NATIONAL BOARD FOR TECHNICAL EDUCATION

PLOT B BIDA ROAD, P.M.B. 2239, KADUNA, NIGERIA

HIGHER NATIONAL DIPLOMA
IN
LEATHER AND LEATHER PRODUCTS TECHNOLOGY PROGRAMME
(LEATHER TECHNOLOGY OPTION)

CURRICULUM AND COURSE SPECIFICATIONS

IN COLLABORATION
WITH

NIGERIAN INSTITUTE OF LEATHER AND SCIENCE TECHNOLOGY (NILEST)
P. M. B 1034, SAMARU – ZARIA, NIGERIA

APRIL, 2026

PREFACE

The dynamic nature of technology, industry demands, and global best practices necessitates the periodic review of programme curricula to ensure relevance, quality, and responsiveness to contemporary needs. It is in this regard that the National Diploma (ND) and Higher National Diploma (HND) in Leather Technology curricula have been carefully reviewed and restructured, culminating in their rebranding as the *ND and HND Leather and Leather Products Technology Programme Curricula*.

This important exercise was sponsored by the Nigerian Institute of Leather and Science Technology (NILEST), Zaria, whose unwavering commitment to advancing leather education, research, and industry development in Nigeria has once again been demonstrated. The review process was guided by the need to align the curricula with modern technological advancements, entrepreneurial opportunities, value addition across the leather value chain, and the evolving expectations of both local and international markets.

The newly reviewed curricula place greater emphasis on practical skills, innovation, product development, and sustainable practices, thereby equipping diplomates with the competencies required to thrive in the leather and leather products industry. It is expected that this will significantly contribute to job creation, economic growth, and the global competitiveness of Nigeria's leather sector.

We wish to express our profound appreciation to all the resource persons whose expertise, dedication, and insightful contributions made this review exercise a great success. Their collective efforts, drawn from academia, industry, and regulatory bodies, have ensured the development of robust, technology driven and industry-relevant curricula. It is our sincere hope that the implementation of these programme curricula will enhance the quality of technical manpower in the Nigerian leather industry.

Prof. Idris M. Bugaje
Executive Secretary
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GENERAL INFORMATION

1. TITLE OF THE PROGRAMME

The ***Higher National Diploma in Leather and Leather Products Technology (Leather Technology Option).***

2. GOAL OF THE PROGRAMME

The Higher National Diploma Programme in Leather and Leather Products Technology (Leather Technology Option) is designed to produce skilled and innovative Technologists capable of processing, designing and manufacturing quality leather and leather products and manage leather production enterprises for industrial and entrepreneurial development.

3. OBJECTIVES OF THE PROGRAMME

At the end of the programme, the diplomates should be able to:

a. Apply technical skills in leather processing, design and production in leather and leather products manufacturing;
b. Carry out physical and chemical analysis on leather and leather products;
c. Plan and manage production, machines, and resources effectively;
d. Provides training in schools, colleges and other related institutions on leather and leather products technology;
e. Acquire technical skills through mandatory skills qualification for self-reliance and economy empowerment;
f. Develop entrepreneurial ability, work effectively in teams, communicate professionally and uphold safe environmentally best practices.

4. ENTRY REQUIREMENTS

The entry requirements into Higher National Diploma in Leather and Leather Products Technology (Leather Technology) Programme include at least a minimum of Lower Credit in National Diploma (ND) in Leather and Leather Products Technology or equivalent qualification from a recognized and accredited Institution with at least one (1) year post ND cognate Industrial Training.

At least five credit level passes in GCE, WASC, SSCE, WAEC, SAISSCE, NECO or NABTEB at not more than two sittings. The five subjects must include English Language, Mathematics, Chemistry, Biology or Agricultural Science and one other subject from: Technical Drawing, Further Mathematics, Geography and Physics.

5.0 CURRICULUM

The curriculum of the HND Leather and Leather Products Technology (Leather Technology Option) Programme consists of the following components:

i. General Studies;
ii. Foundation courses;

iii. Professional courses;

5.1 General Studies

These include: Use of English, Management Studies, Business Statistics and Practice of Entrepreneurship, etc. These components shall account for 10% - 15% of total contact hours for the Programme.

5.2 Foundation Courses

Foundation courses for Higher National Diploma in Leather and Leather Products Technology (LT Option) shall include courses in Mathematics, Chemistry and Engineering courses, etc. which acquaint the students with application of science courses.

