UNIVERSITY OF DHAKA
BANGLADESH

DETAILED GUIDELINES AND SYLLABUS FOR B. Sc. IN LEATHER ENGINEERING

(FOUR YEARS COURSE)

Fourth Year

Approved by Academic council
University of Dhaka

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

D. ACADEMIC RULES

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 Engineering.
12. The Courses for the B. Sc. in Leather Engineering shall extend over four academic years.
13. The medium of instruction and examination shall be in English.
14. 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.
39. Candidates for admission to the first year B. Sc. in Leather 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 Central Admission committee.
40. Admission to the first year B. Sc. in Leather 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.
41. The detail syllabus for degree of Leather Engineering shall be approved by Academic Council of the University of Dhaka.
42. 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.
43. There shall be a Departmental Academic Committee consisting of all the full-time teaching staff to help academic matters.
44. 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 authority.
45. The question paper setters and the examiners will be selected by the Examination Committee from the panel approved by the Academic council.
46. The question papers shall be moderated by the Examination Committee.
47. No candidate shall be eligible for degree of B.Sc. in Leather 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.
48. There shall be 15 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.

49. No student shall be allowed to study any other degree programme during his/her study in Institute of Leather Engineering and Technology.

B. CURRICULUM AND EXAMINATION RULES

17. The subjects to be studied and the scheme of examinations for B. Sc. in Leather 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 other 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.

23. Final practical examinations will be conducted jointly by Four examiners, 3 (three) internal and 1 (one) external appointed by the examination committee.

24. 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:

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

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)

(ii) Course final examination 70% of total marks

(iii) Continuous assessment 40% of total marks for practical courses

(iv) 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 examinations
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.

26. 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)

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) If students obtain a grade C+ or lower in a course in any year, he/she will be allowed to repeat the term-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. (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 Engineering, the decision of Academic Council of the University shall be final.

DEPARTMENT: LEATHER ENGINEERING

FIRST YEAR

Sl. No.	Course Code	Course Title	Credit		Marks Distribution					Total Marks
					Theory			Practical		
			Theory	Practical	A* 70%	B* 25% C* 5% 30%		A* 60%	B** 40%	
01.	LE-101	Manufacturing Technology of Leather-I	3	-	70	25	5	-	-	100
02.	LE-102	Manufacturing Technology of Leather-I Practical	-	4	-	-	-	60	40	100
03.	LE-103	Physical Chemistry	3	-	70	25	5	-	-	100
04.	LE-105	Inorganic Chemistry	3	-	70	25	5	-	-	100
05.	LE-107	Organic Chemistry	3	-	70	25	5	-	-	100
06.	LE-108	Chemistry Practical	-	4	-	-	-	60	40	100
07.	LE-109	Physics	3	-	70	25	5	-	-	100
08.	LE-110	Physics Practical	-	2	-	-	-	60	40	100
09.	LE-112	Engineering Drawing	-	2	-	-	-	60	40	100
10.	LE-113	Computer and Information Engineering	3	-	70	25	5	-	-	100
11.	LE-114	Computer and Information Engineering Practical	-	2	-	-	-	60	40	100

12.	LE-115	Mathematics-I	3	-	70	25	5	-	-	100
13.	LE117	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 Code	Course Title	Credit		Marks Distribution					Total Marks
					Theory			Practical		
			Theory	Practical	A* 70 %	B* 25 %	C* 5%	A* 60 %	B** 40 %	
						30%				
01.	LE-201	Manufacturing Technology of Leather-II	3	-	70	25	5	-	-	100
02.	LE-202	Manufacturing Technology of LeatherII Practical	-	4	-	-	-	60	40	100
03.	LE-203	Applied Chemistry and Chemical Engineering	3	-	70	25	5	-	-	100
04.	LE-204	Applied Chemistry and Chemical Engineering Practical	-	4	-	-	-	60	40	100
05.	LE-205	Materials Science and Technology	3	-	70	25	5	-	-	100
06.	LE-207	Mathematics-II	3	-	70	25	5	-	-	100
07.	LE-209	Statistics	3		70	25	5			100

