics and it provides a foundation to understand different phenomenon by plotting them and deriving their properties. This will shape to create a foundation for advance trigonometry also. Laplace and Fourier transformation will be used to transform derivatives, integrals, periodic functions etc. In addition, Fourier series will be conducive to understand some intricate phenomenon like harmonic analysis. Methods of Ordinary and Partial differential equations are most useful mathematical

techniques for developing mathematical models of real life problems like bacterial growth with the change of time, predator-prey model etc.

Course Objectives:

- To provide students a comprehensive idea on solving problems involving science and engineering.
- To develop conceptual ideas of two and three dimensional geometry.
- To understand the techniques of Laplace and Fourier transformations and Fourier series which are necessary tools for solving real life problems.
- To enhance knowledge on advance trigonometry.
- To garner knowledge of the methods of ordinary and partial differential equations that will provide ideas for developing real life models involving one or more dependent variables with respect to one or more independent variables as well as their solution procedures.

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

Three dimensional geometry: Plane and lines - 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, curved surfaces, equations of a sphere, section by a plane, tangent plane, standard equations of cone, cylinder and conchoids properties.

Trigonometry: Complex numbers and functions: De Moivres theorem and application, summation of finite trigonometric series, hyperbolic function.

Laplace transforms: Transforms of simple functions, basic operational properties, transforms of derivatives and integrals, periodic functions, convolution theorem, inverse transforms, initial and final value theorem, applications of Lap lace transforms to linear differential equations.

Fourier series : Dirichets conditions, general Fourier series, half range sine and cosine series, parsevals identity, harmonic analysis.

Fourier transforms: Fourier integral representation, Fourier transform pairs, properties, Fourier sine and cosine transforms, transforms of simple functions, transform of derivatives, the convolution integrals of Fourier, application to one dimensional wave and diffusion equation.

Differential equation: Ordinary differential equation: formation of differential equation, 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.

Partial differential equations: Formation, 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.

Learning Outcomes:

- At the end of Two-dimensional geometry students will be able to do transformations of axes. They will also be able to determine different properties of straight lines, circles and conics with identification of curves.
- At the end of Three-Dimensional geometry students will be able to determine directional cosines and directional ratios of straight lines manually with geometric interpretations, and different properties of conics and straight lines in three dimensions.
- At the end of Trigonometry they will be adroit to apply the idea of De Moivre's theorem, and also to determine sum of infinite trigonometric series.
- At the end of the Laplace and Fourier transformation and Fourier series students will learn about transformations of integrals, derivatives, periodic functions, half range sine and cosine series, harmonic analysis.

References:

1. Bali N. P. Ashok Saxena and Sriman Narayana- A Text Book on Engineering Mathematics.
2. P. Kandasamy, K. Thilagavathi and K. Gunavathi- Engineering Mathematics, Vols. I and II.
3. S. Narayanan, T. K. Manicavachagam Pillay and G. Ramanaiah- Advanced Mathematics for Engineering Students, Vols. I and II.
4. E. Kreyszig - Advanced Engineering Mathematics.
5. R. V. Churchill and J. W. Brown -Complex Variables and Applications.
6. S. S. Sastry -Introductory Methods of Numerical Analysis.

7. Finney and Thomas-Calculus and Analytical Geometry.
8. Mohammad & Bhattacharjee-Differential Calculus.
9. M. R. Spiezel- Advanced Calculus.
10. R. A. Sardar -Differential Calculus.

LPE-209: STATISTICS

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction: Statistics play an important role in many aspects of engineering including forecasting, optimization of industrial processes, quality assurance and design of reliable systems. This course provides an introduction to the theory and practice of probability and statistics in the context of engineering. Topics covered are: review of descriptive statistics and basic probability, random variables, commonly used discrete and continuous distributions including Bernoulli, binomial, Poisson, and normal probability distribution, central limit theorem, hypothesis tests, single sample, two independent samples, paired samples, inference for proportions; acceptance sampling, general control charts, regression and correlation, simple linear regression, least squares estimation, prediction and estimation, index number and z-transformation.

Course Objectives

- Students will be taught on how to use and incorporate statistical tools for solving engineering statistics problem.

Course Contents:

Introduction: Historical development of the subject, its nature and scope, nature of statistical data, attributes and variables, population and sample, collection and condensation of data. Frequency distribution, graphical representation of data.

Measures of location: Arithmetic mean, median and mode, geometric mean, harmonic mean. quadratic mean, deciles and percentiles.

Measures of dispersion: Range, mean deviation, standard deviation, variance, quartile deviation. Coefficient of variation, moments and cumulates of a distribution, skewness and kurtosis.

Regression and correlation: Bivariate data, relationship between the variables, method of least squares, regression line, correlation and regression coefficients, rank correlation.

Probability: Definition of probability and related concepts, laws of probability, discrete and continuous random variables, mathematical expectation, conditional probability, Binomials, poisson and normal distribution and their properties.

Sampling: Population and sample, census and sampling, methods of sampling, random sampling, stratified sampling, systematic sampling, two stage sampling errors and non sampling errors, population projection.

Statistics for industry: Introduction, level of significance, hypothesis, important steps in a test of significance, testing the difference between two-sample mean and population mean. Acceptance sampling procedure, introduction, acceptance sampling by attributes, consumer's and producer's acceptance sampling by variables, continuous sampling plan, sequential sampling. Control charts natural tolerance limits and specification limit.

Index number: The concept of an index number, problems in construction of index number. Construction of price, quantity, value and cost of living indices, their uses. Laspeyere, paasche and Fisher's ideal indices, test of index number, cost of living index number. National income & wealth.

Educational statistics: Introduction, education and psychology, scaling measurement of different scores, IQ, planning, reliability and validity of tests.

Difference equations and z-transform: Linear difference with constant coefficients, elementary properties of z transform, applications of z transform, application of z transform to difference equations.

Learning Outcomes:

After successfully completing the course, students should be able to do the following:

- Compute and interpret descriptive statistics using numerical and graphical techniques for both categorical and continuous data.
- Understand the basic concepts of probability, random variables, probability distribution, and joint probability distribution.
- Know and apply the concepts of expected value and variance for discrete and continuous variables.
- Know and apply the Central Limit Theorem, which is crucial for inference.
- Understand confidence intervals and hypothesis tests.
- Carry out and interpret one-sample and two-sample analyses for means and proportions.
- Carry out and interpret statistical modeling using linear regression analysis.
- Know and apply basic quality control procedures.
- Understand and use process monitoring charts.
- Understand and apply index number.

References:

1. Barlow R. J. - Statistics.
2. Meyer A.- Probability and Statistics.
3. Mosteler, Rourke and Thomas - Probability with Statistical Applications.
4. Ross S.M. - A First Course in Probability.
5. Toha H.A.- Introduction to Operation Research.
6. Hoel P.- Introductory Statistics.
7. Mostafa M. G.- Methods of Statistics.
8. Weatherburn- First course in Mathematical Statistics.
9. Yule and Kendal- An Introductory to the Theory of Statistics.
10. Duncan A. J.- Quality Control and Industrial Statistics.
11. Grant- Statistical Quality Control.
12. Guilford J. P. - Educational Statistics and Psychometric Methods.

**LPE-211: MECHANICAL ENGINEERING FOR LEATHER PRODUCTS
MANUFACTURE**

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the course: Mechanical Engineering is an applied science theory and performance based practical course. It makes in students the idea of implementation of force, use of heat and mass transfer, safe heat and mass transfer, use of fluid energy, protection against corrosion and use of Engineering Materials, Refrigeration and Air-conditioning etc.

Course Objectives:

- Students have to try to understand Engineering materials, Corrosion, Engineering Mechanics, Fluid mechanics, Heat and mass transfer, Refrigeration and Air-conditioning, welding etc

Course Contents:

Engineering materials: Introduction, properties of engineering materials, characteristics & specification of brick, composition & uses of sand, constituents of cement, cement concrete (c.c), reinforce cement concrete (r.c.c.), abrasives; types of abrasives, abrasive wheels, use of abrasives in leather-goods, normal abrasive, artificial abrasive, paints & their constituents, fuels & lubricants, types of iron & steels, reason for alloying, iron-carbon equilibrium diagram.

Corrosion: Definition of corrosion, behavior of iron and steel in atmosphere, types of corrosion atmospheric, soil, high temperatures, stray current, protection from corrosion and its types, inorganic coatings, metallic coatings, non-metallic inorganic enamel and cathodic coatings.

Welding: Idea of shop safety practice, acquaintance with arc and gas welding tools, machines, electrodes, gas cylinders and their identification, types of gas flames, safety and precaution for welding. Mechanism of gas and arc welding and gas cutting on mild steel sheets and plates, non-ferrous metal working, cast-iron welding, soldering and brazing, study of welding defects.

Engineering mechanics: Introduction, force, moments and their applications; lever, center of gravity, moment of inertia, work, power and energy, friction on inclined surfaces; wedge, simple stress and strain, pressure vessel, torsion of circular shafts.

Fluid mechanics: Introduction, fluid flow and its measurement, boundary layer equations, laminar flow, turbulent flow, compressible flow, fluid machinery; pumps, lifting machines, etc. compressors; type of compressors, pneumatic compressor; preparation of compressed air, use of compressed air in leather-products machinery, blowers, hydraulics; the pressurization, hydraulic clicking press operation, hydraulic devices.

Heat and mass transfer: Introduction, different modes of heat transfer, heat transfer through plane wall, composite wall and cylindrical wall, overall heat transfer co-efficient, critical thickness of insulation, solution of energy balance equations, heat exchangers.

Refrigeration and air-conditioning: Introduction, vapor-compression refrigeration cycle, refrigerants, fundamentals of air-conditioning, summer air-conditioning system.

Learning Outcomes: From learning and practice of the course a student can be able to:

- Understand Engineering materials, Corrosion, Engineering Mechanics, Fluid mechanics, Heat and mass transfer, Refrigeration and Air-conditioning, welding etc.

Reference:

1. Virgil Moring Faires- Analytic Mechanics.
2. R.S. Khurmi-A Text Book of Mechanical Technology.
3. Mark's Standard Handbook for Mechanical Engineers.
4. Ferdinand P. Beer, E. Russel Johnston, Jr.- Vector Mechanics for Engineers.
5. R.S. Khurmi,J.K. Gupta- Theory of Mechanics.
6. G.J.Kulkarni- Engineering Materials
7. Dr. M.A. Aziz- Engineering Materials
8. J.P. Holman-Heat Transfer.
9. Rogers and Mathew- Engineering Thermodynamics.
10. R.S. Khurmi- A Text of Engineering Mechanics.
11. K.L. Kumar-Engineering Fluid Mechanics.
12. Stocker/Jones- Refrigeration & air conditioning.

13. G.C. Mostley- Leather Goods Manufacture.
14. W.A. Attwater- Leathercraft.
15. Hamlyn- Leatherwork- A step by step guide.
16. Sylvia Grainger- Leatherwork.
17. R.S.Khurmi-Applied Mechanics and Strength of Materials

**LPE-212: MECHANICAL ENGINEERING FOR LEATHER PRODUCTS
MANUFACTURE PRACTICAL**

Class per week	Credit	Marks
1	2	Continuous assessment : 40, Course final examination 60

Introduction to the course: Mechanical Engineering is an applied science theory and performance based practical course. It makes the student practice on different mechanical machines, welding practice and machine elements and their maintenance.

Course Objectives:

- To perform fitting works;
- To perform machining on lathe, shaper, milling, drilling and grinding machine;
- To perform DC/AC arc welding and gas welding

Course Contents:

Mechanical Machines: Introduction, hand tools & accessories, measuring tools, machine tools, uses of steel vice, working bench, lapping machine, lathe, shaper, milling, drilling and grinding machine, air compressor, knife bending machine, knife cutting machine and leather crushing machine etc.

Welding: Shop safety practice, acquaintance with arc and gas welding tools, machines, electrodes, gas cylinders and their identification, types of gas flames, safety and precaution for welding. Practice on gas, arc welding and gas cutting on ms sheets and plates, non-ferrous metal working, cast-iron welding, soldering and brazing, study of welding defects.

Machine elements and their maintenance: Introduction, power transmission system, gear, pulley and chain, bearing, wood and machine screws, simple lifting machine; efficiency of machine, steam boiler and their accessories and mountings, pre-heater, heater, super-heater and economizers, planning and scheduling of preventive maintenance, break-down maintenance and trouble shooting, computerized machine maintenance systems.

Learning Outcomes: From the practice of the course a student can perform:

- To work on different machines and their maintenance, fitting work, welding, etc.

References:

- 1.Khurmi., R.S.; “A Text Book of Mechanical Technology”.
- 2.Mark’s Standard Handbook for Mechanical Engineers.
- 3.Khurmi., R.S. ;”Workshop Technology”, Volume-1
- 4.Chapman.,W.A.J.; “Workshop Technology(4th Edition)”, Part-1
- 5.Khurmi., R.S.; & Gupta., J.K.; “ Theory of Mechanics”
- 6.Choudhury., S.K. Hazra. & Bhattacharya., Dr.S.C.; “Elements of Workshop Technology” (4th Edition),Volume-1
- 7.Roy., Uttam Kumar.; “Mechanical Engineering Workshop Practice for Footwear Manufacture”

LPE-213: ELECTRICAL AND ELECTRONIC ENGINEERING

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the Course: Electrical and Electronic Engineering (EEE) is one of the dynamic and time demanding branches in engineering sector. EEE course is offered to all the undergraduate students of the Institute of Leather Engineering and Technology. This course is designed to cover most of the core scientific fundamentals related to basic electrical and mechanical engineering principles. Main contents of this course include different types of symbols used in electrical circuits, circuit laws, network transformation, network-analysis,

network theorems, magnetic circuits, magnetic properties of matter, basic construction, principle, and operation of DC and A.C. machines.

Course Objectives: The specific objective of this course is to expertise the students for the following skills:

- Have the skills for a successful career as well as the ability to collaborate with others to solve problems with creative thinking and effective communication.
- Function effectively in laboratory environment and pursue independent research towards the development of new devices and products using sophisticated EEE concepts.
- Work efficiently in leather, leather products, and footwear industries where proper application of engineering knowledge requires the basics of electronics, communication systems, signal processing, control systems, and computer-based systems.

Course Contents:

Electrical: Different types of symbol used in electrical circuits, types of wires and cables and their uses, domestic and factory wiring, Delta-wye transformation, network-analysis methods of branch and loop currents, method of node-pair voltages, Thevenin's and Norton's theorems, magnetic field, right-hand rule, magnetic flux density, Biot-savart law, magnetic properties of matter, poles and dipoles, Gauss's law for magnetism, para magnetism, diamagnetism and ferromagnetism, nuclear magnetism, magneto motive force, magnetic field intensity, permeability, susceptibility, energy in a magnetic field, magnetization curves, Hysteresis, magnetic field intensity, measurement of magnetic flux, energy of magnetic field, theory of ferromagnetism. Electrical machines: Introduction to magnetic circuit, eddy current loss, core loss, elementary A.C. generator, Transformer: single-phase transformer-equivalent circuit, laboratory testing, introduction to three-phase transformer, D.C. generator: principles, types, performances and characteristics, D.C. motor: principles, types, performances, speed control, Ward Leonard system, starters and characteristics. A.C. machines: three phase induction motor principles, equivalent circuit, introduction to synchronous machines and fractional horse power motors, choice of motor and generator for specific load, armatures and their types, winding and rewinding of armature, manual and automatic star-delta starters, Driver Servo-motors: basic theory and application. Measuring instruments and their classification, working principles and uses (Ammeter, voltmeter, wattmeter, energy meter, AVO-meter, frequency-meter, earth-tester, clamp-tester and A.C. madders etc.)

Electronics: Different types of symbol used in electronic circuits, color code of resistors and capacitors, concept of conductor, semiconductor and insulator, emission of electron, thermo ionic valves, principles of operation & applications of semiconductor diode, zener diode, LED, LCD, LDR, Photo diode. Transistors: (bipolar and FETs), silicon controlled rectifier (SCR), DIAC, TRIAC Characteristics and application of CB, CE & CC and class (ABC) amplifiers, feedback in amplifiers, oscillators, inverters, clipping & clamping ckts, timer, voltage regulators. . OP-amp, digital logic gates (combination and sequential) and its truth table, basic idea about microprocessors, different types of sensors and transducer, strain, pressure, temperature, speed and torque measurement, Microcomputer based systems & Industrial robots.