5.3 Professional Courses

The professional courses are the core to the programme which are mandatory for proper understanding of the theory and practice of Leather and Leather Products Technology. These may account for 70-80% of the contact hours.

6.0 CURRICULUM STRUCTURE

The structure of the HND Programme consists of four semesters of classroom, laboratory and tannery workshop activities in the Institution. Each semester shall be seventeen (17) weeks of duration made up of: 15 contact weeks of teaching, i.e. lectures, practical, assignments, tests, etc and 2 weeks for examinations.

7.0 STAFFING REQUIREMENTS

7.1 Core Teaching Staff

A minimum of four (4) Core teaching staff who should possess at least a HND or BSc in Leather Technology or related disciplines.

7.2 Technical Staff

Technical staff should be HND holder in Leather and Leather Products Technology or related discipline.

7.3 Headship of the Department

The Head of Department shall be a registered and licensed member in related professional field with at least a Master's Degree in relevant field. He or she shall not be less than the rank of a Senior Lecturer.

7.4 Career/Academic Prospects

The diplomate would work as a Technologist.in:

i. Educational Institutions;
ii. Tanneries;
iii. Footwear Industry;
iv. Furniture Industry;
v. Non-Government Organisations;
vi. Leather goods industry;
vii. Government Ministries and parastatals;
viii. Private enterprises etc

They can also proceed to University for further studies.

8.0 CERTIFICATION

A diplomate of this programme shall be awarded HND in Higher National Diploma in Leather and Leather Products Technology (Leather Technology option).

9.0 ACCREDITATION

Each Programme offered at the HND level shall be accredited by the NBTE before the diplomates can be awarded the certificates.

10. CONDITIONS FOR THE AWARD OF THE HND

10.1 Institutions offering accredited programmes will award the Higher National Diploma to candidates who successfully completed the programme after passing prescribed coursework, examinations, and HND project. Such candidates should have completed a minimum of between 72 and 80 semester credit units depending on the programme.

10.2 Classification of Diplomas

Higher National Diplomas shall be classified as follows:

Distinction	CGPA of 3.50 - 4.0
Upper Credit	CGPA of 3.00- 3.49
Lower Credit	CGPA of 2.50 – 2.99
Pass	CGPA of 2.00 – 2.49

10.3 Grading of Courses:

Courses shall be graded as follows:

SCORE RANGE	GRADE	WEIGHTING
75% and above	A	4.00
70% – 74%	AB	3.50
65% – 69%	B	3.25
60% – 64%	BC	3.00
55% – 59%	C	2.75
50% – 54%	CD	2.50
45% – 49%	D	2.25
40% – 44%	E	2.00
Below 40%	F	0.0

11. GUIDANCE NOTE FOR TEACHERS

11.1 The new curriculum is drawn in unit courses. This is keeping with the provisions of the National Policy on Education which stress the need to introduce the semester credit units which will enable a student who so wish to transfer the units already completed in an institution of similar standard from which he is transferring.

11.2 In designing the units, the principles of the modular system by product has been adopted; thus making each of the professional modules, when completed provide the students with technician operative skills, which can be used for employment purposes.

11.3. As the success of the credit unit system depends on the articulation of programmes between the institutions and industry, the curriculum content has been written in the behavioral objectives, so that is clear to all, the specific learning objective of the student who successfully completed some of the courses or the diplomates of the programme. There is a slight departure in the presentation of the performance based curriculum which state categorically, the specific learning objective for the students, also, there is a deliberate attempt to further involve the staff of the department teaching by having another column called Teachers activities. This is to ensure that the teachers deliver the required learning objectives. There is a third column for the Resources required for each learning objective. Each department is expected to develop its own teaching curriculum from this minimum Guide curriculum and ensure that the resources required are available. The Academic Board of the institution may vet departmental submission on the final curriculum. Our aim is to continue to see to it that a solid internal evaluation system exists in each institution for ensuring minimum standard and quality of education in the programmes offered throughout the TVET Institutions.

11.4 The teaching of the theory and practical work should, as much as possible, be integrated. Practical exercises, especially those in professional courses and laboratory work should not be taught in isolation from the theory. For each course, there should be a balance of theory to practice in the ratio 50:50 or 60:40, or the reverse.

12. PRACTICAL MANUAL

A practical manual should be developed by the Department in line with the practical contents of all the core or professional courses as the case may be.

13. PRACTICAL LOGBOOK

A practical Logbook to be kept by each student shall contain all day-to-day, weekly summary and semester summary of all the practical activities from day one to the end of the programme. This is to be checked, marked, endorsed and recorded by the lecturers concerned at the end of every week.