08.	LE-211	Mechanical Engineering for Leather Manufacture	3	-	70	25	5	-	-	100
09.	LE-212	Mechanical Engineering for Leather Manufacture Practical	-	2	-	-	-	60	40	100
10.	LE-213	Electrical and Electronic Engineering	3	-	70	25	5	-	-	100
11.	LE-214	Electrical and Electronic Engineering Practical	-	2	-	-	-	60	40	100
12.	LE-215	Industrial Management for Leather Manufacture	3	-	70	25	5	-	-	100
13.	LE-216	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 Code	Course Title	Credit		Marks Distribution					Total Marks
					Theory			Practical		
			Theory	Practical	A* 70 %	B* 25 %	C* 5%	A* 60 %	B** 40 %	
						30%				
01.	LE-301	Manufacturing Technology of Leather-III	3	-	70	25	5	-	-	100

02.	LE-302	Manufacturing Technology of Leather-III Practical		4				60	40	100
03.	LE-303	Analytical Chemistry for Leather Manufacture-I	3	-	70	25	5	-	-	100
04.	LE-304	Analytical Chemistry for Leather Manufacture-I Practical	-	2	-	-	-	60	40	100
05.	LE-305	Dyeing and Finishing -I	3	-	70	25	5	-	-	100
06.	LE-306	Dyeing and Finishing Practical	-	2	-	-	-	60	40	100
07.	LE-307	Testing of Leather and Allied Materials	3	-	70	25	5	-	-	100
08.	LE-308	Testing of leather and Allied Materials Practical	-	2	-	-	-	60	40	100
09.	LE-309	Microbiology and Biotechnology in Leather Manufacture	3	-	70	25	5	-	-	100
10.	LE-310	Microbiology and Biotechnology in Leather Manufacture Practical	-	2	-	-	-	60	40	100
11.	LE-311	Footwear Technology	3	-	70	25	5	-	-	100
12.	LE-312	Footwear Technology Practical	-	4	-	-	-	60	40	100
13.	LE-313	Industrial and Production Engineering for Leather Manufacture	3	-	70	25	5	-	-	100
14.	LE-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 Code	Course Title	Credit		Marks Distribution					Total Marks
					Theory			Practical		
			Theory	Practical	A* 70%	B* 25% C* 5% 30%		A* 60 %	B** 40 %	
01.	LE-401	Manufacturing Technology of Leather-IV	3	-	70	25	5	-	-	100
02.	LE-402	Manufacturing Technology of LeatherIV Practical	-	4	-	-	-	60	40	100
03.	LE-403	Analytical Chemistry for Leather Manufacture-II	3		70	25	5	-	-	100
04.	LE-404	Analytical Chemistry for Leather Manufacture-II Practical	-	2	-	-		60	40	100
05.	LE-405	Dyeing and Finishing - II	3	-	70	25	5	-	-	100
06.	LE-407	Polymer Science and Engineering	3	-	70	25	5	-	-	100
07.	LE-408	Polymer Science and Engineering Practical	-	2	-	-	-	60	40	100
08.	LE-409	Environmental Science and Pollution Control	3	-	70	25	5	-	-	100
09.	LE-410	Environmental Science and Pollution Control Practical	-	2	-	-	-	60	40	100
10.	LE-411	Leather Products Technology	3	-	70	25	5	-	-	100
11.	LE-412	Leather Products Technology Practical	-	4	-	-	-	60	40	100
12.	LE-413	Production Planning and Quality Control	3	-	70	25	5	-	-	100
13.	LE-415	Entrepreneurship and Business Development	3	-	70	25	5	-	-	100
14	LE-416	Project Work and Seminar	-	2	-	-	-	75+ 25	-	100