Learning Outcomes:

- Understand the mathematical and physical foundations of electrical engineering and how these are used in electronic devices and systems.
- Apply knowledge of mathematics, science, and engineering to identify, formulate, and solve engineering problems.
- Employ as a practicing engineer in fields such as design, research, development, testing, manufacturing, operations and service systems.
- Design and conduct experiments as well as to analyze and interpret data.
- Communicate effectively to function on multidisciplinary teams.
- Use the techniques, skills, and modern engineering tools necessary for engineering practice.

References:

1. V.K.Metha - Principles of Electronics.
2. Paul D. Malvino - Electronic principles.
3. Chut & Chut - Electronics in Industry.
4. B.L. Therera & A.K. Therera - Solid State Electronics
5. B. L. Therja, A. K. Theraja- A Textbook of Electrical Technology.
6. V. K. Mehta- Principles of Electrical Engineering and Electronics.
7. Kurt S. Lion- Elements of Electrical and Electronic Instrumentation.
8. A. K. Sawhney- A course in Electrical & Electronics Measurement and Instrumentation.
9. Robert P. Ward- Introduction to Electrical Engineering.
10. George J. Angerbauer- Principles of DC and AC circuits.

LPE-214: ELECTRICAL AND ELECTRONIC ENGINEERING PRACTICAL

Class per week	Credit	Marks
1	2	Continuous assessment : 40 Course final examination 60

Introduction to the course: Electrical and Electronic Engineering (EEE) is one of the dynamic and time demanding branches in engineering sector. EEE practical course is offered to all the undergraduate students of the Institute of Leather Engineering and Technology. This course provides a broad training on electrical engineering, analogue, digital, and power electronics, and electrical AC & DC machines with laboratory experiments in order to develop their skills in basic engineering. In future it will help the students to function effectively in laboratory environment and pursue independent research towards the development of new devices and products using sophisticated engineering concepts.

Course Objectives:

The Course Objectives of this course are to expertise the students for the following skills:

- Understand the machines and their functions related to electrical and electronic engineering in practical classes.
- Provide necessary knowledge to adapt in a world of constantly evolving and innovative technology.
- Function effectively in laboratory environment and pursue independent research towards the development of new devices and products using sophisticated EEE concepts.
- Work efficiently in leather, leather products, and footwear industries where proper application of engineering knowledge requires the basics of electronics, communication systems, signal processing, control systems, and computer.

Course Contents:

1. Measurement of high resistance by megger and bridge megger.
2. Calibration of voltmeter, ammeter and watt hour meter.
3. Measurement of voltage, current and power by voltmeter and wattmeter.
4. Measurement of internal resistance of a storage cell.
5. Measurement of resistance of a bulb in (i) cold and (ii) hot condition.
6. Star and delta connection of three phase circuit.
7. Connection of a three phase transformer in an AC circuit.

8. Connection of one lamp controlled by single way switch and by two way switch.
9. Connection of two lamps with the main to work as series with no switch and parallel with switch.
10. Connection of a fluorescent lamp controlled by a switch.
11. Connection of an electric bell controlled from two points with lamp indication.
12. Changing of storage battery from DC mains.
13. Detection of defects of DC and AC.
14. Study of AC and DC starters.
15. Load test of a DC motor.
16. Speed control of a three phases induction motor.
17. Measurement of self-inductance by Raleigh's method.
18. Study the characteristic of a general purpose & Zener diode.
19. Study the characteristic of a transistor in CB configuration.
20. Study the characteristic of a transistor in CE configuration.
21. Study the characteristic of a single stage amplifier.
22. Study the basic characteristic of logic gates.
23. Study the basic characteristic of SCR, LDR & TRIAC,
24. Study the basic operation of Microprocessors.
25. Study the basic operation of different sensors & Transducers.

Learning outcomes:

- Understand the mathematical and physical foundations of electrical engineering and how these are used in electronic devices and systems.
- Design and conduct experiments, as well as to analyze and interpret data.
- Employed as a practicing engineer in fields such as design, research, development, testing, manufacturing, operations, and service systems.
- Use the techniques, skills, and modern engineering tools necessary for engineering practice.
- Use the fundamental aspects of electrical and electronic engineering in careers in industry.
- Continue to learn through advance study or engagement in professional development activities within physics, electrical engineering or other technically related fields.

References:

1. V.K.Metha - Principles of Electronics.

2. Paul D. Malvino - Electronic principles.
3. Chut & Chut - Electronics in Industry.
4. B.L. Therera & A.K. Therera - Solid State Electronics
5. B. L. Therja, A. K. Theraja- A Textbook of Electrical Technology.
6. V. K. Mehta- Principles of Electrical Engineering and Electronics.
7. Kurt S. Lion- Elements of Electrical and Electronic Instrumentation.
8. A. K. Sawhney- A course in Electrical & Electronics Measurement and Instrumentation.
9. Robert P. Ward- Introduction to Electrical Engineering.
10. George J. Angerbauer- Principles of DC and AC circuits.

**LPE- 215: INDUSTRIAL MANAGEMENT FOR LEATHER PRODUCTS
MANUFACTURE**

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the course: This course aims to facilitate student understanding of management scope, importance, functions, principles, social responsibilities, management process, skills, roles, effectiveness and efficiency. It offers an overview of management theories and applications including planning, organizing, leading, controlling and global management. Moreover, industrial policies of Bangladesh are also introduced in this course.

Course Objectives:

The Course Objectives of this course are to expertise the students for the following skills:

- To familiarize students with different management principles.
- To help students develop an understanding of managerial functions, types, skills and roles.
- To familiarize students with different concepts including planning, organizing, leading, controlling and global management.
- To introduce different industrial policies, nationalization, privatization, foreign investment, role of Government.

- To prepare students to practice professionally in the fields of industrial management and product manufacturing.

Course Contents:

Introduction: Definition of Management- scope, importance, functions, principles, objectives and their attainments- social responsibilities, historical evolution, management process, skills, roles, effectiveness and efficiency.

Planning: Nature and meaning, importance, types, steps, process, tool and techniques, limitation.

Organizing: Definition, principles, importance, types of structures, delegation and decentralization, authority, span of supervision.

Leading: Definition of directing, importance, principles, consultative direction, coordination need, aids, means, motivation, theories, types of needs, means, motivation level in Bangladesh, definition of leadership, theories, and styles.

Controlling: Meaning, types, methods, process, requirements, budgetary control.

Environment: Internal and external, components, merits and demerits.

Global management: Nature and characteristics, management of multinational corporations (MNCS), role of recipient countries, demerits, problems for developing countries like Bangladesh.

Industrial policy of Bangladesh: Nationalization, privatization, foreign investment, role of MNCS, export processing zone, problems of industrialization in Bangladesh, ways to overcome, Government role.

Technology transfer: Definition of technology, types, appropriate technology-technology policy and base, lessons from Japan, Malaysia, Korea, Pakistan, India. Drawbacks of technology transfer.

Management structure in Bangladesh: Features of financial and industrial management, patterns, problems, measures, prospects.

Learning outcomes:

- Understand the and basic principles of management.
- Describe the most well-known theories and perspectives on management employed as a practicing engineer in fields such as design, research, development, testing, manufacturing, operations, and service systems.

- Work professionally in the fields of industrial and systems engineering in either manufacturing or service sectors, and able to work in a wide range of areas such as systems engineering, sustainability, quality engineering, and advanced manufacturing.
- Able to work with multidisciplinary teams.
- Identify, formulate, and solve engineering problems.
- Use the fundamental aspects of professional and ethical responsibility.
- Capable of applying different principles to solve relevant Industrial problems.

References:

1. Khan M. Y. & Jain P. K. - Financial Management.
2. Van Horne J. C. - Financial Management & Policy.
3. Pandey I. M. - Financial Management.
4. Woodward-Industrial Organisation.
5. Moore-Manufacturing Management
6. Gitman L. J. & Moses E. A. - Financial Management:cases
7. Kuchhal S. C. - Financial Management- An Analytical and conceptual approach.
8. Weston J. F. & Brigham E. F - Managerial Finance.
9. Ashraf Ali A. F. M. - Arthikh Babosthapona.
10. Block S. B. & Hirt G. A - Foundation of Financial Management.
11. Johnson R. W. - Financial Management.

LPE- 216: COMPUTER GRAPHICS DESIGN

Class per week	Credit	Marks
1	2	Continuous assessment : 40, Course final examination 60

Introduction to the course: This is an introductory practical course which focuses on basic photo corrections, selecting with the magic wand tool, cropping an image, rearranging layers. The Computer Graphics Design helps student in creating, editing a quick mask and saving a selection as a mask. This course will improve the skill about retouching, repairing, painting, editing etc. Furthermore this course also provides the current practices in 3D Studio Max and Auto CAD.

Course Objectives :

The learning objectives of this course are :

- To understand basic concept and mechanism basic photo corrections, selecting with the magic wand tool, cropping an image, rearranging layers.
- To introduce the essential facts and development method in creating, editing a quick mask and saving a selection as a mask.
- To acquaint students with the current practices in 3D Studio Max Auto CAD.

Course Contents:

Adobe Photoshop

Work area: using tools, viewing images, working with palettes.

Basic photo corrections: Resolution and image size, straightening and cropping an image, adjusting the tonal range, removing a color cast, replacing colors in an image, adjusting lightness with the dodge tool, adjusting saturation with the sponge tool.

Selections: making selections, moving selection contents, selecting with the magic wand tool, selecting with the lasso tool, transforming a selection, selecting with the magnetic lasso, cropping an image and erasing within a selection.

Layer basics: Layers, rearranging layers, editing text, flattening and saving files, creating a layer set and adding a layer.

Masks and Channels: Creating a quick mask, editing a quick mask, saving a selection as a mask, editing a mask, loading a mask as a selection and applying an adjustment, extracting an image, applying a filter effect to a masked selection, creating a gradient mask.

Retouching and repairing: repairing areas with the clone stamp tool, pattern stamp tool, healing brush and patch tools, retouching on a separate layer.

Painting and editing: custom workspace, blending an image with the background, changing image with the history tool, brush tool.

Basic pen tool techniques: paths and pen tool, drawing straight paths, drawing curved paths, combining straight and curved path segments, editing anchor points, using paths with artwork, adding layers to complete the effect.

Creating special effects: automating a multi step task.

3D Studio Max

Introduction: MAX interface, customizing MAX interface

Objects: Referencing External objects, Importing and Exporting, Cloning objects and using arrays, selecting and grouping objects, modifying objects.

Modeling: creating primitive objects, working with spline shapes, meshes, creating patches, creating loft objects, building compound objects.

Materials and Maps: material editor, material maps.

Lights and Cameras: Controlling lights, lighting special effects, controlling cameras, camera matching and tracking.

Particle systems and space wraps: creating and controlling particle systems, space wraps, particle system special effects.

Model systems: Building linked hierarchies, schematic view, creating an inverse kinematics system.

Animation: Animation basics, track view, animating with controllers, expressions, dynamic simulation.

Rendering and post production: Backgrounds, environments and atmospheric effects, setting rendering parameters, render effects.

AutoCAD

Getting familiar with AutoCAD, understanding the drafting tools, Drawing 2D objects, editing AutoCAD objects, editing with the modify panel tools, Drawing fundamentals:

Use of line, circle, square, rectangle, triangle, ellipse, polygon.

Creating 3D drawings, getting organized with layers, using blocks, groups, design center, creating text, using dimensions, gathering information, laying out and painting drawing.

Learning Outcomes: After completion of this unit the students will able to:

- Possess the skills in photo corrections, selecting with the magic wand tool, cropping an image, rearranging layers.
- Describe the essential facts and development method in creating, editing a quick mask and saving a selection as a mask.
- Understand the drafting tools, Drawing 2D objects, editing Auto CAD objects, editing with the modify panel tools.
- Learn to use the line, circle, square, rectangle, triangle, ellipse, polygon.
- Acquire extensive knowledge and use of computer aided drafting software.
- Understand the current practices in 3D Studio Max Auto CAD.

LPE: 301: MANUFACTURING TECHNOLOGY OF LEATHER PRODUCTS-III

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the Course : This course is designed to provide the basic concepts of clothing history, clothing design in leather products manufacturing. It also covers the development method of fashion, fashion accessories for simple jacket, different ladies skirt, waist coat , trouser, children wear, men's and women's wear. In addition, various fundamental concepts, principles and practices involved in ladies bags, school bags, college bags manufacturing are also introduced.

Course Objectives : The learning objectives of this course are :

- To understand basic concept and mechanism clothing design.
- To introduce the essential facts and development method in different ladies skirt, waist coat, trouser, children wear, men's and women's wear manufacturing.
- To acquaint students with design and construction of slicker, princess line coat, duster, wrap over/clutch, frock coat, pelerine, logger's cruiser utility.

Course Contents:

Background: History of leather product, pre history of Renaissance /Renaissance to industrial revolution, Industrial revolution to the present day.

Clothing: Introduction, Clothing culture and communication, the individual and dress, fashion men's /women's wear, materials, choosing patterns, cutting patterns, fitting garments, stitching.

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

Jacket: Different parts of simple jacket, pattern control, matching of leather grain and color, area necessary, cutting of a simple jacket, control of cutting jackets, cutting of lining, size and models

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.

Skirt: Different parts of simple skirt, ladies straight skirt, construction of basic skirt block, pleats construction, grading for skirts, modification in basic skirt, design & construction of flayed skirt-paneled skirt, components attachment -pockets-pleats.

Trouser: Different parts of a simple trouser, basic trouser block, construction of trouser with pleats, components attachment-zip, safari jacket, collar construction, sleeve construction, modification to basic block, design & pattern making, fabrication.

Children's wear: Liberty cap, sun hat, ankle sock, tight, pants, bib, tee shirt, leggings.

Boys and Girls wear: Plain suit, splash suit.

Men's and Women's wear: Slicker, princess line coat, duster, wrap over/clutch, frock coat, pelerine, logger's cruiser utility.

Medium leather goods:

Ladies bags, School; bags, college bags

Learning Outcomes:

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

- Use techniques and skills essential for the development of design and fashion.
- Obtain a comprehensive knowledge in the development of basic block, design & pattern making, fabrication in children wear, men's and women's wear manufacturing.
- Develop new method to produce different ladies skirt, waist coat, trouser, children wear, men's and women's wear.
- Critically analyze to control the quality in leather garments manufacturing.
- Use technology, where appropriate, to enhance and facilitate green technology.
- Provides the basic knowledge about medium leather goods manufacturing.
- Develop skill in total pattern making, quality control, assembling and construction.
- Acquire a comprehensive knowledge in the development of basic block, design & pattern making, fabrication in trouser manufacturing.

References:

1. Roland Kilgus- Clothing Technology
2. Attwater W. A.- Leathercraft
3. Moseley G. C. - Leather Goods Manufacture
4. Kathryn Mc Kelvey- Fashion Source Book.

5. Francesca Sterlacci- Leather Apparel Design.
6. Martin M. Shoben & Janet P. Ward- Pattern Cutting and making up.
7. Batsford - Fashion with leather.

**LPE 302: MANUFACTURING TECHNOLOGY OF LEATHER PRODUCTS –III
PRACTICAL**

Class per week	Credit	Marks
4	4	Continuous assessment : 40, Course final examination 60

Introduction to the Course :

This course is designed to offer a practical knowledge about the basic concepts of clothing design. It also covers the development method of fashion, fashion accessories for simple jacket, different ladies skirt, waist coat , jacket, trouser, children wear, boys and girls dress, men’s and women’s wear. Furthermore, various elementary concepts, principles and practices involved in ladies bags, school bags, and other medium goods manufacturing are also introduced.

Course Objectives : The learning objectives of this course are

- To perceive basic working knowledge for the development of the leather garment design.
- To introduce the essential facts and development method in different ladies skirt, waist coat, trouser, children wear, men’s and women’s wear manufacturing.
- To obtain a comprehensive practical knowledge in the development of basic block, design & pattern making, fabrication in children wear, men’s and women’s wear manufacturing.
- To acquaint students with design and construction of slicker, princess line coat, duster, wrap over/clutch, frock coat, pelerine, logger's cruiser utility.