14. FINAL PROJECT

Final year students in this programme are expected to carry out a project work. This could be on individual basis or group work of not more than five students per group, but reporting must be undertaken individually. The project should, as much as possible be related to the programme discipline. Project reports should be well presented and should be properly supervised. The department should make its own arrangement of schedules for project work.

CURRICULUM TABLE

Year I, Semester I

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	PLT 313	Polymer Chemistry	2	0	0	2	2
2.	GNS 301	Use of English III	2	0	0	2	2
3.	MTH 212	Business Statistics	2	0	0	2	2
4.	CHE 331	Basic Chemical Engineering	2	0	0	2	2
5.	STC 311	Inorganic Chemistry	2	0	0	2	2
6.	MSQ 311	Principles of Quality Assurance Assessment	1	0	1	2	2
7.	LPT 311	Leather Manufacture I	2	0	2	4	4
8.	LPT 312	Leather Chemistry I	2	0	0	2	2
9.	LPT 313	Physical and Fastness Testing of Leather I	2	0	2	4	4
10.	LPT 314	Applied Spectroscopy	2	0	0	2	2
11.	LPT 315	Chemical Analysis I	2	0	2	4	4
Total			**21**	**0**	**7**	**28**	**28**

Year I, Semester II

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	LFT 314	Pattern Production I	2	0	1	3	3
2.	GNS 302	Communication in English III	2	0	0	2	2
3.	ENT 326	Practice of Entrepreneurship I	2	0	1	3	3
4.	GLT 322	General Instrumentation	2	0	0	2	2
5.	MSQ 321	Practice of Quality Assurance Assessment	1	0	1	2	2
6.	LPT 321	Leather Manufacture II	2	0	2	4	4
7.	LPT 322	Leather Chemistry II	2	0	0	2	2
8.	LPT 323	Physical and Fastness Testing of Leather II	2	0	2	4	4
9.	LPT 324	Applied Chemistry	2	0	0	2	2
10.	LPT 325	Chemical Analysis II	2	0	2	4	4
11.	LPT 326	Leather Dyeing and Finishing I	2	0	0	2	2
Total			**21**	**0**	**9**	**30**	**30**

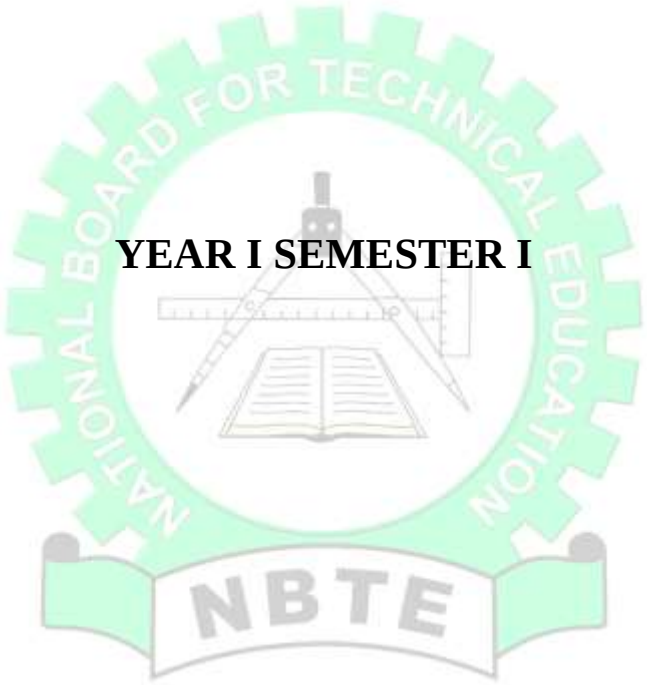
Year Two, Semester One

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	FDI 315	Footwear Graphics	1	0	2	3	3
2.	GNS 401	Communication in English IV	2	0	0	2	2
3.	GNS 413	Industrial Management	2	0	0	2	2
4.	ENT 416	Practice of Entrepreneurship II	2	0	2	4	4
5.	LPT 411	Leather Manufacture III	2	0	2	4	4
6.	LPT 412	Leather Chemistry III	2	0	0	2	2
7.	LPT 413	Leather Dyeing and Finishing II	2	0	0	2	2
8.	LPT 414	Research Methodology	2	0	0	2	2
Total			**15**	**0**	**6**	**21**	**21**