15.	LE-418	Industrial Training [2 Months]	-	2	-	-	-	50	-	50
16.	LE-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										

LE-401: MANUFACTURING TECHNOLOGY OF LEATHER-IV

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

Finishing: Introduction, definition, purpose, classification of finishing, finishing components, preparation of leather before finishing, absorptive quality of leather, spray dyeing before finishing (staining), impregnation of grain surface of leather, theory of adhesion, theory of film formation, different types of film forming materials and their application, characteristics of finishing film, different layers in finish coat, nature of polymeric molecules used as film formers, factors influencing the intermolecular forces of attraction, thermoplastic and cross linking binders, non thermoplastic binders, plasticization and plasticizers.

Finishing auxiliaries: Anti-sticking agents, foaming agent, defoamers, fixing agents, filling agents, modifiers, matting agents, optical brighteners, penetrators, polishing agents, flow improvers, cross linking agents, hardeners, thickeners, plate releasing agent

Manufacture of shoe upper, lining, suede and nappa leather: Introduction, physical and chemical requirements, detail classification, principles, methodology, detail processing techniques, optimization of process according to requirement, details of variation in processing techniques, optimization of process, utility.

Manufacture of army boot upper leather: Introduction, properties, physical and chemical requirements, principles, methodology detail processing techniques, variation in process according to requirement, uses, details of variation in processing techniques, optimization of process.

Manufacture of semi-chrome upper leather: Introduction, properties, physical and chemical requirements, detail classification of semi chrome upper leather, principles, methodology, details,

processing, techniques, variation in process according to requirement, details of variation in processing techniques, optimization of process, utility of semi-chrome leather.

Manufacture of glaze kid, chamois, upholstery leather: Introduction, physical and chemical requirements, details processing techniques, variation in process according to requirement, optimization of process utility, uses.

Manufacture of grain garments leather: Introduction, properties, physical and chemical requirements, details processing techniques, variation in process according to requirement, optimization of process utility of grain garments leather.

Manufacture of book binding leather: Introduction, properties, Physical and chemical requirements, details processing techniques, variation in process according to requirement, optimization of process utility of book binding leather.

Manufacture of vegetable /chrome tanned belting leather: Introduction, properties, Physical and chemical requirements, details processing techniques, variation in process according to requirement, optimization of process utility of vegetable /chrome tanned belting leather.

Manufacture of vegetable tanned firm sole leather: Introduction, properties, principles involved in sole lather making, types of sole leather, physical and chemical requirements, methodology, detail processing technique, variation in process according to requirement, degree of tannage of sole leather, optimization of process, utility of vegetable tanned firm leather.

Manufacture of hand glove leather: Introduction, properties, physical and chemical requirements, details processing techniques, variation in process according to requirement, optimization of process utility of hand glove leather.

Manufacture of mesh leather: Introduction, properties, physical and chemical requirements, details processing techniques, variation in process according to requirement, optimization of process utility of mesh leather.

Manufacture of Football leather: Introduction, types of Football leather, properties, physical and chemical requirements, details processing techniques, variation in process according to requirement, optimization of process utility of Football leather.

Manufacture of fur skin, reptile leather: Introduction, classification of fur skin, properties, Physical and chemical requirements, details processing techniques, variation in process according to requirement, optimization of process, utility.

Manufacture of picker band, shrunken grain leather: Introduction, classification, properties, physical and chemical requirements, principles, methodology, details processing techniques, variation in process according to requirement, optimization of process, utility.

Trouble Shooting: Troubles arising in different stages of operation in Leather manufacture and their remedies.