Course Contents:

Jacket:

Pattern construction and manufacturing of different jackets.

Waist Coat:

Construction of basic waist coat blocks, Manufacturing of different waist coat

Skirt:

Construction of basic skirts block, Manufacturing of different skirts

Trouser:

Construction of basic trousers block, Manufacturing of different trousers

Children's wear:

Construction of basic children wear block, Manufacturing of different children dresses, liberty cap, sun hat, ankle sock, tights, pants, bibs, tee shirts, leggings.

Boys and Girls wear:

Construction of basic boys and girls dress blocks, Manufacturing of different dresses for boys and girls.

Pockets:

Manufacturing of different pleated pocket and flap, gusset pocket and flap, Piping pocket, False pocket.

Collars:

Pattern construction and manufacturing of different collars

Medium leather goods:

Pattern making, assembling and sewing of Ladies bags, School bags, college bags

Learning Outcomes: Upon successful completion of this course students will be able to:

- Use practical knowledge and skills essential for the development of design and fashion.
- Receive a comprehensive practical knowledge in the development of basic block, design & pattern making, fabrication in children wear, men's and women's wear manufacturing.
- Develop new method to produce different ladies skirt, waist coat, trouser, children wear, boy's and girl's wear.
- Critically analyze to maintain the quality in leather garments manufacturing.
- Understand basic working knowledge for the development of the leather garment design.
- Use technology, where appropriate, to enhance and facilitate green technology understanding.
- Provide the fundamental technical knowledge about medium leather goods manufacturing.
- Develop skill in total pattern making, quality control, assembling and construction.

- Impart constructive knowledge to students with design and construction of slicker, princess line coat, duster, wrap over/clutch, frock coat, pelerine, logger's cruiser utility.

References:

1. Roland Kilgus- Clothing Technology
2. Attwater W. A.- Leathercraft
3. Moseley G. C. - Leather Goods Manufacture
4. Kathryn Mc Kelvey- Fashion Source Book.
5. Francesca Sterlacci- Leather Apparel Design.
6. Martin M. Shoben & Janet P. Ward- Pattern Cutting and making up.
7. Batsford - Fashion with leather.

LPE-303: ANALYTICAL CHEMISTRY FOR LEATHER PRODUCTS MANUFACTURE-I

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the Course: The course gives an introduction to inorganic and organic analytical chemistry, including basic analytical methods and application in leather products.

Course Objectives: The objectives of this course is to provide:

- An introduction to analytical chemistry for leather products manufacture and an overview of important analytical methods and their range of application in leather within detection of inorganic, organic and other toxic compounds.
- Important analytical quantitative techniques from classical methods, electrochemical methods, spectroscopic / spectrophotometric methods, and separation techniques are reviewed.
- The course also includes risk assessment of chemical experiments, important steps and procedures in analytical chemistry, and evaluation/interpretation of results.
- The course gives an overview of important use of selected classical and instrumental chemical quantitative analytical methods in leather product manufacturing and a short introduction to their basic theory.

Course Contents:

Introduction: Evaluation of analytical results, accuracy and precision, errors, minimization of errors, significant figure and computation, rejection of data- the Q test. Sampling.

Gravimetric and volumetric methods: Principles of gravimetric methods, conditions for precipitation co-precipitation and post-precipitation, precipitation from homogeneous solution. Principles of volumetric analysis, Acid-Base titration, complexometric titration, precipitation titration, oxidation-reduction titration. Determination of end point.

Chromatographic techniques: Introduction, principles, classification of chromatographic methods, instrumentation and application of paper, thin layer chromatography (TLC) and high performance liquid chromatography (HPLC). Application in leather science.

Analytical spectrometry: Ultraviolet /Visible spectroscopy: Introduction, absorption laws, deviation from Beer's Law, instrumentation, principles, applications, molar extinction coefficient, measuring unknown concentration, absorbing species, absorption spectrum and λ_{MAX} , application of transmission spectrophotometry to dyes. Reflectance spectrophotometry- Introduction, principles, Kubelka-Munk equation, reflectance measurement, instrumentation, determination of surface colour of solid substrates, application of reflectance spectrophotometry for the surface colour determination of leather.

Thermal techniques Differential thermal analysis (DTA), Differential scanning calorimetry (DSC), Thermogravimetry (TG): Basic principles and application in leather science.

Chemical analysis of leather and related chemicals: Tanning materials- Routine analysis of vegetable, analysis of chrome extract: Cr_2O_3 , basicity.

Analysis of leather- vegetable tanned leathers: moisture, oils and fats, water solubles, insoluble ash, nitrogen and hide substance, degree of tannage, pH of water solubles, oxidized fat, combined fat, differential number, glucose, total ash, epsom salt, analysis of chrome tanned leather; Leather auxiliaries: casein, shellac, oils, fats, and waxes: moisture, acid value, saponification value, iodine value, unsaponifiable matter; determination of sulphide in alkaline liquors, determination of chlorides in alkaline liquors, determination of total available strong alkali.

Environmental analysis: Sampling procedures of waste water for analysis. Analysis of tannery wastewater sample: pH, alkalinity, acidity, total solids, dissolved solids, suspended solids, sulphate, sulphide, chromium, settleable solid.

Laboratory automation: Introduction, approaches to laboratory automation, principles of automation, planning for laboratory automation, automated instruments, microprocessor-controlled instruments: “smart” instruments, computers in analytical chemistry.

Safety practice in laboratory: Introduction, MAK values of working material that involved health hazard, list of harmful materials, carcinogenic working materials, emission protection law, danger symbols, regulations concerning the transportation of materials classified as dangerous goods, prevention of accidents and first aid in laboratory, hazard and hazard agents identification, hazard classification, hazard control, safety management, safety promotion and awareness creation, safety and emergency provisions.

Learning Outcomes: After examination the student should be able to:

- Explain the theoretical principles and important applications of classical analytical methods within titration (acid/base titration, complexometric titration, redox titration), and various techniques within gravimetric and volumetric methods.
- Explain the theoretical principles of selected instrumental methods within electroanalytical and spectrometric/spectrophotometric methods, and main components in such analytical instruments.
- Explain the theoretical principles of various separation techniques in chromatography, and typical applications of chromatographic techniques in leather products.
- Assess and suggest a suitable analytical method for a specific purpose, and evaluate sensitivity, important sources of interferences and errors, and also suggest alternative analytical methods for quality assurance.
- Performing risk assessment of chemical experiments and chemical analytical activity
- Performing classical analytical experiments, and make observations and assessments of important factors that could affect the analytical result.
- Be familiar with calculations in analytical chemistry, be able to calculate titration errors for method evaluation, and perform statistical evaluation of results from classical and instrumental chemical experiments and analyses.
- This will give a general understanding in how to work safely in the laboratory

LPE-304 - ANALYTICAL CHEMISTRY FOR LEATHER PRODUCTS MANUFACTURE PRACTICAL

Class per week	Credit	Marks
1	2	Continuous assessment : 40, Course final examination 60

Introduction to the courses: This course is designed for the 3rd year students of B.Sc. in Leather Products Engineering to introduce analytical chemistry practical utilizing their previous knowledge on basic chemistry. This course deals with the methodologies for the estimation of heavy metals, anions, pH, dye, ash, moisture, fat in the leather products and liquors using volumetric, spectroscopic, chromatographic, thermal, and gravimetric analyses to ensure the quality of leather products and the validity of used methods.

Course Objectives:

- The objectives of this course are to familiarize the students with the practical knowledge on analytical chemistry for the analysis of leather products, liquor and extracts from different tanning materials for the estimation of chromium, fat, moisture, pH, acid value, iodine value, dissolved substances and so on.

Course Contents:

1. Determination of fats, oils and other soluble.
2. Determination of water-soluble matter, water -soluble inorganic matter and water-soluble organic matter.
3. Determination of sulphated total ash and sulphated water-insoluble ash.
4. Determination of nitrogen and hides substance from different types of leather.
5. Determination of chromium content from different types of leather.
6. Determination of chromium content from different commercial chrome tanning agents.
7. Determination of sulphide from sodium sulphide.
8. Test for the identification of vegetable tanning materials.
9. Determination of moisture/total solids/ total solubles/non-tannin constituents/insolubles/colour/ pH from vegetable tanning materials.
10. Determination of moisture/ soluble matter/ ash/ alkalinity of ash/ pH/non-tannin of hide powder.
11. Determination of sulphur dioxide in bleaching extracts.

12. Determination of iron and copper in vegetable tanning extracts.
13. Determination of strong alkali in solution.
14. Determination total available strong alkali.
15. Determination of acid /iodine value of oil/fat.
16. Determination of unsaponifiable matter.
17. Determination of chloride content from alkaline liquor.
18. Determination of unknown concentration of dye solution.
19. Determination of thermal response of raw hide/limed pelt/pickled pelt/tanned/Crust leather/ finished leather.
20. Determination of dissolved solid/ suspended solid/total solids from wastewater sample.

Learning Outcomes: Upon completion of this course the students will be able to

- Handle with the equipment and apparatus safely and properly
- Familiarize with techniques for the treatment of leather products
- Know the principle and use of machines such as spectrophotometer
- Gain knowledge about chromatographic processes
- Prepare samples for characterizing leather and liquor from different tanning processes
- Investigate heavy metals by various techniques
- Know the process how to analyze iodine value and saponification value
- Investigate chloride, sulphated total ash and so on
- Perform and use pH meter for the estimation of pH
- Determine solubles and insolubles materials from liquor and tanning materials

References:

1. Gary D. Christian- Analytical Chemistry
2. John Kenkel- Analytical Chemistry for Technicians
3. Skoog, Holler & Nieman- Principles of Instrumental Analysis
4. Sharma B. K. - Instrumental Methods of Chemical Analysis
5. Skoog, West & Holler- Fundamental of Analytical Chemistry
6. Browning D. R. - Chromatography
7. Hatakeyama T. and Quinn F.X. - Thermal analysis.
8. Vogel A. I. - Text Book of Quantitative Chemical Analysis
9. Roderick McDonald-Colour Physics for Industry.

10. P.K. Sarker - Analytical Chemistry for Leather Manufacture.
11. Williams D. H. and Ian Fleming- Spectroscopic methods in Organic chemistry.
12. Kalsi P.S. - Spectroscopy of organic compounds.
13. Venkatachalam P.S. - Lecture Notes on Leather.
14. John A. Dean. -Analytical Chemistry Handbook.
15. Dr. Sethi P.D. - High Performance Liquid Chromatography.
16. Banwell C. N. -Fundamentals of Molecular Spectroscopy.
17. Hamilton, Hamilton-Thin Layer Chromatography.
18. Fifield & Haines-Environmental Analytical Chemistry.
19. UNIDO- Tannery and Environment.
20. Chhatwal G .R. - Encyclopedia of Environmental Analysis (vol.1, 2 &3)

LPE 305 LEATHER TECHNOLOGY-I

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the course: This course covers the knowledge, skills and attitudes required to identify and interpret histological structure and chemical composition of hides and skins, process of slaughtering and procurement of hides & skins, preservation / curing of hides and skins, defects of hides and skins, sorting and gradation of raw hides and skins, different process of leather making like soaking, liming, deliming, bating, pickling and tanning.

Course Objectives: The learning objectives of this course are:

- To understand the structure of raw hides and skins- their composition and histo-chemical properties.
- To introduce the essential knowledge and skill of slaughtering and flaying of animals, objectives and principles of preservation / curing, advantages and disadvantages of different types of curing.
- To familiarize students with pre-mortem and post-mortem defects of hide and skin and their effect on leather, sorting and grading of hides and skins.
- To acquaint students with soaking, liming, deliming, bating, pickling, tanning and many

other operations in leather processing.

Course Contents:

Histological structure and chemical composition: Structure of raw hides and skins. Structural difference between hides and skins of different origin, chemical composition of hides and skins

Slaughtering and procurement of hides & skins: Slaughtering and flaying of animals, tools, equipment and techniques for slaughtering and flaying, hides and skins of slaughtered and fallen animals, cares to be taken during flaying, handling and storage of raw hides and skins, collection practice in Bangladesh.

Preservation / curing of hides and skins: Introduction, objectives and principles of preservation, short and long terms preservation, methods of preservation/curing, advantages and disadvantages of different types of curing, factors affecting preservation / curing process.

Defects of hides and skins: Definition, pre-mortem and post-mortem defects of hide and skin and their effect on leather, methods of identification of defects, common defects of hides and skins in Bangladesh and their remedies.

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

Beam house operations: Introduction and role of beam house operations in leather making.

Soaking: Objectives and different controls in soaking operation. different methods of soaking.

Liming: Chemistry of unhairing, unhairing by different methods, objectives of liming, effects of liming of collagen, enzymatic controls in liming operation to achieve different physical properties of leather.

Deliming and Drenching: Objectives, principles and controls of deliming and drenching.

Bating: Chemistry of proteolytic enzymes used for bating, necessity of bating, Its preparation and controls for desired properties of leather.

Pickling: Acid binding capacity of collagen, use of organic acids or salts in pickling, its necessity and controls, concept of, depickling.

Degreasing: Objects and necessity of degreasing, different systems and methods.

Tanning: Basic concept, theoretical background, tanning potentials of various metals, non-metals, natural and synthetic materials, tanning characteristics, hydrothermal stability and shrinkage temperatures of various tanning materials

Chrome tanning: Historical development, chromium complexes, theories of chrome tanning, factors affecting chrome tanning, basicity and its effect on chrome leather production, masked and self-basified chrome tanning and their advantages and disadvantages

Other tanning Operations

Aluminum and titanium tanning, Vegetable tanning, Synthetic tanning, Aldehyde tanning, Oil tanning.

Learning Outcomes: After completion of this unit the students will able to:

- Identify and interpret histological structure and chemical composition of hides and skins.
- Interpret the process of slaughtering and procurement of hides & skins.
- Interpret preservation/curing of hides and skins.
- Identify defects of hides and skins.
- Perform sorting and gradation of raw hides and skins.
- Demonstrate different process of leather making like soaking, liming, deliming, bating, pickling and tanning.

References:

1. Jean J. Tancous-Skin, Hide and Leather Defect.
2. Krysztof Bienkiewicz-Physical Chemistry of Leather making.
3. K.T.Sarkar-Theory and Practice of Leather Manufacture.
4. S.S. Dutta- An introduction to the principles of Leather Manufacture.
5. O'Flaherty, Roddy, Robert W.T.M. Lollar (Ed)-The Chemistry and Technology of Leather, Volume -1
6. Gerhard John- Possible Defects in Leather Production.
7. R.Reed - Science for the students of the Leather Technology.
8. H.R. Proctor - The principles of Leather Manufacture.
9. R. Puvanarishnan Susil C. Dhar- Enzyme Technology in Beam House Practice.
10. Jotirmay Dey - Practical Aspects of the Manufacture of upper Leathers
11. Hidemann. E - Fundamentals of Leather Manufacture.

12. Sharphouse - Leather Technicians Hand books.

LPE 306 LEATHER TECHNOLOGY-I PRACTICAL

Class per week	Credit	Marks
1	2	Continuous assessment : 40, Course final examination 60

Introduction to the course: This course is design to provide practical knowledge, skills and attitudes required to identify and interpret different process of slaughtering and procurement of hides & skins, preservation / curing of hides and skins, defects of hides and skins, sorting and gradation of raw hides and skins. The course also demonstrate and conducts different process of leather making like soaking, liming, deliming, bating, pickling and tanning. In this course, students are also perform various types of leather manufacturing processes.

Course Objectives: The learning objectives of this course are:

- To introduce the essential knowledge and skill of slaughtering and flaying of animals, objectives and principles of preservation / curing, advantages and disadvantages of different types of curing.
- To acquaint students with soaking, liming, deliming, bating, pickling, tanning and many other operations in leather processing.
- To familiarize students with pre-mortem and post-mortem defects of hide and skin and their effect on leather, sorting and grading of hides and skins.
- To perform different processes for shoe upper leather, fur skin leather, screen/block printed leather, glaze kid leather, nubuck leather, nappa leather and suede leather manufacturing.

Course Contents:

1. Manufacturing of Clothing leather/garments leather.
2. Manufacturing of Fur skin leather.
3. Manufacturing of Screen/block printed leather.
4. Manufacturing of Glaze kid leather.
5. Manufacturing of Nubuck leather.