Year Two, Semester Two

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1.	LFT 411	Pattern Production II	1	0	1	2	2
2.	LPT 421	Leather Manufacture IV	2	0	2	4	4
3.	LPT 422	Leather Chemistry IV	2	0	0	2	2
4.	LPT 423	Tannery Waste Management	2	0	0	2	2
5.	LPT 424	Global Leather Economics	2	0	0	2	2
6.	LPT 425	Seminar and Oral Presentation	0	0	2	2	2
7.	LPT 426	Project	0	0	6	6	6
Total			**9**	**0**	**11**	**20**	**20**

- L - Lectures T – Tutorial P - Practical CH - Contact Hours, CU - Credit Unit



YEAR I SEMESTER I

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE TITLE: LEATHER MANUFACTURE I	**Course Code: LPT 311**	**Contact Hours: 4 Hours/Week**
	Credit Unit: 4	**Theoretical: 2 Hours/Week**
Year: I Semester: I	**Pre-requisite: Introductory Leather Manufacture**	**Practical: 2 Hours/Week**
GOAL: This course is intended to provide students with in-depth knowledge of principles and methods of pre-tanning and tanning processes in leather production.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know tannery processes/operations, chemicals, equipment, and machines; 2.0 Know the raw materials for leather manufacture; 3.0 Know the principles and methods of soaking of cured hides/skins; 4.0 Know the process of unhairing, liming and deliming of hides or skins; 5.0 Know the techniques and significance of bating; 6.0 Comprehend the process of acidification, pickling agents and degreasing.		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE: LEATHER MANUFACTURE I	**Course Code: LPT 311**	**Contact Hours: 4 Hrs/Week**
	Credit Unit: 4	**Theoretical: 2 Hrs/Week**
Year: I Semester: I	**Pre-requisite: Introduction to Leather Manufacture**	**Practical: 2 Hrs/Week**

COURSE SPECIFICATION: THEORETICAL AND PRACTICAL

General Objective 1.0: Know tannery processes, operations, chemicals, equipment and machines

THEORETICAL CONTENT				**PRACTICAL CONTENT**		
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
1-3	1.1 Discuss Tannery sections i.e. Beam house, Tan yard, and Finishing yard. 1.2 State the various processes and operations in each section of the Tannery in sequences. 1.3 Name the various chemicals, equipment, machines and vessels in each section. 1.4 Explain the purposes for each section and their different operations	• Outline the Tannery Layout and state their purposes • Explain the Tannery processes and operations in sequences according to the sections. i.e. Beam house, Tan yard and finishing yard. • Explain the uses of different chemicals,	Classroom Audio visuals Whiteboard Projector Marker Text books Relevant journals Online Courses Lecture notes	• Identify Tannery sections, name the processes/ operations in sequence • Identify all the chemicals in the tannery store for specific operation or processes. • Operate the machines, equipment and vessels for operations in each section of the Tannery. • Utilize the chemicals, equipment, machines etc. • Maintain various equipment and machine in each section of the tannery	• Guide the students to identify tannery sections and their processes and operations • Guide the students to identify the chemicals, the equipment, machines and vessels use in each section and for different processes. • Guide the students on	Laboratory/ Workshops Practical Manuals Chemicals PPE Tannery resources Equipment Machines Vessels. Log book

		equipment, machines and vessels in each sections of the Tannery. • Mention at least three (3) chemicals, equipment, Machine and Vessels used in each process/ operation and state their purposes.			how to utilize the chemicals, equipment, machines etc • Demonstrate the use of various equipment and machines	
General Objective 2.0: Know the raw materials for leather manufacture						
4-5	2.1 Identify types of raw materials for leather manufacture, e.g skins of: i Goat ii Sheep iii Reptiles iv Hides: v Cattles vi Elephants vii Carmel viii Zebra ix Donkey etc, 2.2 Draw a well labeled structure (histology) of animal skin. 2.3 Describe the	• Describe the raw materials mentioned in 2.1 • Describe with the aid of diagram, the raw material (skin) and the economic benefits of its layers and compositions. • Discuss the histological differences in the raw	Classroom Audio visuals Whiteboard Projector Marker Text books Relevant journals Internet Lecture notes Charts, Diagram.	• Identify different raw materials available in the tannery. • Determine the physico- chemical composition of the raw materials available in the Tannery.	• Guide the students to: ○ Identify different raw materials available in the tannery (Assortment of hides/skins ○ Identify the differences between goatskin, sheepskins, calfskin and cattle hides before	Skins: Goat Sheep Reptiles Hides: Cattles Elephants Carmel Zebra Donkey etc,