References:

60. Anthony D. Kovington- Tanning Chemistry The Science of Leather 61.
Dutta S.S.-An introduction to the principles of leather manufacture.
62. Krystof Bienkieuicz - Physical chemistry of leather making.
63. Flaharty , Roddy , Lollar-The chemistry and technology of leather (vol-2&3)
64. Sarkar K.T.-Theory and Practice of Leather Manufacture.
65. Reed R. -Science for Students of Leather Technology.
66. BASF Manual -Pocket Book for the Leather Technologist.
67. Sarphouse J.H.-Leather Technicians Handbook.
68. Heidenmann Eckhart - Fundamentals of Leather Manufacture.
69. Procter H.R.-The Principle of Leather Manufacture.
70. Mclaughlin.George D. - The Chemistry of Leather Manufacture.
71. Gustavson K.H. - The Chemistry of Tanning Processes.
72. John Gerhard - Possible defects in Leather Production.
73. Dey Jyotirmay - Practical Aspect of the Manufacture of Upper Leather.
74. Thorstensen Thomas C. - Practical Leather Technology.
75. Wilson John Arthur-Modern Practice in Leather Manufacture 76. Wilson John Arthur-The chemistry of leather manufacture
77. Journal of the American Leather Chemists Association.
78. Journal of the Society of Leather Technologist and Chemists.
79. World Leather.

LE-402: MANUFACTURING TECHNOLOGY OF LEATHER-IV PrACTICAL

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

1. Manufacture of full chrome/semi chrome/full veg. shoe upper leather.
2. Manufacture of suede/nubuck/nappa/chamoise leather.
3. Manufacture of picker/picking band/belting leather.
4. Manufacture of sole/ insole leather.
5. Manufacture of shrunken/zug-grain leather.
6. Manufacture of book binding leather.
7. Manufacture of garments/clothing/gloving leather.
8. Manufacture of lining leather.
9. Manufacture of football leather.

10. Manufacture of upholstery leather.
11. Manufacture of fur skin.
12. Manufacture of saddle/harness skin leather.
13. Manufacture of glace kid/ corrected grain/aniline finish leather.
14. Manufacture of army boot leather.
15. Manufacture of screen/block/boutik printed leather.
16. Manufacture of industrial and technical leather.

LE - 403: Analytical Chemistry for LEATHER MANUFACTURE-II

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

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 gasliquid 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.

Spectrometry:

Infrared spectrometry: Principles, instrumentations and applications.
Nuclear magnetic resonance spectrometry: Principles, instrumentations and applications.
Mass spectrometry: Principles, instrumentations and applications.
Atomic absorption spectrometry: 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, River water etc.

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 hydoxyproline in materials containing collagen.

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.

LE - 404: Analytical Chemistry for LEATHER MANUFACTURE-II PRACTICAL

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

1. Determination of moisture content/total solids/ total solubles/non-tannin constituents/insolubles/colour/ pH in synthetic tanning materials.
2. Determination of pH/ ash content of sulphated oils.
3. Determination of unsaponifiable matter of sulphated oils.
4. Determination of organically combined SO_3 existing as neutralized sulphuric esters/ sulphonic acid groups.
5. Determination of total fat in sulphated oils.
6. Test for the identification of surface active agents.
7. Determination of silicone/zirconium/phosphorus/ aluminum by atomic absorption spectroscopy.
8. Determination of hydroxyproline in materials containing collagen.
9. Determination of sulphide in alkaline liquors.
10. Determination of saponification value of oil/fat.
11. Determination of bio-chemical oxygen demand (BOD_5) of wastewater sample.
12. Determination of chemical oxygen demand (COD) of wastewater sample.
13. Determination of thermal behaviour of sole, insole, crust and finished leather.
14. Determination of refractive index of supplied sample.
15. Determination of particle size and shape of supplied pigments.
16. Determination of Chromium (VI) content from spent liquor using UV-VIS spectrophotometer.
17. Determination of Pentachlorophenol using High Performance Liquid Chromatography.
18. Determination of extractable fat content from leather sample
19. Identification of phenolic components from leather using High Performance Liquid Chromatography.
20. Identification of banned amines from leather using HPTLC.
21. Determination of particle size and shape of supplied pigments.
22. Determination of Total Organic Carbon from wastewater sample.