6. Manufacturing of Nappa leather/ suede leather.

Learning Outcomes: After completion of this unit the students will able to:

- Perform manufacturing of shoe upper leather.
- Demonstrate manufacturing of fur skin leather.
- Perform manufacturing of screen/block printed leather.
- Perform manufacturing of glaze kid leather.
- Perform manufacturing of nubuck leather.
- Perform manufacturing of nappa leather/ suede leather.

References:

1. Theory and Practice of Leather Manufacture- K.T. Sarkar
2. Principles of Leather Manufacture- S.S. Dutta
3. The Principles of Leather Manufacture- H.R. Procter
4. Modern Practice in Leather Manufacture- J.A. Wilson
5. Fundamentals of Leather Manufacturing- Heidemann
6. Leather Technicians Handbook- Sharphouse
7. Possible Defects in Leather Production- G. John
8. Science for Students of Leather Technology- R. Reed
9. The Chemistry & Technology of Leather (vol. 1, 2, 34)- Roddy, Lollar

LPE-307: TESTING OF LEATHER PRODUCTS AND ALIED MATERIALS

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the Course: The aim of this course is to build in-depth knowledge base and to provide adequate professional skills in the area of physical testing of Leather Goods and allied materials. The course will also equip the students with knowledge and understanding the characteristics of various types' leather and materials which is required for manufacturing leather products. It contains the topics for basic principle and procedure for various physical testing methods for leather, leather products and allied materials.

Course Objectives: Course Objectives of this course are:

- To familiarize students with the various theoretical and practical aspects of physical characteristic of leather, leather products and allied materials.
- To describe Processing steps involved for physical testing of leather, leather products and allied materials.
- To acquaint the students with different machineries involved in the physical testing of leather, leather products and allied materials.
- To make the students competent in the field of leather testing.

Course Contents:

Introduction: Objects of carrying out physical testing of leather, few popular thumb tests for upper leathers, disadvantage of thumb tests, classification of physical testing methods.

Sampling: Introduction, statistical aspects of the sampling problem, collection of samples, sections of raw hides and skins and of leather, sampling positions, conditioning of test pieces.

Strength and stretch of leather: Tensile strength and elongation, stitch tearing strength, tearing strength, tongue tearing strength, buckle tear strength, split tear strength, distension and strength of grain by ball burst test, effect of splitting on strength, area stability, effect of relative humidity, effect of oil content, effect of kind of tannage and method of finishing, measurement of the initial strain energy of leather, temper of leather, resilience properties of leather.

Tests for upper and lining materials: Flexing endurance test, principles of flexing, water vapours permeability test, Improving of WVP of upper leather, Water Vapour Absorption and Water vapour co-efficient, Wrinkelometer test. air permeability of leather, dynamic water proofness test, principles of water proofness test, shrinkage temperature, control of shrinkage temperature, Martindale abrasion test, chisel scuff resistance, softness test, how to improve scuff resistance, dry and wet rub fastness, the gray scale.

Tests for finish film: Introduction, bond strength between the leather surface and the finish film, how to improve this bondage, heat resistance of finish film, cold crack resistance, light fastness of finish film, wet and dry rub fastness, test for bleeding, water fastness, elasticity of finish film, resistance to solvent, resistance to washing and cleaning agents, resistance to dressing

agents, resistance to water stains, moisture fastness, resistance to plasticizer, resistance to buffing of suede leather, resistance to ageing.

Tests for Soling Materials: Apparent and real densities, abrasive resistance, absorption of water by kubelka method, dynamic water proofness test of sole leather, resistance to cracking of grain crack index, why sole leather cracks and how to prevent it, perspiration resistance of leather, how to improve perspiration resistance of leather, Relative porosity. Hydrolysis test, Flexing test (SATRA BATA Ross flex, Bennewart flex) compression set test, adhesion test oil swelling resistance test.

Test for Insole and other Accessories :Insole: Flexing Index, Tensile strength and extension at break, scuff resistance, peel strength, Laminar strength, Water uptake, water absorption and desorption. Laces: Breaking strength and elongation at break, Bodkin attachment strength, abrasion resistance, lace to eyelet abrasion test.. Velcro: Peel test, shear resistance. Hook, Eyelet's, D-Rings: Attachment in leather, corrosion test, Breaking strength. Buckles: Corrosion test, Tensile strength, strength buckle and strap attachment. Top piece: Top piece attachment strength. Stiffener and Toe puffs: Tear strength, Adhesion strength, Shanks: Longitudinal stiffens.

Tests for safety Footwear: Impact resistance of toecap, compression resistance, electrical resistance. Penetration resistance of metal insole. Upper/outsole and sole interlayer bond strength, insulation against heat, insulation against cold, resistance to fuel oil, corrosion resistance of metallic part.

Learning Outcomes: Upon completion of this course the students will be able to

- Describe the physical properties of leather.
- Select the best leather and materials for particular leather products.
- perform various physical tests for leather, leather products and allied materials.

References:

1. Society of Leather Technologists and Chemists-Official Methods of Analysis- 1996.
2. Dutta S.S. - An Introduction to the Principles of Physical testing of Leather.
3. O'Flaherty, William. And Roddy-The Chemistry and Technology of Leather, Vol-IV
4. Heidemann E. -Fundamentals of Leather Manufacturing.

5. Dutta S.S. - An Introduction to the Principles of Leather Manufacture.
6. John Arthur Wilson-Modern Practice In Leather Manufacture.
7. Venkatachalam P.S. - Lecture Notes on Leather.
8. SATRA Owner's Manual – SATRA, UK

**LPE-308: TESTING OF LEATHER PRODUCTS AND ALIED MATERIALS
PRACTICAL**

Class per week	Credit	Marks
1	2	Continuous assessment : 40, Course final examination 60

Introduction to the Course: This course is to build in-depth practical base and to provide adequate professional skills in the area of physical testing of Leather Goods and allied materials. It contains practical works about various physical testing for leather, Leather products and allied materials.

Course Objectives: Course Objectives of this course are:

- To familiarize students with the various practical aspects of physical characteristic of leather, leather products and allied materials.
- To describe Processing steps involved for physical testing of leather, leather products and allied materials.
- To acquaint the students with different machineries involved in the physical testing of leather, leather products and allied materials.
- To make the students competent in the field of leather testing.

Course Contents:

1. Determination of tensile strength and % of elongation at break.
2. Determination of tear strength / stitch tear strength / tongue tear strength/ split tear strength.
3. Determination of flexing endurance.
4. Determination of water-vapor permeability of leather.
5. Determination of water vapor absorption and their co-efficient.

6. Determination of scuff, heat, bending resistance of leather.
7. Determination of wash fastness, of leather used in products manufacture.
8. Determination of break/pipiness/wrinkles of supplied leather.
9. Determination of adhesion of finish film of supplied finished.
10. Different strength tests of adhesive.
11. Different thread tests.
15. Different tests of accessories.
16. Determination of softness for upper leather.

Learning Outcomes: Upon completion of this course the students will be able to

- Perform the test various physical tests for leather, leather products and allied materials.
- Select the best leather and materials for particular leather products.
- Compare the leather products, leather and allied materials with standard.

References:

1. Society of Leather Technologists and Chemists-Official Methods of Analysis- 1996.
2. Dutta S.S. - An Introduction to the Principles of Physical testing of Leather.
3. O'Flaherty, William. And Roddy-The Chemistry and Technology of Leather, Vol-IV
4. Heidemann E. -Fundamentals of Leather Manufacturing.
5. Dutta S.S. - An Introduction to the Principles of Leather Manufacture.
6. John Arthur Wilson-Modern Practice In Leather Manufacture.
7. Venkatachalam P.S. - Lecture Notes on Leather.
8. SATRA Owner's Manual – SATRA, UK

LPE-309: COMPUTER AIDED DESIGN AND PATTERN MAKING

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the Course: This course gives an introduction to computer aided design and pattern making and will provide an overview of computer-aided design (CAD), computer aided manufacturing (CAM), computer integrated manufacturing system (CIMS), industrial automation concepts and their applications to the traditional skills of designing, pattern cutting, grading, fashion design and manufacturing. This course also introduce modern CAD/CAM technology for leather products engineering and their software packages which include Shoe master and Crispin.

Course Objectives:

- To improve theoretical knowledge about computer aided design (CAD), computer aided manufacturing (CAM), computer integrated manufacturing system (CIMS) for leather goods manufacturing.
- To understand about CAD, CAM, CIMS, CAPP software for leather goods.
- To develop practical skills required for CAD and especially preparing pattern for production of various leather goods.
- To know about pattern grading, pattern engineering and engineering analysis.
- To intensify knowledge about industrial automation and their applications.
- To learn about geometric modeling, group technology, digitization.
- To enhance the skill in computer control manufacturing systems.

Course Contents:

Industrial automation: Definition, types of automation, development of automation, development of computers, application of computers to manufacturing.

Computer-integrated manufacturing (CIM): Principles of CIM, essentials of computer-integrated manufacturing systems, effectiveness of CIM, advantages and disadvantages of CIM.

Computer-aided design (CAD) : Introduction to CAD and its application in different sector of leather products, foot wear technology in brief., fundamental concepts on coordinate systems; draw line, square, rectangle, triangle, etc. using absolute and incremental system, application to simple operations like moving, copying, rotating, trimming, breaking etc. linear, angular and aligned dimensioning system, CAD facilities; Geometric modeling- 2D And 3D models, surface models, solid models; methods of optimum design. Computer-automated process planning, automated manufacturing planning-function involved in AMP, computer- aided routing (CAR), CAR system.

CAD/CAM: Principles and scope of CAD hardware & software in CAD and introduction to CAM, NC, CNC devices for computer aided cutting including laser and water jet, computer aided stitching, Digitization: 2D and 3D coordinate extraction, principles of digital to analog conversion, digital input/output processing systems, programming techniques and languages, computerized techniques, principles and strategies for collection of data for imaging, rendering, data reduction and processing techniques with special reference for different designs, CAD/CAM system- integrating CAD and CAPP. Automatic machine tools for mass production; computer-controlled manufacturing systems; automated assembly, automatic materials handling, industrial robots, industrial robots in manufacturing.

CAD for leather-products: Introduction to input and out-put devices required for CAD and their working principles for leather-products and footwear manufacturing; Capabilities of CAD for styling purposes-color, basic primitives; etc.; use of 2D and 3D techniques for leather products designing, panel design and grading, pattern production; scrap materials calculation.

CAM for Leather-products: Tools required in CAM; applications of CAM in leather-products manufacturing.

Learning Outcomes: Computer Aided Design and Pattern Making course will be able to learn about:

- Different types of automated machines and their applications.
- Students will differentiate between NC and CNC type machines and their functions.
- Recall drawing, modification and optimization of a design.
- Identify the elements of CIM, its principle, CIM installation and benefits of CIM software.
- Identify and interpret information provided in technical drawing.
- Produce two-dimensional drawings using traditional visualization techniques.
- Understand computer aided process planning, data reduction and processing technique.

- Understand the theory, objectives and tools of automatic manufacturing.
- Students gather proper knowledge about input and output devices for CAD and CAM and their functions.
- Apply the scope of CAD/CAM/CIMS.
- Understand the relationship between automation and CIMS.
- Understand the computer controlled manufacturing systems like automated assembly, automated material handling, and industrial robots in manufacturing.
- Implement quality improvement techniques and support smart automation systems.

References

1. Harrington, J.- Computer Integrated Manufacturing.
2. Singh, N - Systems Approach to Computer-Integrated Design and Manufacturing.
3. Boothroyd G.- Assembly Automation and Product Design.
4. Chang T.C., Wysk, R.A and Wang, H.P. – Computer-aided manufacturing.
5. Pivecka J. - Practical Handbook on Shoe Production.
6. Americal Shoe making, Shoe Trades Publishing Co.
7. Hitomi K. – Manufacturing System Engineering.
8. Singh S. -Computer Aided Design and Manufacturing.
9. Gerry C. - Pattern Grading For Women’s Clothes
10. Hand Book on Manufacture of Leather Garments

LPE-310: COMPUTER AIDED DESIGN AND PATTERN MAKING PRACTICAL

Class per week	Credit	Marks
2	2	Continuous assessment : 40, Course final examination 60

Introduction to the Course: This course gives an introduction to computer aided design and pattern making and will provide an overview of computer-aided design (CAD), computer aided manufacturing (CAM), computer integrated manufacturing system (CIMS), industrial automation concepts and their applications to the traditional skills of designing, pattern cutting, grading, fashion design and manufacturing. This course also introduce modern CAD/CAM

technology for leather products engineering and their software packages which include Shoe master, Luggage master and Crispin.

Course Objectives:

- To improve practical knowledge about computer aided design (CAD), computer aided manufacturing (CAM), computer integrated manufacturing system (CIMS) for leather goods manufacturing.
- To know about CAD, CAM, CIMS, CAPP software for leather goods.
- To develop practical skills required for CAD and especially preparing pattern for production of various leather goods.
- To learn about pattern grading, pattern engineering and engineering analysis.
- To enhance about industrial automation and their applications.
- To understand geometric modeling, group technology, digitization.
- To know about computer control manufacturing systems.

Course Contents:

Manufacturing Techniques of the following items-

Leather Goods:

1. Leather Key rings (Triangular, Rectangular, Circular, Pentagon, Polygon etc.)
2. Leather Mobile cover
3. Address-card holder in leather material
4. Leather Money Bag
5. Leather Vanity Bag
6. Leather Belts for Gents

Leather Garments:

1. **Men's wear preparation and Grading techniques:**
 - a) Block preparation.
 - b) Bolero type waistcoat
 - c) Gilet type waistcoat
2. **Women's wear preparation and Grading:**
 - a) Block preparation.
 - b) Ladies jacket
 - c) Skirt grading.

3. Preparation of various types of bags.

Different Size Modifications: Different Size Modifications of different Leather Goods and Leather Garments.

Learning Outcomes:

Computer Aided Design and Pattern Making course will be able to learn about:

- Different types of automated machines and their applications.
- Students will differentiate between NC and CNC type machines and their functions.
- Recall drawing, modification and optimization of a design.
- Identify the elements of CIM, its principle, CIM installation and benefits of CIM software.
- Identify and interpret information provided in technical drawing.
- Produce two-dimensional drawings using traditional visualization techniques.
- Understand computer aided process planning, data reduction and processing technique.
- Students gather proper knowledge about input and output devices for CAD and CAM and their functions.
- Apply the scope of CAD/CAM/CIMS.
- Understand the relationship between automation and CIMS.
- Understand the computer controlled manufacturing systems like automated assembly, automated material handling, and industrial robots in manufacturing.

References:

1. Pattern Cutting & Making up- Martin M. Shoben
2. Leather Apparel Design – Francesca Sterlacci
3. Clothing Technology- Europa Lehrmittel
4. Fashion With Leather- Bastford
5. Making Leather Clothes- Jongensen.
6. Pattern Cutting for Women's Outerwear- Gerry Cooklin.
7. Metric Pattern Cutting for Children's Wear and Baby Wear- Winifred Aldrich
8. Grading for the Fashion Industry- Taylon Shoben
9. Pattern Drafting and Making up- Bella Kapoor
10. Pattern Grading for Men's Cloths- Cooklin

11. Pattern Grading for Women's Cloths- Cooklin
12. Fabric Form and Flat Pattern Cutting- Winifred Aldrich
13. The Clothing Factory- H. C. Carr
14. Computers in the Fashion Industry- Patrick Taylor
15. Leather Goods Handbook.

LPE-311: FOOTWEAR TECHNOLOGY

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the course: Footwear Technology is an important course for leather products engineers as footwear is widely used leather product. This course is related to foot anatomy, different types and styles of footwear, last, different methods of manufacturing, sizing systems, sequence of operations for different constructions, special types of footwear making etc.

Course Objectives: The learning objectives of this course are

- To learn about the anatomy of human foot and its importance for the body.
- To know the functions of foot and footwear.
- To acquire knowledge different types and styles of footwear.
- To familiarize about foot problems.
- To enhance skill in manufacturing sequences of footwear.
- To know about the machines required for footwear manufacturing.
- To learn most commonly used shoe sizing systems in the world.
- To gather knowledge of different types of upper and lining materials of footwear.
- To get overall idea about foot, last and footwear.