	structure and functions of each layer of the animal skin e.g. epidermis, dermis, hypodermis etc. 2.4 Discuss the physico-chemical composition of the animal skin, e.g. water, protein, minerals and other elements. 2.5 Explain different kinds of raw materials used for leather production e.g. hides, skins, pelt, wet-salted skins, etc. 2.6 Explain common raw material terms, sources and uses.	materials. • Mention all the physico-chemical compositions of Hides/Skins and state their percentages. e.g. water – 60-70%, Protein – 25-30%, etc. • State the similarities and differences between goatskin/ sheepskin, cattle hide/ calf skin, etc. • State the common raw material terms e.g. kip, heifer, domestic hide/skin etc.			tanning using their specific histological characteristics.	
General Objective 3.0: Know the principles and methods of soaking of cured hides/skins						
6-8	3.1 Explain the principles and procedures of soaking in pit, paddle and drum.	• Describe rehydration of cured hides/skins and explain the	Classroom, Audio visuals, e-books, Internet, Relevant journals,	• Perform soaking of various types of hides/skins in pit, paddle and drum.	• Guide students on how to carry out soaking using various	Water, soaking aids e.g. detergents, emulsifiers

	3.2 Explain the methods used in soaking various types of cured hides/skins. 3.3 Explain various factors affecting soaking e.g. pre-history, pH, time, wetting agents, mechanical action, etc. 3.4 Explain the problems associated with poor soaking e.g. under soaking, over soaking. 3.5 Discuss the process to unhair, de-wool, or descale. 3.6 Explain deliming process and its objectives. 3.7 Explain deliming methods (complete and partial) and outline various deliming agents and their effects.	objectives. • Describe the methods of soaking different cured hides/skins for leather making e.g. hair-on leathers, full grain leathers etc. • Enumerate the soaking agents and explain the factors that affect the process. • Highlight the effects of poor soaking to resultant leathers. • Briefly explain the factors affecting the processes • Explain deliming process and its objectives. • Summarize deliming methods (complete and partial) and	Lecture notes etc		types of cured raw skins and different methods with different agent • Guide the students on soaking process. • Guide the students to carry out deliming using available deliming agents. • Supervise the students to carry out the process • Carry out bating and test for the completion of the process by thumb print, and porosity test. • Guide the students to carry out pickling on the delimed	etc. Water, sharpeners, lime, etc. Enzymes, dark and humid room, etc. Weak organic salt (ammonium sulphates, ammonium chlorides, etc), weak organic acids (boric, formic, acetic, etc) Bate powder Salt (sodium chloride), acid (formic, sulphuric, etc.) Paraffin wax, kerosene, etc.

		outline various deliming agents and their effects			and bated pelts. • Guide the students to degrease sheep pelts using solvent and aqueous methods	
General Objective 4.0: Know the process of unhairing, liming and deliming of hides or skins						
7-8	4.1 Recognize the purposes of unhairing and liming processes. 4.2 Explain various unhairing and liming methods e.g. (a) hair saving and (b) hair destruction methods and the chemicals/ agents involved in each. 4.3 Outline the merits and demerits of each methods listed in 4.2. 4.4 Explain the factors affecting unhairing/ liming processes. 4.5 Outline the principle of deliming process. 4.6 Explain different methods of deliming process and the significance of	• Discuss with aid of diagrams, the principle of unhairing with their objectives. • Describe the various unhairing methods viz: sweating, enzyme, paint or paste, hair pulping, amine, and oxidative unhairing. Explain sharpeners e.g., dimethyl amines, sulphides, etc. • Explain the problems /challenges that	Classroom, Audio visuals, e-books, Internet, relevant journals, Lecture notes etc	• Perform the following unhairing and liming methods: i Hair saving and ii Hair destruction methods	• Assess the students practical reports.	Water, soaking aids e.g. detergents, emulsifiers etc. Water, sharpeners, lime, etc. Enzymes, dark and humid room, etc. Weak organic salt (ammonium sulphates, ammonium chlorides, etc), weak organic acids (boric, formic, acetic, etc) Bate powder Salt (sodium