LE - 405: DYEING AND FINISHING –II

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

Behavior of dyes in solution: Nature of dye solution, effect of concentration, temperature, pH, presence of electrolytes in dye solution, ionic nature of dye solution, poly dispersity of dye in solution, light absorption and dye solution, light absorption and dye concentration, factors affecting dye spectra - solvent effect, effect of pH, concentration, temperature, heating of solution,

interfering ions, ionic strength, irradiation, redox potential, dissolution aid, component interaction, hydrolysis, light fading, turbidity, plating, aggregation of dyes in solution, causes of aggregation of dyes in solution, conditions necessary for the formation of aggregates of dyes in solution-one dimensional aggregates (rods), two-dimensional aggregates
(discs), three dimensional aggregates (spheres), determination of aggregation number- Nernst-Husckel equation, schematic representation of dye in solution,

Diffusion of dye in solution: Fick's law of diffusion, diffusion in the steady state, diffusion in the non-steady state, and boundary layers in diffusion, diffusion in finite baths, dyeing with ionized dyes on substrate without Sites, activation energies of diffusion, factors effecting diffusibility of dyes in solution, measurement of co-efficient of diffusion, affinity of dyes in solution, determination of affinity in dyeing system, influence of affinity.

Thermodynamics of Dyeing: First law & second law of thermodynamics, activity of a dye, standard affinities of dyes for fibres, surface adsorption, adsorption at dyebath-fibre interfaces, adsorption isotherms - freundlich (or classical) adsorption isotherm, Langmuir adsorption isotherm, rate of dyeing , dyeing equilibrium, adsorption equilibria, chemical potential, electrical effect of dyeing, chemical affinity of dyeing, , half-time of dyeing, velocity constant of dyeing, heat of dyeing, equilibria and equilibrium state on affinity, entropy of dyeing, enthalpy of dyeing, heat of dyeing.

Light, light sources & light interaction: Light, colour and electromagnetic spectrum, Planckian radiators and colour temperature, day light and CIE standard illuminants, sources of artificial light, properties of artificial light sources, color matching booth & visual color matching.
Interaction of light with matter, light absorption, reflection and colour, light interaction with atoms and molecules, details of different fastness properties.

Colour and vision: Concept of colour, visible spectrum, selective absorption, sensitivity of the retinal cones, colour vision, colour primaries and colour mixing, colour space, colour atlases and colour order systems and details of theories of colour vision, attributes of color, method of investigating the perception of color, discrimination of color attributes, some color appearance phenomena, individual differences in colour vision, test for defective color vision,

Measurement of color: Tristimulus colourimeter, spectrophotometer-specular and diffuse components, monochromatic and polychromatic illumination and fluorescence, reflectance measurement, spectrophotometer light sources, application of transmission spectrometry to dyes, comparing results from different design of spectrophotometer.

Colourmetry, Colour System, Colour Spaces and Colour differences: Basic principles, additive and substractive colour mixing, colour speciication system, colour matching functions, different colour system, colour order system and colour spaces- Hunter lab and scofield colour space, colour difference and evaluation, metamerism, Kubelka-Munk equation, CMC method of colour matching.

Colour-match prediction for pigmented materials: Introduction, semitransparent layers, partial reflection at air/ coating interface, database calibration of opaque layers, preparation of calibration

panels (Paint), database calibration for semitransparent layers, match prediction of an opaque layer, match prediction of a semitransparent layer.

Formulation of leather finishes: Plain finishes, glazing finish, shellac finish, wax finish, media that can be used for pigment finishes, pigment finish of a simple type, pigment finish from dry powdered pigments, concentrated finishes, colourless lacquers for general use, titanium white, zincoxide castor oil barkite, concentrated white high flash liquor, false grain finish for flesh side of shearling, side leather finish for corrected leathers, finish for glazed lining leather, semi aniline finish for corrected grain sides, clothing and gloving gloss finish, suede leather finishes, patent and wet look leathers, antique finish, gold finish, silver finish, gold kid, etc.