Course Contents:

Human Foot: Function of foot, types of foot, normal foot, foot's section, Foot Anatomy- Bones, muscles, tendons, ligaments, nerves and blood vessels, joint, arches, skin etc. foot anatomy of infants and children, development of human foot from infants to adult-characteristic features of

infant, children and adult foot, Biometry of the human foot, details of foot parameters. Foot Measurement- Necessity, Biometry, foot parameters and measuring procedure.

Footwear: Definition, history of footwear, foot gear, Purpose of footwear, comfortable footwear, types of footwear – oxford, derby, moccasin, mule, boot, sandal, clog, pump, safety footwear, occupational footwear, sports shoe styles and fashion of footwear, features of comfortable shoes, shoes and foot defects, Shoe Anatomy- Shoes section, parts of upper and lining, out soles, mid sole, counter, box toe, footwear components- toe puff, stiffener, insole, shank piece, heel, welt, ornaments and fittings, foot and footwear care.

Last : Last and it's importance, difference between last and feet, last features for different styles of footwear, classification of last, defects of last, measurement of last, symmetric and asymmetric lasts, custom made last, after care of last/storage of last

Shoe sizing and Fitting: Principle of shoe sizing, history of shoe sizing, length size , shoe size classification- UK shoe sizing, parish 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 ,different fitting systems.

Cutting: Definition of Cutting, Principles of Cutting, Cutting of upper components, Hand cutting tools, Hand cutting process, Press cutting, Clicking press knives, environmental factors, Storage of knives, Modern clicking presses, Advantages of various types of cutting machines, press cutting process, Safety method of clicking, Comparison between hand cutting and machine cutting, Sorting of leather for cutting.

Closing: Definition, preparatory operations- identification marking, notch marking, size and marking, stitch marking, Lining stamping, Punching/Perforation, Gimping, Blocking, Preforming, Reinforcing, Embossing, Crimping , Splitting, Skiving, Edge coloring, Burnishing, Folding, Binding, Top line treatment, Eyeleting, Punching, Edge burnishing etc.

Lasting: Definition, functions of lasting, principle of lasting, methods of lasting, hand lasting procedures.

Features and constructions: Sandal, court shoe, oxford shoe, derby shoe- selection of materials, designing and pattern cutting, materials cutting, assembling, closing and lasting and sole attaching.

Shoe room and finishing: The aims and objects of finishing and their utility, upper leather dressing, cleaning and shoe lacing, upper leather cleaning and dressing, fitting the sock, shoe lacing and packaging.

Learning outcomes: The learners will be able:

- Understand about the structure of human foot, last and footwear.
- Know the necessity of foot and footwear.
- Learn to classify footwear based on materials, height, purposes, styles etc.
- Proficient about the manufacturing sequence.
- Possess the skills to identify different footwear materials (both upper and lining).
- Gather idea about different shoe sizing systems.
- Finally the learners will get overall knowledge about footwear manufacturing.

References:

1. Venkatappaiah B. -Introduction to The Modern Footwear Technology-
2. Miller R.G. (Editor) -Manual of Shoe Making
3. Korn J. (Editor) -Boot and Shoe Production
4. Thornton J. H. -Text Book of Footwear Manufacture
5. SATRA Bulletin
6. Spencer Crookenden -K Shoes -The first 150 years 1842-1992
7. Ruth Thomson -Making Shoes
8. Swayam Siddha -Product Knowledge
9. Swayam Siddha -The Skill of Seam Reducing
10. Thornton J. H. -Text Book of Footwear Materials
11. DR. Davidsohn J. & Davidsohn A. - Polishes - Their Raw Materials and Manufacture
12. Martin M. Shoben and Janet P.Ward-Pattern Cutting And Making Up
13. Xenia Ley Parker -Working With Leather
14. Anne and Jane Cope-Leather work
15. Lehrmittel. Nourney -Clothing Technology
16. Swayam Siddha-The Art of Cutting Kid and Goat Skin
17. Roseaman I. P. -Leather Work

LPE-312: FOOTWEAR TECHNOLOGY PRACTICAL

Class per week	Credit	Marks
2	4	Continuous assessment : 40, Course final examination 60

Introduction to the courses: This course is related to identification of different parts of foot from skeleton and model, identification of basic styles of footwear, parts identification for every style of footwear, foot measurement, tools and machines used in footwear manufacturing, designing and manufacturing of basic styles of footwear etc.

Course Objectives:

- To identify foot composition from skeleton.
- To identify basic styles of footwear and different parts for every style of footwear.
- To know the tools and machines used in footwear manufacturing.
- To design and pattern making of a complete set of footwear.
- To manufacture a complete footwear.
- To improve skill in foot measurement and foot impression taking techniques.
- To assimilate knowledge in mean forme-making technique, dead forme, standard making.
- To develop practical knowledge in Sandal making (Toe peg, toe band, v-strap, instep- band, crossed bands, multi-straps).
- To enhance practical knowledge Baby shoe making, slipper making, fancy ladies sandal making.
- To familiarize about Men's Shoe making- Oxford shoe, Gibson/Derby shoe, Brogue shoe, Monk shoe, Army boot, Riding boot, orthopedic shoe, miner's boot, moccasin, Slippers.
- To develop practical knowledge Women's Shoe Making- Fancy shoes, Court shoe, Mule, Bar Shoe, Tie Shoe, Ankle Strap, Sling- back.

Course Contents:

1. Identification of shoes, identification of parts and components of shoes.
2. Foot measurement and foot impression taking techniques.
3. Identification of bones, nerves, muscles from skeleton and model.
4. Handling and introduction of working tools of footwear.
5. Mean forme-making technique, dead forme, standard making.

6. Working pattern making technique
7. Sandal making: Toe peg, toe band, v-strap, instep- band, crossed bands, multi- straps.
8. Attachment of straps of sole.
9. Baby shoe making, slipper making, fancy ladies sandal making
10. Sandal making – Toe peg, Toe band, V-strap, instep-band, Crossed bands, multi- straps.
11. Men’s Shoe making- Oxford shoe, Gibson/Derby shoe, Brogue shoe, Monk shoe, Army boot, Riding boot, orthopedic shoe, miner’s boot, moccasin, Slippers.
12. Women’s Shoe Making- Fancy shoes, Court shoe, Mule, Bar Shoe, Tie Shoe, Ankle Strap, Sling- back.

Learning Outcomes:

- The learners will be able to easily identify the parts of foot, last and footwear.
- They will be expert to design and pattern making for specific style of footwear.
- They will be able to manufacture complete footwear according to proper size and fit.

References:

1. Venkatappaiah B. -Introduction to The Modern Footwear Technology-
2. Miller R.G. (Editor) -Manual of Shoe Making
3. Korn J. (Editor) -Boot and Shoe Production
4. Thornton J. H. -Text Book of Footwear Manufacture
5. SATRA Bulletin
6. Spencer Crookenden -K Shoes -The first 150 years 1842-1992
7. Ruth Thomson -Making Shoes
8. Swayam Siddha -Product Knowledge
9. Swayam Siddha -The Skill of Seam Reducing
10. Thornton J. H. -Text Book of Footwear Materials
11. DR. Davidsohn J. & Davidsohn A. - Polishes - Their Raw Materials and Manufacture
12. Martin M. Shoben and Janet P.Ward-Pattern Cutting And Making Up
13. Xenia Ley Parker -Working With Leather
14. Anne and Jane Cope-Leather work
15. Lehrmittel. Nourney -Clothing Technology

16. Swayam Siddha-The Art of Cutting Kid and Goat Skin
17. Roseaman I. P. -Leather Work

LPE-313: INDUSTRIAL AND PRODUCTION ENGINEERING FOR LEATHER PRODUCTS MANUFACTURE

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the course: This course is a combination of Industrial Engineering and Production Engineering. It is also a Manufacturing course which gives idea on Metal casting, Bulk deformation process, Sheet metal work, Material removal process, Leather Manufacturing machines and their maintenance, Standardization, etc.

Course Objectives: Students have to get the idea on:

- Metal casting, Bulk deformation process, Sheet metal work, Material removal process,
- Leather Products Manufacturing machines and their maintenance, Standardization, etc.

Course Contents:

Metal Casting Processes: casting processes for ferrous and non-ferrous metals; sand, die, centrifugal, slush, plaster mold, loam mold, precision investment casting etc. casting defects, design of moulds, riser, gate sprue and core, cost analysis, metals for casting, product design considerations.

Bulk Deformation Processes in Metal Working: rolling and other deformation processes related to rolling, forging and other deformation processes related to forging, extrusion and other deformation processes related to extrusion, wire and bar drawing.

Sheet Metal Working: cutting operations, bending operations, drawing, other sheet metal forming operations, deep drawing, dies and presses for sheet metal processes, sheet metal operation not for performed on presses, bending of tube stock.

Material Removal Processes: single point cutting tool, chip formation in metal machining, types of chips, various operations performed on turning, milling, drilling, shaping, grinding, broaching etc., cutting tool materials and cutting fluids, tool wear and tool life, economics of machining.

Leather Products Manufacturing Machines and their Maintenance: Cutting section; Hand-Operated leather cutting machine, hydraulic clicking press, traveling head/sewing arm cutting machine. Leather splitting machine, stamping and numbering machine for lining, strap cutting machine, cutting plotter, drawing plotter, cutting knife production unit, stitch marking machine. Sewing section: skiving machine, liner edge folding machine, use of various types of sewing machine for leather products manufacture, zigzag sewing machine, cylinder bed sewing machine for bag profiling and wallets, flat bed single & double sewing machine, post bed single & double needle sewing machine, ornamental sewing machine, light sewing and heavy duty sewing machine, button stitch machine, seam rubbing and taping machine, thread burner, upper leather perforating machine, eyeleting machine, punching and riveting machine, binding machine. Closing section: binding machine, belt-finishing machine, belt-folding marking machine, embossing machine, trimming machine, edge coloring machine, edge polishing machine, fusing machine, buffing machine, ironing machine, spiral cutting machine, leather and plastic auto-weaving machine, humidifier.

Standardization: Introduction, product simplification and diversification, interchangeability, selective assembly, principles, preparation of standards, application of standards in design and manufacturing, applying for patents, international and national standard organization.

Learning Outcomes:

- From learning this course the students can understand the Metal casting, Bulk deformation process, Sheet metal work, Material removal process, Leather Manufacturing machines and their maintenance, Standardization, etc.

References:

1. Production Technology- R.K. Jain
2. Production Process-Degarmo
3. Production Process- Dole

LPE-315: MANAGERIAL ECONOMICS

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the course: Understanding the economic environment is essential for the successful management of virtually any business activity ranging from placement to production and marketing decisions. Indeed, making decisions is what management is all about. However, making the right decision is the biggest challenge any manager faces. Markets are fickle, and competition can be intense, leaving managers faced with a wide variety of information and choices that need to be acted upon. Managerial Economics can help students with structuring these difficult decisions by giving them the adequate tools. Managerial Economics provides a conceptual framework for understanding the economic forces at work in firms and markets and supplies models and tools for improving managerial decision making.

The Course Objectives are as follows:

This course aims to make the participant familiar with the language and methods of economic analysis while emphasizing issues of practical relevance in business management. The students will not only learn how supply and demand effect prices, or the fundamentals of differentiation in a firm's strategy, but also will be able to improve their decision-making processes, at a strategic level within the organisation.

- List the different goals and constraints that firms face.
- Apply the economic way of thinking to individual decisions and business decisions.
- Use calculus (first and second order derivatives) to solve for an optimum solution.
- Understand how prices get determined in markets, how market participants benefit in the form of consumer surplus and producer surplus, and what are the consequences of government intervention.
- Measure the responsiveness of consumers' demand to changes in the price of a good or service, the price of other goods and services, and income
- Understand the different costs of production and how they affect short and long run decisions.
- Derive the equilibrium conditions for cost minimization and profit maximization.

- Understand economies of scale, diseconomies of scale, economies of scope, and cost complementarities, and how each affects the cost of production.
- Explain the principal-agent problem and why different forms of compensation exist.
- Understand the four basic market models of perfect competition, monopoly, monopolistic competition, and oligopoly, and how price and quantity are determined in each model.
- Understand how game theory can be used to explain several business decisions.
- Explain four different pricing practices such as discrimination, two-part pricing, block pricing, commodity bundling, transfer pricing, and peak load pricing.
- Understand why there is a role for the government to play in market economies.

Course Contents:

Managerial economics: Introduction to macro and micro, nature and scope, theories and constructions, firm goals, firm size, location of firm, fundamental concepts and techniques for business decisions.

Demand and supply analysis: Meanings, laws, exceptions, types, determinants and elasticity of demand and supply, demand forecasting for consumer durable like leather, theory of production and supply.

Determination of Prices and Profits under different market conditions: Perfect competition, monopoly and oligopoly costs of production and distribution, pricing practices with special reference to leather, decision making under risk and uncertainty.

Market economy: Meaning, features, markets and prices, operation, dominance of developed countries, impact on developing countries, impact on the economy and industrialization process of Bangladesh.

Monetary policy: Fiscal policy, inflation, devaluation, budgets of Bangladesh, monetary policy for export oriented industries-specially for leather, footwear, leather products, hand- gloves, leather garments, horns and hooves and other by-products based industries, matching grant funds and other special funds for leather, footwear and leather products industries, incentives and other financial supports for leather, footwear and leather products sectors.

Documentation for international business: Up to date govt. documents: export-import policy, monetary policy, duty on import & export, L/C opening, clearing & forwarding, shipment, value added tax (VAT), tariff and non-tariff barriers etc.

Plant & production costing: Selection of machines, cost involved in production system, machine depreciation, material costing, costing for individual item, competitiveness, local & international market price, labor & manpower cost, other overhead cost, cost involved in export/import of goods, gross profit & net profit, break-even point and Merchandising.

Learning Outcomes: After the completion of the course, students will be able to –

- Understand the roles of managers in firms
- Understand the internal and external decisions to be made by managers
- Analyze the demand and supply conditions and assess the position of a company
- Design competition strategies, including costing, pricing, product differentiation, and market environment according to the natures of products and the structures of the markets.
- Analyze real-world business problems with a systematic theoretical framework.
- Make optimal business decisions by integrating the concepts of economics, mathematics and statistics.

References:

1. Benjamin Higgins- Economic Development.
2. Meir & Boldwen- Economic Development.
3. Dwivedi D.N - Managerial Economics, Vikas publishing, India.
4. Export Quality Management, ISO 9000 Quality Management systems,
5. Hyder R. M. - Managerial Economics, Abdullah & Sons, Dhaka.
6. Hossain A. M., Azad G.M., Sibli S.A - Managerial Economics, Dhaka.
7. Kranse- Economic Development
8. Eilis and Buchanon-Approaches to Economic Development.

LPE 401: MANUFACTURING TECHNOLOGY OF LEATHER PRODUCTS -IV

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the Course: This course is a part four (out of four) for Manufacturing Technology of Leather Products in obtaining Bachelor of Science in Leather Products Engineering Degree. The aim of this course is to build in-depth knowledge base and to provide adequate professional skills in the area of Leather Goods manufacturing. The course will also equip the students with knowledge and understanding of Production Technology of Leather goods and garments manufacturing which includes knowledge in pattern construction, Designing and styling development and production.

Course Objectives: Course Objectives of this course are:

- To familiarize students with the various theoretical and practical aspects of Leather products manufacturing
- To foster an understanding of the importance of pattern engineering
- To describe Processing steps involved in the making of leather goods and garments
- To acquaint the students with different machineries involved in the products manufacture
- To enable the students to apply various techniques of design in making leather goods and garments
- To make the students competent in the field of pattern drafting and grading
- To provide comprehensive knowledge about the Organization and management of leather goods and garments manufacturing

Course Contents:

Fabrication Technology of Leather Products: Introduction, preparatory process, Bench operations, Creasing, edge dyeing or staining, punching, riveting, eyeleting, cementing, edge folding. marking, stamping, embossing. construction method and assembling.

Lining material & their use: Silk, satin, velvet, rayon, poplin, moirette/silkette, fabric of mercerized cotton, printed cotton, drill, laminate, Polyesters, wool and far, quality, Polynesia.

Stiffened articles: Flat stiffened work, gusseted pocket, compound gusset, step gusset, turned edged articles, simple card case, envelope case, turned edged wallets.

Box work: Hinges and fastenings, box covering, jewel box lining large box work,

Assembling component parts on leather goods articles: Applying cement adhesives, Assembling materials and semi-produced articles, Trimming edges, Assembling rigid hand bags.

Sewing Machinery : Field of application, Stitch types, Materials feed system, Feeding mechanism, Classification of sewing machine.

Construction of Gussets: Introduction, types of gussets, plain gusset, "V" gussets, flat gussets, three parts gussets (plain), three parts gussets (double).

Bags: types of bag, Materials for bags, tools and equipment for bags manufacture, no-gusset bag shapes, one-gusset bag shapes, two-gusset bag shapes, joining one-and two-gusset bags, attaching straps to gussets, flap fastening, pockets, pockets, making a one-gusset bag pattern, making stitch holes, attaching gussets, box-type bag, general working order, bag fastening-tongue and loop, double tongue and loop, loop and toggle, loop and bead/toggle/button strap and buckle, turn lock, draw string, zips, flaps and straps.

Wallets: Introduction, types & use, raw materials, perspective drawing, list of components, measurement instruction, total pattern making, leather consumption, splitting and skiving instruction, construction and assembling.

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

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

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

Hpholstery: Introduction, tools, materials, frames, stripping upholstery, use of foam, upholstered stools, 'Drop-in 'loose seats, occasional and dining chairs, restoration of antique chairs, pouffes, replacing springing and webbing, stile and collar cutting, planning and cutting covering material, buttoning, show-wood upholstery, fluting, refurbishing wing easy chair, re-upholstery of chippendale period easy chair, re-upholstery of a victorian-style buttoned-back chair, restoration of a victorian twist-leg chair, upholstery of bed headboards.

Outer and Inner wear : ladies jacket, Waiste coat, Blazer, Men's parka, Children wear, Collar and sleeve construction, Neck line, hem lines variations, Assembling of different components.

Materials handling : Automated handling system, hand push movable trolleys, electromechanically power conveyors.

Trouble Shooting: Defects identification in different steps of Leather Products manufacture and their remedies.

Health and safety: Fire- fire risk & prevention / precaution, types of combustion & risks, fire fighting methods & equipments, Hazards- Solvent hazards, mechanical & electrical hazards; ventilation & working environment, ergonomics, fatigue, accidents factors, lighting methods, Occupational safety & health act.

Learning Outcomes:

Upon completion of this course the students will be able to

- Describe Fabrication Technology of Leather Products Manufacturing.
- Design leather bags, Wallets, Leather garments etc.
- Prepare the complete pattern for various types of leather products,

- Select the lining materials and stiffer for particular leather products.
- Ensure the OSH practice in a leather products factory.

References:

1. Anne & Jane Cope-Leatherwork
2. Carr & Latham-The Technology of Clothing Manufacture
3. Kirsten Jorgensen-Making Leather Clothes
4. Ben and Elizabeth Morris-Making Clothes in Leather
5. Sylvia Grainger-Leatherwork
6. Mary and E.A. Manning-Leatherwork
7. Francesca Sterlacei-Leather Apparel Design
8. Martin M. Shoben & Janet P. Ward-Pattern Cutting and making Up
9. Moseley, G.C-Leather Goods Manufacture
10. Batsford-Fashion with Leather
11. Hamlyn-Leatherwork –A step-by-step Guide.
12. Jane E. Garner-The Complete Handbook of Leather crafting.

**LPE 402: MANUFACTURING TECHNOLOGY OF LEATHER PRODUCTS –IV
PRACTICAL**

Class per week	Credit	Marks
4	4	Continuous assessment : 40, Course final examination 60

Introduction to the Course: This course is a part four (out of four) for Manufacturing Technology of Leather Products in obtaining Bachelor of Science in Leather Products Engineering Degree. It contains details about the Leather products manufacture through cutting, Pre assembling, assembling, bench operations, sewing and finishing operations. Then it contains the topics for getting the details idea about specific types of leather products such as ladies bags, purse, gent’s executive bags. Leather garments, skirts, gloves. The course will also equip the students with knowledge and understanding of Production Technology of Leather goods and garments manufacturing which includes knowledge in pattern construction, Designing and styling development and production.

Course Objectives: Course 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 describe Processing steps involved in the making of leather goods and garments
- To enable the students to apply various techniques of design in making leather goods and garments
- To make the students competent in the field of pattern drafting and grading
- To provide comprehensive knowledge about the Organization and management of leather goods and garments manufacturing

Course Contents:

1. Manufacturing of Gent's belt.
2. Manufacturing of zippered purse, jewelry wallet,
3. Manufacturing of picture frame,
4. Manufacturing of waist coat.
5. Manufacturing of Playing card box.
6. Manufacturing of Various types of ladies bags.
7. Manufacturing of wallets.
8. Manufacturing of File folder.
9. Manufacturing of Diary cover.
10. Manufacturing of Tissue Box
11. Manufacturing of Table decorations,
12. Manufacturing of Executive bag.
13. Manufacturing of Gents lunch bag
14. Manufacturing of Passport case.
15. Manufacturing of Hand gloves.
16. Manufacturing of Fitted skirt.
17. Manufacturing of Gourd Skirt.

Learning Outcomes: Upon completion of this course the students will be able to

- Run various machineries involve leather products manufacturing.
- Prepare the complete pattern for various types of leather products,

- Design and manufacture of Wallets, File folder, Diary cover, Tissue Box, Table decorative items, Executive bag, Gents lunch bag, Passport case, Hand gloves, Fitted skirt, Gourd Skirt e.t.c.

References:

1. Anne & Jane Cope-Leatherwork
2. Carr & Latham-The Technology of Clothing Manufacture
3. Kirsten Jorgensen-Making Leather Clothes
4. Ben and Elizabeth Morris-Making Clothes in Leather
5. Sylvia Grainger-Leatherwork
6. Mary and E.A. Manning-Leatherwork
7. Francesca Sterlacei-Leather Apparel Design
8. Martin M. Shoben & Janet P. Ward-Pattern Cutting and making Up
9. Moseley, G.C-Leather Goods Manufacture
10. Batsford-Fashion with Leather
11. Hamlyn-Leatherwork –A step-by-step Guide.
12. Jane E. Garner-The Complete Handbook of Leather crafting.

LPE - 403: ANALYTICAL CHEMISTRY FOR LEATHER PRODUCTS MANUFACTURE--II

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the Course: The course gives an introduction to inorganic and organic analytical chemistry, including basic analytical methods and application in leather products.

Course Objectives: The objectives of this course is to provide:

- An introduction to analytical chemistry for leather products manufacture and an overview of important analytical methods and their range of application in leather within detection of inorganic, organic and other toxic compounds.

- Important analytical quantitative techniques from classical methods, electrochemical methods, spectrochemical / spectrophotometric methods, and separation techniques are reviewed.
- The course also includes risk assessment of chemical experiments, important steps and procedures in analytical chemistry, and evaluation/interpretation of results.
- The course gives an overview of important use of selected classical and instrumental chemical quantitative analytical methods leather product manufacturing and a short introduction to their basic theory.

Chromatography:

Ion-exchange methods: Introduction, ion-exchange resins, synthetic organic ion-exchangers, use of ion-exchange resins. Anion and cation exchange resins, properties of ion exchange resin, application of ion-exchange resins, ion-exchange chromatography, ion-exchange columns, application of ion exchange chromatography, ion -chromatography.

Gas chromatography: Introduction, classification, principles of gas-liquid chromatography, gas-solid chromatography, techniques of gas-liquid chromatography, carrier gas, sample injector, gas chromatograph columns and detectors: different types of detectors- thermal conductivity detector (TCD), flame ionization detector (FID), electron capture detector (ECD), nitrogen/phosphorus detector (NPD), qualitative and quantitative, Application of gas-liquid chromatography in leather industries.

High-Performance liquid chromatography: Basic concept, comparison of HPLC with gas-liquid chromatography, apparatus for HPLC, solvent delivery, sample injector, selection of column Different detectors:- UV & RI detectors, Qualitative and quantitative analysis, effect of temperature in HPLC, application of HPLC.

Spectroscopy:

Infrared spectroscopy: Principles, instrumentations and applications.

Nuclear magnetic resonance spectroscopy: Principles, instrumentations and applications.

Mass spectrometry: Principles, instrumentations and applications.

Atomic absorption spectroscopy: Introduction, basic principles, instrumentation, effect of flame temperature, chemical & spectral interference, recent developments, applications.

Surface characterization by spectroscopy and microscopy: Introduction to the study of surfaces, spectroscopic surface methods, scanning electron microscopy, scanning probe microscopes, principles involved in the morphological investigation on leather and polymers, imaging techniques for surface applications, ESCA, Auger spectroscopy.

Particle size measurements: Introduction, working principles, qualitative and quantitative information, applications.

Environmental analysis: Introduction, Banned amines, Identification of carcinogenic amine from a mixture of dyes, identification of benzidine-based dye, *Air pollution in Tannery*-determination of volatile organic compound (VOC), formaldehyde content in finishing area, Total Organic carbon (TOC) analyzer and its application for determining TOC, determination of COD & BOD of tannery effluent.

Chemical analysis of leather and related chemicals: Introduction, Tanning materials-routine analysis of synthetic tanning materials, analysis of alum tanning agents; formaldehyde.

Analysis of leather- analysis of alum tanned leather; formaldehyde tanned leather. Leather auxiliaries: analysis of sulphated oils: moisture, acid value, soaps, organically combined SO_3 existing as neutralized sulphuric esters and as neutralized sulphonic esters, sodium sulphate, sodium chloride, unsaponifiable matter, qualitative identification of surface active groups, determination of hydroxyproline in materials containing collagen.

Learning Outcomes: Upon completion of this course the students will be able to

- Introduce analytical chemistry for leather products manufacture and an overview of important analytical methods and their range of application in leather within detection of inorganic, organic and other toxic compounds.
- Interpret different analytical quantitative techniques from classical methods, electrochemical methods, spectrochemical / spectrophotometric methods, and separation techniques.
- Learn about risk assessment of chemical experiments, important steps and procedures in analytical chemistry, and evaluation/interpretation of results.
- Understand and use of selected classical and instrumental chemical quantitative analytical methods and a short introduction to their basic theory.

References:

1. Gary D. Christian- Analytical Chemistry
2. John Kenkel- Analytical Chemistry for Technicians
3. Skoog, Holler & Nieman- Principles of Instrumental Analysis
4. Sharma B. K. - Instrumental Methods of Chemical Analysis
5. Skoog, West & Holler- Fundamental of Analytical Chemistry
6. Browning D. R. - Chromatography
7. Hatakeyama T. and Quinn F.X. - Thermal analysis.
8. Vogel A. I. - Text Book of Quantitative Chemical Analysis
9. Sarker P.K. - Analytical Chemistry for Leather Manufacture.
10. Williams D. H. and Ian Fleming- Spectroscopic methods in Organic chemistry.
11. Kalsi P.S. - Spectroscopy of Organic Compounds.
12. Venkatachalam P.S. - Lecture Notes on Leather.
13. John A. Dean. -Analytical Chemistry Handbook.
14. Dr. Sethi P.D. - HPTLC (High Performance Thin Layer Chromatography).
15. Banwell C. N. - Fundamentals of Molecular Spectroscopy.
16. Hamilton, Hamiltoan-Thin Layer Chromatography.
17. Fifield & Haines-Environmental Analytical Chemistry.
18. UNIDO- Tannery and Environment.
19. Chhatwal G .R. - Encyclopedia of Environmental Analysis (vol.1, 2 &3)
20. Robert L. Grob- Modern Practice of Gas Chromatography
21. Dyer A., Hudson M.J. and Williams P.A. -Progress in Ion Exchange -Advances and applications.

LPE-405: DESIGN AND PATTERN MAKING

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the Course: This course is designed to reinforce designing skills and introduce students to different theoretical knowledge of designing various leather products. It will prepare

students for work in high level designing courses in which research writing is a requirement. It introduces basic designing terms including: art and design, free hand drawing, design and techniques for leather products, design analysis etc. The course will place equal or greater emphasis on macro-level pattern making skills such as: concepts of pattern, modifications, pattern grading, enlargement etc.

Course Objectives:

- To have complete knowledge on the basic terms of product designing.
- To create own designed product with specific purpose.
- To be able to apply the principles of design to any product.

Course Contents:

Art & Design: definition, idea and discussion on art, design, motif, fashion, style, fads, craze, newness, crafts. Application of design, style, fashion, motif in leather products. Exploration of design, source and influence available for a leather products design, sketching variety of products styles and design covering men's and women's wear in 2D and 3D, effective use of line, shape, color, pattern, and texture on leather products, presenting design themes, stimulating presentation or balanced, logical and readable solutions.

Free hand drawing: Line (straight and curve), triangle, circle, ellipse, rectangle, Tone (silver tone, first tone, second tone, third tone,) Composition, Proportion, Illustration using water colour, Poster colour, Colour pencil, Pastel colour. Different colour terms, Theory, vision, matching, Basic scheme, 3-dimensions, subjective nature of colour vision. Motif analysis, Drawing composition, Design in dimension, Texture fixation, Colour composition in design creativity analysis. Products sketching technique.

Design and techniques for leather products: Planning the design and selecting the skin, 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, visual and verbal analysis, assignment of finished garment. Boutique, screen print, applique techniques

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, aspects of consumer /buyer behavior, Customer profiles, Customer needs and wants, Pricing strategies, Method of distribution retail, Mail order and future strategies. Designers problem of a personality perspective.

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, colour board preparation, motif analysis, logo design, value addition, research and inspiration, cultural value in design.

Style and design variations: 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.

Modifications: Lowered armhole adaptation, extend and dropped shoulder adaptation (body with sleeve and yoke).

Pattern Grading for men's and women's clothing: Introduction, history, size and measurements, system development, grading methodology,

Enlargement: System of enlargement, body measurement and system analysis for enlargement procedure and calculations followed by standard sizing charts.

Learning Outcomes: By the end of the course, students will be able to:

- Demonstrate and apply knowledge of basic leather products designing, including pattern making.
- Employ the various stages of the product design.
- Demonstrate understanding of and apply the principles of fashion designing.
- Improve academic and theoretical knowledge of designing.

References:

1. Pattern Cutting & Making up- Martin M. Shoben
2. Leather Apparel Design – Francesea Sterlacci
3. Clothing Technology- Europa Lehrmittel
4. Fashion With Leather- Bastford
5. Making Leather Clothes- Jongensen.
6. Pattern Cutting for Women’s Outerwear- Gerry Cooklin.
7. Metric Pattern Cutting for Children’s Wear and Baby Wear- Winifred Aldrich
8. Grading for the Fashion Industry- Taylon Shoben
9. Pattern Drafting and Making up- Bella Kapoor
10. Pattern Grading for Men’s Cloths- Cooklin
11. Pattern Grading for Women’s Cloths- Cooklin
12. Fabric Form and Flat Pattern Cutting- Winifred Aldrich
13. The Clothing Factory- H. C. Carr
14. Computers in the Fashion Industry- Patrick Taylor
15. Leather Goods Handbook.

LPE-406: DESIGN AND PATTERN MAKING PRACTICAL

Class per week	Credit	Marks
2	2	Continuous assessment : 40, Course final examination 60

Introduction to the Course: This course is designed to be expertise on designing skills and introduce students to different practical knowledge of designing various leather products. It will prepare students for work in high level designing courses in which product designing with purpose is a requirement. The course will place equal or greater emphasis on macro-level pattern making skills such as: concepts of pattern, modifications, pattern grading, enlargement etc.

Course Objectives:

- To be able to apply practically the principles of design to any type of leather product
- To be expertise on making any kind of patterns.
- To create own designed product.

Course Contents:

Manufacturing Techniques of the following items

1. Men's wear preparation and Grading techniques:

- a) Block preparation.
- b) Bolero type waistcoat
- c) Gilet type waistcoat

2. Women's wear preparation and Grading:

- a) Block preparation.
- b) Ladies jacket
- c) Skirt grading.

3. Preparation of various types of bags.

4. Different Size Modifications

Learning Outcomes: By the end of the course, students will be able to:

- Prepare any kind of men's and women's wear.
- Make any kind of grading to the pattern.
- Create different size modifications.
- Prepare various types of bags.