Rheology of coatings: Introduction, rheology, rheological measurements, rheological processes associated with coatings, low VOC coatings- flow problems and solutions.

Physics of film formation: Introduction, thermoplastic coatings, solutions of crosslinking polymers, solventless crosslinking systems, disperse phase systems.

Performance properties of coatings: Introduction, mechanical performance, ageing processes and the retention properties, chemical exposure.

Coatings polymers: Polymeric materials, polymers in coatings, thermoplastic binders, reactive binders, cross linking chemicals, high solid coatings, powder coatings.

References:

1. Charles Hugh Giles-A Laboratory Course in Dyeing.
2. Gohl E.P.G. -Textile Science.
3. Paterson D. -Textile Colour Mixing.
4. Lubs H. A. - The Chemistry of Synthetic Dyes and Pigments.
5. Finer I. L. - Organic Chemistry (vol-1).
6. Kurt Nassau-The Physics and Chemistry of Colour.
7. Venkata Raman K. - The Chemistry of Synthetics Dyes. (Vol.1-7)
8. Colour Index (Vol. 1-7).
9. Shenai V. A. - An Introduction to the Chemistry of dyestuffs.
10. Koteswara Rao & Olivannan- Dyeing and Finishing of Leather.
11. Sarkar K.T. - Theory and Practice of Leather Manufacture.
12. Roderick McDonald-Colour Physics for Industry.
13. O'Flaherty, Roddy and Lollar-The Chemistry and Technology of Leather.
14. Allen R.L.M - Colour Chemistry.
15. Publio Puene, Jose' Valldegeras Jose' Cegera- The Dyeing of Textile Materials.
16. Jone Shone-Cellulosics Dyeing.
17. Shenai V.A. -Technology of Dyeing.
18. Mac Adam D.L. - Colour Measurement-Themes and Variations.

LE-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

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, phenolformaldehyde 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.

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

Le-408: POLYMER SCIENCE AND ENGINEERING PrACTICAL

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

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.

LE-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

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.

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

LE-410: ENVIRONMENTAL SCIENCE AND POLLUTION CONTROL PRACTICAL

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

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

LE-411: LEATHER-PRODUCTS Technology

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

Introduction of leather products and materials used in its manufacture: Definition, historical background of leather products, classification of leather goods, Materials and components for leather goods and their selection criteria, principles and methods of construction, layout design and styling, standardization of materials, machinery, hand tools and fittings.

Cutting operations for leather products : 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.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.

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

Pattern making: Concept of pattern making, patterns-copied patterns, commercial patterns, ready-towear garments pattern, transferring the patterns, free hand drawing, 3D drawing, 3D-2D concept, allowance, 2D drawing, Basic pattern making techniques for rectangular, conical and base constructions, pattern making for coin purse, pen holder, card holder, ladies hand purse and shoulder bags.

Preparation and joining technique of different components of leather products: Joining techniques, hand stitching and machine stitching, types of stitching, Decorative stitches, preparation of seams, components and accessories, lining, stiffen materials, substitute of leather, edging tools, preparatory process, turning over, visible turnover, curved turnover, creasing, edge marking, roughing, stamping, assembling techniques, reinforcing and binding hide edges, laced hide edges, edge treatment.

Belts: Classification, Materials for belt, tools and equipment for belt manufacture, working order, covered hide belt fastening- buckles, attaching buckle, manufacture of classic waist belt and contour belt.

Wallets: Classification, Materials for wallets, tools and equipment for wallets manufacture, construction, putting the piece together manufacture of bi-fold and tri-fold wallets and passport wallet.

Bags: Classification, Materials for bags, tools and equipment for bags manufacture, Manufacture of ladies hand purse and shoulder bag.

Design techniques for leather garments: Clothing and its function, Development of a collection, fashion and fashion accessories, Materials and components for leather garments and their selection criteria. Machineries for leather garments production elements of cutting, types of cutting, lining cutting, different parts simple jacket, sketches and making up complete industrial pattern, use of body proportions, different types of sleeve, pockets, collar, waist bands, modification to basic block, design and pattern making, basic sewing exercise for components assembly computers in pattern grading and design, different parts of a simple trouser, basic trouser block.