References:

1. Pattern Cutting & Making up- Martin M. Shoben
2. Leather Apparel Design – Francesea Sterlacci
3. Clothing Technology- Europa Lehrmittel
4. Fashion With Leather- Bastford
5. Making Leather Clothes- Jongensen.
6. Pattern Cutting for Women's Outerwear- Gerry Cooklin.
7. Metric Pattern Cutting for Children's Wear and Baby Wear- Winifred Aldrich
8. Grading for the Fashion Industry- Taylon Shoben
9. Pattern Drafting and Making up- Bella Kapoor
10. Pattern Grading for Men's Cloths- Cooklin
11. Pattern Grading for Women's Cloths- Cooklin
12. Fabric Form and Flat Pattern Cutting- Winifred Aldrich
13. The Clothing Factory- H. C. Carr
14. Computers in the Fashion Industry- Patrick Taylor

15. Leather Goods Handbook.

LPE-407: POLYMER SCIENCE AND ENGINEERING

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the Course: From the candy wrapper to the artificial heart, polymers touch our lives as does no other class of materials. This course deals with polymers which find technological use as adhesives, fibres, plastics, rubbers as well as upper and lining materials of leather products. Different modes of synthesis of polymers, factors affecting glass transition temperature of polymer, degradation of polymer, polymer processing techniques are included.

Course Objectives: The objective of this course is to guide the students:

- To learn polymer and macromolecules and synthesis of different types of polymer.
- To identify the characteristics and application of polymer.
- To understand mode of synthesis of polymer and different polymerization techniques.
- To know the causes of polymer degradation.
- To understand different polymerization processing techniques.

Course Contents:

Polymeric materials: Definition and classification of polymers, chemistry and mechanism involved in different polymerization process such as stepwise, addition, ring opening, free radical polymerization, polymerization techniques-Bulk, solution, suspension and emulsion polymerization. Co-polymerization, anionic and cationic polymerizations. Chemistry & Technology involved in - Natural & synthetic rubber, PVC, polystyrene, PU, LDPE & HDPE polypropylene, EVA, ABS, acrylics, fibre reinforced plastics, poromerics /PVC or PU coated fabrics. Polymeric materials as adhesives and binders.

Macromolecules: Introduction, classification, structure of macromolecules in solid and solution state.

Structure and properties of polymers: Chemical and geometrical structure of polymer molecules, glass transition temperature and related topics of polymers properties, crystallinity in polymers.

Properties of commercial polymers: Introduction, polyamide and related polymers, phenol-formaldehyde polymers, urea-formaldehyde polymers and melamine-formaldehyde polymers, cellulose and related polymers, silicones, epoxies and biopolymers.

Polymers Degradation and Environmental issues: Introduction, types of degradation, management of plastics in the environment, polymer recycling, incineration, biodegradation, impact on environment of various types of polymers.

Polymers, additives, blends and Composites: Additives, plasticizer, filler and reinforcements, other important additives, polymer blends and interpenetrating networks- polymer blend.

Polymers used in Leather, Footwear and Leather products industry: Introduction, important polymers used in leather industry and application in leather processing.

Polymer processing: Basic processing operations, Plastic technology, Fibre technology, Elastomer technology.

Learning Outcomes:

This course will give the students sufficient grounding to:

- Know the characteristics of materials that not only are commercially important but are a part of the everyday experience.
- Understand different additives and their role on polymer blending.
- Learn to synthesis of different polymers.
- Provide knowledge about polymer degradation and impact of various types of polymers on environment.
- Gather idea of different polymer processing technique.

References:

1. Billmeyer F.W. Jr. - Text Book of Polymer Science.
2. Fried J.R. - Polymer Science & Technology.
3. Gowariker V. R. -Polymer Science.

4. Arora M.G. & Singh M. - Polymer Chemistry.
5. Reed R. (Ed.) - Science for Students of Leather Technology.
6. Misra G.S. - Polymer Chemistry.
7. Bienkiewicz K. - Physical Chemistry of Leather Making.
8. Heidemann E. - Fundamentals of Leather Making.
9. Parry D.A.D. & Creamer L.K. - Fibrous Proteins: Scientific, Industrial and Medical aspects.
10. Finar I. L. - Organic Chemistry Volume-II
11. Winding C.C. & Hiatt G.D. - Polymeric Materials.
12. Ghosh P. - Polymer Science and Technology of Plastics and Rubbers.
13. Sandler S. R. & Karo W. - Polymer Synthesis.
14. Gustavson-The chemistry & Reactivity of Collagen

LPE-408: POLYMER SCIENCE AND ENGINEERING PRACTICAL

Class per week	Credit	Marks
2	2	Continuous assessment : 40, Course final examination 60

Introduction to the Course: This course provides the students a practical guide to identify different types of polymeric materials, their characterization, viscosity determination, synthesis of different types of polymer etc.

Course Objectives: This course will make the students skilled about

- To synthesis of different types of polymer
- To identify different types of polymeric materials and their characterization.
- To determine the viscosity of polymer.
- To understand the application of polymer in leather products manufacturing.

Course Contents:

1. Identification of polymers use in leather, footwear and leather products manufacturing.
2. Determination of chemical compositions of selected polymers.
3. Determination of ionic character of selected polymers and surfactants.
4. Determination of viscosity of acrylic, polyurethane, butadiene binders.

5. Determination of electrolyte stability of acrylic, polyurethane, butadiene binders.
6. Determination of solvent stability of acrylic, polyurethane, butadiene binders
7. Determination of film hardness of acrylic, polyurethane, butadiene binders.
8. Determination of adhesive strength 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
11. Determination of flexibility of finish film based on acrylic, polyurethane, butadiene binders.
12. Determination of water resistance of finish film based on acrylic, polyurethane, butadiene binders, silicones based compounds and nitrocellulose based compounds
13. Chromatographic analysis of plasticizer.

Learning Outcomes: After completion of this course students will be able to

- Identify leather, adhesives, fibres, rubbers and plastics
- Synthesis of different types of polymer and their characterization
- Apply knowledge to find out the application of polymer in leather products manufacturing.
- Determine the viscosity of polymer.

References:

1. Billmeyer F.W. Jr. - Text Book of Polymer Science.
2. Fried J.R. - Polymer Science & Technology.
3. Gowariker V. R. -Polymer Science.
4. Arora M.G. & Singh M. - Polymer Chemistry.
5. Reed R. (Ed.) - Science for Students of Leather Technology.
6. Misra G.S. - Polymer Chemistry.
7. Bienkiewicz K. - Physical Chemistry of Leather Making.
8. Heidemann E. - Fundamentals of Leather Making.
9. Parry D.A.D. & Creamer L.K. - Fibrous Proteins: Scientific, Industrial and Medical aspects.
10. Finar I. L. - Organic Chemistry Volume-II
11. Winding C.C. & Hiatt G.D. - Polymeric Materials.
12. Ghosh P. - Polymer Science and Technology of Plastics and Rubbers.
13. Sandler S. R. & Karo W. - Polymer Synthesis.

14. Gustavson-The chemistry & Reactivity of Collagen

LPE-409: ENVIRONMENTAL SCIENCE AND POLLUTION CONTROL

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the Course: The course has been designed to improve the understanding of the students primarily about the leather manufacturing unit operations carried out in tanneries, types of tannery wastes, exposure pathways and evaluate their impacts to environmental quality and human health. It aims to enable students to understand the necessity of installation of pre-treatment and recycling plant for treating the tannery wastes for their reuse or safe disposal to the environment. The course will also be dealing about the sources of pollution in water, air and soil, control strategies and the skills of application of remediation techniques to combat pollution in these three environmental compartments. In addition, the students will be given the training to develop the particular skills required in pollution related structured research.

Learning Objectives: The learning objectives of this course are to

- Provide the basics about three major types of pollutions (water pollution, air pollution and soil pollution) that degrade the environmental quality poses a serious threat to human health worldwide.
- Present up to date information and data with regard to existing tanneries/leather manufacturing units in operation, type of tanning processes and chemicals employed, and storage of raw materials.
- Inform about the volume, types of tannery discharge, how they pollute the water, air and soil, causing ecological imbalance and the spreading of different kinds of fatal and contagious disease among the tannery workers and other individuals.
- Offer the fundamentals of tannery effluent treatment processes, and demonstrate the necessity of installation of a pre-treatment and recycling plant based on processes developed locally and internationally and other aspects of environmental pollution and its control.

- Aware about the health and safety policies developed for the tannery workers to reduce the accidents in the tanneries and how to use the emergency facilities in case of a problem.

Course Contents:

Environment and ecology: Introduction, components of environment, factors affecting environment.

Tannery and environment: Tanning process and their environmental implications, major process sequences, chemical inputs and wastes -curing of hides and skins, beam house operations, tanning, post tanning activity - wet and mechanical processes, and finishing.

Water pollution: Introduction, definitions of water pollution, sources of water pollution, different types of water pollution and their harmful impacts on ground and surface water, factors affecting surface water pollution, classification of water pollutants and effects of the various types of pollutants.

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, global and modeling climate change, green house gases and green house effect, acid rain and its effect, air pollutant and their characteristics, hazardous air pollutant (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.

Waste management: Definition of waste, integrated waste management, waste generation, separation, storage, collection, transformation of solid waste, transfer and transport, disposal water and air pollution control. Purification and reuse of water during leather processing, low float techniques using updated equipment, recycling of individual process liquors. International standard and exposure limits.

Recovery, regeneration, reuse and disposal of tannery wastes: Recovery of residues of effluents, organic materials, dissolved salts, energy, solid waste, recycling of lime /sulphide liquors, dehair, high chrome exhaustion techniques in chrome tanning, chrome recovery and recycling, oil and grease recovery, disposal of effluents

Biodegradability and biodegradation: Introduction, methods of measuring biodegradation, characteristics of tannery discharges, biological treatment of tannery effluents.

Tannery chemicals and waste generated in different tanning operations: Introduction, brief discussion of different types of chemicals used in leather processing.

Impact of tannery discharge on receiving waters: Introduction, presentation of receiving water and techniques used, results obtained and physico-chemical study, biological study and results obtained, specific analysis of chromium traces.

Pollution due to sulfur, chlorine and nitrogen: Introduction, ecotoxicity of chlorine, nitrogen and sulfur compounds; sulfur, chlorine and nitrogen in tannery effluents, study of effluents and treatment plants, balance in residual baths, tests for demonstrating nitrification.

Ecotoxicology: Introduction, toxic hazards and their control, controls of substance hazardous to health, hazard evaluation, risk assessment and control.

Safety manual on leather processing: Introduction, chemical safety, raw material handling, ranking of chemicals based on their hazard potential, storage instructions for hazardous and other chemicals, use of safety wares or personal protective equipment, upkeep of working and working surfaces.

Treatment technology: General outline of treatment-necessitated processes, types of treatment. Introduction, principle of pre, primary and secondary treatments, screening, settling. Chemical precipitation, removal of grease and oil, sulphide liquors, chromium, solid waste, primary treatment plant. Sedimentation tank, trickling filters system, biological fluidized beds. Different types of technologies used for the treatment of tannery wastes, primary and secondary treatment plant tertiary and quaternary treatment of tannery wastes.

Environmental Law and Industrial Pollution: Environmental pollution control, enforcement, monitoring and auditing, technical services government and industry policies, self-regulations by industry

Learning Outcomes: Upon completion of this course the students will be able to

- Understand the diverse environmental problems, looking at causal linkages between pollution sources, exposure pathways and impacts to environmental quality and human health.
- Know the adverse effect associated with the operation of tanning and leather finishing facilities primarily include exposure to chemicals, biological and physical hazards, and proper management procedures required for personal safety from potential risks.
- Understand and design the type of effluent treatment plant that is required for treating the tannery wastes for their reuse or safe disposal to the environment.
- Illustrate the safety recommendation and regulations for the workers working in the tanneries.
- Obtain the specific competencies necessary for working as a mentor in a tannery industry.

LPE-410: ENVIRONMENTAL SCIENCE AND POLLUTION CONTROL PRACTICAL

Class per week	Credit	Marks
2	2	Continuous assessment : 40 Course final examination 60

Introduction to the Course: The course has been designed to teach the students to measure the level of water pollution originates mainly from tannery effluents that help to identify trends or changes in water quality parameters. It also enables students to estimate the amount of chemicals that absorb/adsorb on leather during the beam house, tanning and post-tanning operations.

Learning Objectives: The learning objectives of this course are to

- Demonstrate the laboratory techniques used for quantification of various parameters of environmental samples.
- Offer the chance of gaining practical experience of analyzing various leather or environmental samples by titrimetric/ spectrophotometric method.
- Impart practical knowledge on separation and quantification of chemicals extracted from leather by thin layer and/or high performance liquid chromatography.
- Gain the specific laboratory skills necessary for working as an environmentalist in a research institution.

Course Contents:

1. Determination of chloride content in alkaline solution.
2. Test for the identification of surface active groups.
3. Determination of bio-chemical oxygen demand from wastewater sample.
4. Determination of chemical oxygen demand from wastewater sample.
5. Determination of particle size and shape of supplied pigments.
6. Determination of chromium (VI) content from spent liquor using UV-VIS Spectrophotometer
7. Determination of Penta-chlorophenol using High Performance Liquid Chromatography
8. Determination of extractable fat content from leather sample
9. Identification of Phenolic components from leather using High Performance Liquid Chromatography
10. Identification of banned amines from leather using High Performance Thin Layer Chromatography

Learning Outcomes: Upon completion of this course the students will be able to

- Identify, properly use, and care for equipment and supplies used in analytical laboratory.
- Analyze various leather or environmental samples by titrimetric / spectrophotometric method.
- Design and carry out environment related scientific experiments as well as accurately record, analyze and present the results of these experiments.

References:

- 1.Thierry Chambolle-Environment and Tannery
- 2.DE A.K. - Environmental chemistry
- 3.Society of Leather Technologists & Chemists - Official Methods of Analysis (1996).
- 4.UNIDO- Tannery and Enviroment.
- 5.Chhatwal, G.R.-Environmental Analysis.
- 6.Mensink Ir. J.S.-Environmental Quick Scan Leather Products.
- 7.Chhatwal G .R. - Encyclopedia of Environmental Analysis (vol. 1, 2 &3)
- 8.Fifield & Haines. -Environmental Analytical Chemistry.
- 9.Environmental Chemistry-B.K. Sharma and H. Kaur.
10. Roy M. Harrison-Pollution causes, Effects, and Control.

11. Richard J. Watts- Hazardous wastes: Sources, Pathways Receptors.
12. Thierry Chambolle-Environment and Tannery

LPE-411: LEATHER TECHNOLOGY-II

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the Course: This course is designed to introduce various tanning process such as; vegetable tanning- hydrolysable tanning and condensed tanning, resin tanning, synthetic tanning, aldehyde tanning, chrome-vegetable combination tanning. Not only tanning process but also process of imparting strength properties, dyeing and fat liquoring etc. can be learnt through this course. It will broaden students' understanding of finishing techniques for shoe upper leather, nappa leather, glaze kid leather, nubuck leather, suede leather, patent leather, corrected grain leather, pull-up leather, clothing leather sole and insole leather etc.

Course Objectives: The objective of this course is

- To know about different types of tanning processes.
- To learn various theories of chrome tanning, vegetable tanning, aluminum tanning, aldehyde tanning and so on.
- To know about strength properties of leather, action of dyes on leather, neutralization and fat liquoring process.
- To acquire knowledge on different chemicals used in leather manufacturing.
- To gather knowledge on finishing techniques for shoe upper leather, nappa leather, glaze kid leather, nubuck leather, suede leather, patent leather, corrected grain leather, pull-up leather, clothing leather, sole and insole leather etc.

Course Contents:

Tanning: Introduction, vegetable tanning- hydrolysable tanning and condensed tanning, resin tanning, synthetic tanning, aldehyde tanning, chrome-vegetable combination tanning.

Mechanical operation prior to post tanning operation: Sammying, splitting, shaving,

Re-chroming & Neutralization : Re-chroming- Objectives, chemicals used for rechroming, influencing factors for rechroming operation, Neutralization- Objectives, chemicals used for neutralization, influencing factors of neutralization, quality control during neutralization.

Retanning: Objectives, chemicals used for retanning, influencing factors of the retanning operation, quality control during retanning.

Dyeing & Fat liquoring : Dyeing- objectives, dyes and their classification, selection of dyes for specific leather production, influencing factors of the dyeing operation.

Fat liquoring- Objectives, selection of fat-liquors and oils, influencing factors of the fat-liquoring operation, quality control during fat -liquoring.

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, flesh coating, staining/color impression, ground coating, season coating, top coating, ironing, glazing, plating, selection.

Finishing techniques: Shoe upper leather, nappa leather, glaze kid leather, nubuck leather, suede leather, patent leather, corrected grain leather, pull-up leather, clothing leather.

Insole leather: lining leather, split leather.

Learning Outcomes: Upon successful completion of this course students will be able to

- Understand different types of tanning processes and their objectives.
- Interpret the functions of different chemicals used in tanning, retanning, fat liquoring and finishing process.
- Know about strength properties of leather, action of dyes on leather, neutralization and fat liquoring process.
- Poses experience in creative experiments on leather making.
- Understand the merits and demerits of using chemicals on leather.
- Gather overall theoretical knowledge of shoe upper leather, nappa leather, glaze kid leather, nubuck leather, suede leather, patent leather, corrected grain leather, pull-up leather, clothing leather manufacturing process.

References:

1. Anthony D. Kovington- Tanning Chemistry The Science of Leather
2. Dutta S.S.-An introduction to the principles of leather manufacture.
3. Krystof Bienkiewicz - Physical chemistry of leather making.
4. Flaharty , Roddy , Lollar-The chemistry and technology of leather (vol-2&3)
5. Sarkar K.T.-Theory and Practice of Leather Manufacture.
6. Reed R. -Science for Students of Leather Technology.
7. BASF Manual -Pocket Book for the Leather Technologist.
8. Sarphouse J.H.-Leather Technicians Handbook.
9. Heidenmann Eckhart - Fundamentals of Leather Manufacture.
10. Procter H.R.-The Principle of Leather Manufacture.
11. Mclaughlin.George D. - The Chemistry of Leather Manufacture.
12. Gustavson K.H.- The Chemistry of Tanning Processes.
13. John Gerhard - Possible defects in Leather Production.
14. Dey Jyotirmay - Practical Aspect of the Manufacture of Upper Leather.
15. Thorstensen Thomas C. - Practical Leather Technology.
16. Wilson John Arthur-Modern Practice in Leather Manufacture
17. Wilson John Arthur-The chemistry of leather manufacture
18. Journal of the American Leather Chemists Association.
19. Journal of the Society of Leather Technologist and Chemists.
20. World Leather.

LPE-412: LEATHER TECHNOLOGY-II PRACTICAL

Class per week	Credit	Marks
4	4	Continuous assessment : 40, Course final examination 60

Introduction to the Course: The purpose of the course is to provide the students practical knowledge and improved the skilled in leather manufacturing.

Course Objectives: The objective of this course is:

- To have knowledge about specific leather productions

- To able to predict the problems and defects that might occur in specific leather processes
- To be able to compare old and recent techniques in specific leather production, to be able to make design for new leather type
- To gain knowledge to students about the production methods and techniques of specific leather types (upper leather, suede, nubuck, nappa, chamoise leather, lining leather, glaze kid, shrunken grain, patent finish, garments, clothing, gloving leather, fur tanned leather, screen/block/boutique printed leather) having different fields of final use.

Course Contents:

1. Standard upper leather manufacture
2. Manufacture of suede/nubuck/nappa/chamoise leather.
3. Standard lining leather manufacture
4. Manufacture of glaze kid finish
5. Manufacture of shrunken grain leather
6. Manufacturing process of patent finish leather
7. Manufacture of garments/clothing/gloving leather.
8. Manufacture of fur skin .
9. Manufacture of screen/block/boutique printed leather.

Learning Outcomes: After completion of this unit the Students will able to:

- Acquire Practical knowledge about different types of tanning processes.
- Understand the functions of different chemicals used in tanning process, re-tanning, fat liquoring and finishing operations.
- Poses experience in creative experiments on leather making.
- Develop knowledge on finishing techniques for shoe upper leather, nappa leather, glaze kid leather, nubuck leather, suede leather, patent leather, corrected grain leather, pull-up leather, clothing leather, sole and insole leather etc.
- Gather overall theoretical knowledge of leather manufacturing process.

References:

1. Anthony D. Kovington- Tanning Chemistry The Science of Leather
2. Dutta S.S.-An introduction to the principles of leather manufacture.
3. Krystof Bienkieuicz - Physical chemistry of leather making.

4. Flaharty , Roddy , Lollar-The chemistry and technology of leather (vol-2&3)
5. Sarkar K.T.-Theory and Practice of Leather Manufacture.
6. Reed R. -Science for Students of Leather Technology.
7. BASF Manual -Pocket Book for the Leather Technologist.
8. Sarphouse J.H.-Leather Technicians Handbook.
9. Heidenmann Eckhart - Fundamentals of Leather Manufacture.
10. Procter H.R.-The Principle of Leather Manufacture.
11. Mclaughlin.George D. - The Chemistry of Leather Manufacture.
12. Gustavson K.H.- The Chemistry of Tanning Processes.
13. John Gerhard - Possible defects in Leather Production.
14. Dey Jyotirmay - Practical Aspect of the Manufacture of Upper Leather.
15. Thorstensen Thomas C. - Practical Leather Technology.
16. Wilson John Arthur-Modern Practice in Leather Manufacture
17. Wilson John Arthur-The chemistry of leather manufacture
18. Journal of the American Leather Chemists Association.
19. Journal of the Society of Leather Technologist and Chemists.

LPE-413: PRODUCTION PLANNING AND QUALITY CONTROL

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the course: This course covers the knowledge, skills and attitude required about the concept, models, issues, and concerns in quality planning, quality control and total quality management. It also provide update knowledge of current practices in material handling, inventory management and control, production engineering design, development and management to sustain in the competitive market.

Course Objectives: The objective of this course is:

- To understand and interpret the knowledge and skill about the production planning and quality control.

- To learn about different productivity improvement technique for shoe and leather goods production.
- To familiarize quality assurance system in leather products manufacturing.
- To introduce the quality management systems (ISO-9000 series) and Environmental management systems (ISO 14000 series).
- To know overall idea of quality control for different stages in leather products manufacturing.

Course Contents:

Introduction: Concept of production system, scope and importance of production, elements of production, production planning, determination of factors of production and their control.

Productivity concept:

Introduction, productivity of materials, land, building, machine and manpower, factors contributing to productivity improvement.

Techniques for productivity improvement:

Introduction, work content and ineffective time, productivity improvement by reducing work content, productivity improvement by reducing ineffective time, management of productivity.

Work study:

Introduction, basic procedure, prerequisites of conducting a work study, human factors, the influence of working condition, Ergonomics.

Method study:

Introduction, objectives, procedure, record, examine. Develop, flow and handling of materials, tools for recording the movement of worker.

Work measurement:

Introduction, objectives, basic procedure, the techniques, time study, rating, standard time.

Quality: Definition of quality and quality control, important terminology used in quality control, quality function, quality planning and improvement, parameters for fitness for use.

Quality policies and objectives: Need for quality policies, corporate quality policies, quality policies for specific parameters and formulation of quality policies, quality objectives, zero defects.

Total quality management (TQM): Total quality management concept, internalization of quality, customer driven quality activity, system development for TQM, ideal TQM system, application of TQM on leather industry.

Standards for leather products testing: International Standards, national standards, Testing soling materials, Testing adhesives, Testing other products components, Using computers for quality control in the leather products industries.

Quality control for different stages of leather-products manufacturing: Quality control in pattern cutting- cutting of bags, wallets, belts, jackets, dresses etc; quality control during skiving and splitting, closing -cementing, priming, sewing, decoration creating with different accessories; quality control during finishing- spraying, ironing, polishing, handing, storage, preservation, packaging and delivery.

Recommended quality requirements: For leathers or non-leather materials, cotton lining materials, other hidden quality requirement.

Health and safety in leather products manufacture: Hazards and potential accidents, safety measures.

Quality assurance in leather products manufacture: Quality assurance, quality control, raw materials, design department, production planning and control in cutting department, during preparation for sewing, in the sewing room, intermediate inspection, final inspection, cost of quality, cost of conformance, cost of non-conformance.

Quality management systems: Perceptions of quality, development of ISO-9000 series, content and application field of ISO-9000-9004 series.

Environmental management systems: Introduction, ISO 14000 series: structure of the ISO 14001 standard, occupational health hazards and industries, environmental impact assessment (EIA) and audit, environmental audit (EA), environmental management plan.

iii) Unit-wise Learning Outcomes

Learning Outcomes: After completion of this unit the Students will able to:

- Discuss current concept and theoretical models, issues, and concerns in quality planning, quality control and total quality management.
- Describe current practices in material handling, inventory management and control.
- Evaluate existing method and production layout and apply the general problem solving process and tools to improve productivity in leather products industry.
- Work effectively in small groups through well-developed problem solving skills and be able to organize the group to optimize performance and results.
- Possess the skills in production engineering design, development and management to sustain in the competitive market.
- Understand ISO 9000 and ISO 14000 series issues and impact on the organization.

References:

1. European Organization of Quality Control; *Glossary of Terms Used in Quality Control*. Berne, Switzerland.
2. Juran J.M, Gryna F.M - *Juran's Quality Control Hand Book*. McGraw-Hill Book Company.
3. Ott ; *Process Quality Control..* McGraw-Hill Book Company.
4. Taylor - *Quality Control Systems*. McGraw-Hill Book Company.
5. Juran J. M.- *Juran on Planning for Quality*. The Free Press, New York.
6. UNIDO, *Acceptable Quality standards in the Leather and Footwear Industry*.
7. Roland Kilgus - *Clothing Technology*

LPE-415: ENTREPRENEURSHIP AND BUSINESS DEVELOPMENT

Class per week	Credit	Marks
2	3	Course final Exam: 70, In-course assessment: 25, Class Attendance: 5. Total Class: 45

Introduction to the Course: The course is about entrepreneurship and entrepreneurial business development. Entrepreneurship is the act of being an entrepreneur or one who undertakes innovations, finance and business acumen in an effort to transform innovations into economic goods. This may result in new organizations or may be part of revitalizing mature organizations in response to a perceived opportunity. The most obvious form of entrepreneurship is that of starting new businesses (referred as a startup strategy); however, in recent years, the term has been extended to include social and political forms of entrepreneurial activity. When entrepreneurship is describing activities within a firm or large organization it is referred to as intra-preneurship and may include corporate venturing, when large entities spin-off organizations. Entrepreneurship is generally synonymous with resourcefulness, ingenuity, and the ability to take calculated risks in order to introduce a new, untested product or service into the marketplace.

Course Objectives:

- To give an overview of fundamental issues, concept, principles, functions, objectives, modus operandi of entrepreneurship and business development.
- To facilitate acquiring necessary knowledge and skills required for organizing and carrying out entrepreneurial activities.
- To develop the ability of analyzing and understanding business situations in which entrepreneurs act
- To help master the knowledge necessary to plan entrepreneurial activities.
- To develop the ability of analyzing various aspects of entrepreneurship especially of taking over the risk, and the specificities as well as the pattern of entrepreneurship development
- To contribute to their entrepreneurial and managerial potentials.

Course Contents:

Business- Meaning, element, characteristics, function, importance, advantages, relation with economics

Entrepreneurs- Meaning, function, qualities, factors, role of business entrepreneurs

Business method and Business organization – Meaning, importance, distinction, types, principles, evolution, factors influence

Sole proprietorship business – Meaning, features, advantages, importance, fields suitable for sole proprietorship business

Partnership business - Meaning, element, advantages, disadvantages, contents of Partnership deed, power of Partner, reconstruction of Partnership business, difference between sole trade ship and Partnership business.

Joint Stock Company - Meaning, characteristics, advantages, disadvantages, difference between JSC & Partnership business, classification of JSC & Private and public limited company.

Export Management –_Meaning, Function, Principles,_Factors, types, Leather export: Introduction-A profile of industry- Leather manufacture; basic steps in leather making- Grading – quality control- Animal and tannery by-products-Leather products- Technical aspects of footwear manufacture- Garment construction- Machinery- Role of council for Leather Exports- Schemes for Government for leather Exports; Medium term export Strategy for 2002-2007;EPCG schemes; Duty exemption schemes; Duty remission schemes etc.- Schedule of rates under duty entitlement Pass book scheme and draw back.

Expected outcomes from the course:

- Students will be able to sell themselves and their ideas. They will master oral and visual presentation skills and establish a foundation of confidence in the skills necessary to cause others to act.
- They will be able to find problems worth solving and advance their skills in customer development, customer validation, competitive analysis, and iteration while utilizing design thinking and process tools to evaluate in real-world problems and projects.
- They will be able to mobilize people and resources and identify and secure customers, stakeholders, and team members through networks, primary customer research, and competitive and industry analyses in order to prioritize and pursue an initial target market in real-world projects.

- Students will be able to create value and to create presentations and business plans that articulate and apply financial, operational, organizational, market, and sales knowledge to identify paths to value creation through 1) company formation (for-profit); 2) social innovation (nonprofit); or 3) intellectual property licensing.
- They will develop and cultivate endurance and increase their awareness and deliberately practice the skills and disciplines necessary to increase confidence and agency; foster self-efficacy and self-advocacy; improve communication and problem-solving skills, manage strong impulses and feelings; and identify personal purpose.

References:

1. Business systems & commercial letter- Md. Khalekhuzaman
2. W. H. Newman – Business Policies Management.
3. B. I. B Ghosh – Business organization, A. Mukherjess Co.
4. M. C. Shukla – Business organization & Management.

LPE-416 PROJECT WORK AND SEMINAR

Credit: 2	Project Work:	: 75
	Seminar:	: 25

Project and Seminar:

Introduction to the course:

Each student is required to submit a report on the project assigned to him/her by the department. Prior to the submission of the project report, each student should present a seminar based on the work done.

Course Objectives: The objective of this course is:

- To help students to develop research skills and competencies.
- To acquaint them with contemporary real life aspects of Leather Products Engineering.
- To improve the effectiveness of their independent research work, which is required for the successful completion of the degree.

Learning Outcomes: After completion of this unit the Students will able to:

- Professional orientation of students to help them choose the field and topic of their field.
- Poses academic skills, including preparing and conducting project in the field of Leather Products Manufacturing.
- Gather knowledge systematize and process information and prepare analytic reports and documents.
- Acquaint students with the standard workflow.
- Able to write and publish papers and articles.

LPE-418: INDUSTRIAL TRAINING

Credit:2	Marks: 50	
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Introduction to the course: Industrial Training refers to practical contact with and observation of facts or events during the program of study that is relevant to professional or practical development prior to the completion of the theoretical courses. In this course student will go to the industry for **two months** training at any suitable time of 4th year based on the availability of the industry located in the suitable area of the country.

Course Objectives: বাবন রনতক্ষশভশফ ষখমনদঢ়ভৎনড় ষপ ঢ়বভড় দয়ক্ষড়ন তক্ষন:

- To prepare students for future employment in their chosen industrial discipline.
- To boost up the practical knowledge by experiencing the theoretical knowledge into practical perspective.
- To develop understanding of the functioning and organization of a industrial process.
- To permit students to practice what they have learned.
- To learn problem solving process for sustainable development.

Learning Outcomes: By the end of the course, students will be able to:

- Demonstrate and apply practical knowledge of basic leather products designing, including pattern making and product manufacturing.
- Understand the concepts of industrial process.

- Possess the skills in problem solving process.
- Analyze and evaluate the existing production layout.
- Use the techniques, skills, and modern engineering and Management tools necessary for leather products engineering.
- Work effectively in small groups through well-developed problem solving skills and be able to organize the group to optimize performance and results.
- Adopt a factual approach for decision making.

LPE-420: COURSE VIVA

Credit:2	Marks	: 50
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At the end of the 4th year (after completing all the courses of 4 years) a student will sit for an oral examination. Members of the examination committee will evaluate the students by asking questions relevant to the courses of the 4 years. The teacher panel interviews the students on subjects studied 4 years-long and measure their competency and understanding.

Course Objectives: The learning objectives of this course are:

- To prepare the students to face interview both at the academic and the industrial sector.