Skirt: Classification, Basic measurements, Designing and pattern making of straight skirt, assembling and stitching of skirt.

Jacket: Classification, Basic measurements, Block making for casual jacket and waist coat, Designing and pattern making of jacket and waist coat, Assembling, stitching and finishing of jacket.

References:

1. Batsford- Fashion with leather
2. Attwater W.A.-Leather Craft
3. Roland Kilgus- Clothing Technology
4. Moseley G.C. – Leather Goods Manufacture
5. Gerhard John- Possible defects in leather production.
6. Swayam Siddha -Product Knowledge
7. Swayam Siddha -The Skill of Seam Reducing
8. Martin M. Shoben and Janet P.Ward-Pattern Cutting And Making Up

LE-412: Leather Products Technology Practical

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

Leather Products: (Practical)

1. Introduction of tools and their uses and tooling technique.
2. Introduction of pattern cutting technique, consideration of allowance, lining construction, working pattern making.
3. Assembly of pleated pocket and flap, Gusset pocket, assembly of gusset pocket and flap, piping pocket, false pocket. Conical shape pattern making.
4. Card holder making, Key ring making.
5. Money Bang Making, Passport case Making
6. Skirt manufacture
7. Waist coat manufacture making.
8. Ladies bag making
9. Document case Making
10. Belts making

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

Plant Layout: Types of plant layout-production, process layout, activities and layout design, departmental space requirements, departmental arrangement.

Materials handling: Classification of material handling system, objectives of material handling, description and design of belt, chain conveyors, handling of raw hides and skins, handling of wet-blue, crust and finished leather, handling of leather chemicals, packaging and shipment.

Inventory management: Types of inventory control, inventory costs and control, classification of stocks-raw hides and skins stock, wet-blue stock, crust and finished stock, stock-in-process, safety-stock, out of stock, lead-time, reorder point, economic order quantity (EOQ), inventory models under certainty, inventory control under risk.

Resource scheduling: Introduction, objectives, scheduling and sequencing, gantt chart, linear programming, transportation model, network analysis, critical Path Method (CPM), programme evaluation and review technique (PERT), critical path and determination of minimum member of works.

Sales forecasting*:* Introduction, purpose of sales forecasting, methods of sales forecasting, time series analysis of sales forecasting, forecasting for new products, co-ordination between sales, manufacturing and purchase departments

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 and Work measurement

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 testing: International Standards, national standards, Testing of leather, Testing of lining leather, Testing other products components,

Quality control for different stages of leather manufacturing: Quality control in soaking, liming, deliming, bating, pickling, tanning, retanning, fat liquoring and dyeing and 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.

References:

01. European Organization of Quality Control; Glossary of Terms Used in Quality Control. Berne, Switzerland.
02. Juran J.M, Gryna F.M - Juran‘s Quality Control Hand Book. McGraw-Hill Book Company.
03. Ott ; Process Quality Control.. McGraw-Hill Book Company.
04. Taylor - Quality Control Systems. McGraw-Hill Book Company.
05. Juran J. M.- Juran on Planning for Quality. The Free Press, New York.
06. UNIDO, Acceptable Quality standards in the Leather and Footwear Industry.
07. Roland Kilgus - Clothing Technology

LE-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

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 makingGrading – 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.

Reference:

* Business systems & commercial letter- Md. Khalekhuzaman
* W. H. Newman – Business Policies Management.
* B. I. B Ghosh – Business organization, A. Mukherjess Co. *

M. C. Shukla – Business organization & Management.

LE-416: PROJECT WORK AND SEMINAR

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

Project and Seminar:
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.

LE-418: INDUSTRIAL TRAINING

Credit:2 Marks: 50

Duration -2 months

LE-420: COURSE VIVA

Credit:2 Marks :50