	various deliming agents.	can occur during these processes and how to control them e.g. lime blast. • Highlight the advantages and disadvantages of each unhairing/ liming method.				chloride), acid (formic, sulphuric, etc.) Paraffin wax, kerosene, etc.
General Objective 5.0: Know the techniques and significance of bating						
9-11	5.1 Define bating. 5.2 Explain the significance of bating in the production of light leather. 5.3 Discuss the various materials used for bating and its preparation 5.4 Explain bating techniques and controls for desired properties of leather. 5.5 Explain the factors affecting bating process.	• Explain the objectives of bating • Outline various bating materials (local or natural and synthetic), compositions , and their functions. • Explain different bating techniques e.g. bating calf/hide for shoe upper, hair sheep for	Classroom, Audio visuals, e-books, Internet, Relevant journals, Lecture notes etc	• Demonstrate bating process.	Ensure that safety precautions are observed by the students during practicals.	Water, soaking aids e.g. detergents, emulsifiers etc. Water, sharpeners, lime, etc. Enzymes, dark and humid room, etc. Weak organic salt (ammonium sulphates, ammonium chlorides, etc), weak organic acids (boric, formic, acetic,

		gloving leather, crocodiles etc. • Enumerate the factors affecting bating process such as Temperature, Time, pH, and strength/concentration of bate.				etc) Bate powder Salt (sodium chloride), acid (formic, sulphuric, etc.) Paraffin wax, kerosene, etc.
General Objective 6.0: Comprehend the process of acidification, pickling agents and degreasing						
12-15	6.1 Outline the process of acidification of hides/skins (pickling process) and its types 6.2 Explain its necessity. 6.3 Discuss various pickling agents and their significance 6.4 Explain the pickling formulations and the effects of their variations. e.g. + salts – acid etc. 6.5 Tabulate the factors affecting pickling and their control	• Briefly explain pickling and its objectives. • Enumerate pickling agents and their uses • Formulate a pickling recipe and explain the effects of pickling agents and variations. e.g, more salt, more acids, etc. • Explain the factors affecting pickling	Classroom, Audio visuals, e-books, Internet, Relevant journals, Lecture notes etc.	• Demonstrate pickling methods. • Apply any of the following degreasing methods: i Pressure degreasing, ii Aqueous degreasing, and; iii Solvent degreasing.	Guide the students to carry out the practical	Water, soaking aids e.g. detergents, emulsifiers etc. Water, sharpeners, lime, etc. Enzymes, dark and humid room, etc. Weak organic salt (ammonium sulphates, ammonium chlorides, etc),

	during the process. 6.6 Define the concepts of de-pickling, degreasing 6.7 State their objectives 6.8 Describe different degreasing systems and methods. 6.9 List the chemicals used.	process and their control. • Explain the use of fungicides in pickling for storage. • Explain the process of de-pickling and degreasing with their objectives • Outline the chemicals used in degreasing e.g., paraffin, kerosene, etc. and explain various methods of degreasing, viz: pressure degreasing, aqueous degreasing, and solvent degreasing				weak organic acids (boric, formic, acetic, etc) Bate powder Salt (sodium chloride), acid (formic, sulphuric, etc.) Paraffin wax, kerosene, etc.

Course Assessment:

Course work:	10%
Assignment:	10%
Practical:	40%
Examination:	40%
Total:	**100%**

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE: LEATHER CHEMISTRY I	**COURSE CODE: LPT 312**	**Contact Hours:2 Hrs/Week**
	Credit Unit: 2	**Theoretical: 2 Hrs/Week**
Year: I Semester: I	**Pre-requisite: Introduction to Leather Chemistry**	**Practical: 0**
GOAL: This course is intended to provide students with in-depth knowledge of nature, structure, and biochemistry of hides and skins		

GENERAL OBJECTIVES

On completion of this course, the student should be able to:

1.0 Understand the structure and functions of hides/skins and as the largest organ of the body of mammals ;
2.0 Understand the different layers of the hide/skin and their functions;
3.0 Understand the chemistry of hide/skin protein and its chemical components

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
Course Title: LEATHER CHEMISTRY I	**Course Code: LPT 312**	**Contact Hours: 2 Hrs/Week**
	Credit Unit: 2	**Theoretical: 2 Hrs/Week**
Year: I Semester: I	**Pre-requisite: Introduction to Leather Chemistry**	**Practical: 0**

COURSE SPECIFICATION: THEORETICAL

GENERAL OBJECTIVE1.0: Understand the structure and functions of hides/skins as the largest organ of the body of mammals

THEORETICAL CONTENT				**PRACTICAL CONTENT**		
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
1-4	1.1 Draw the structure and sources of hides and skins. 1.2 Define curing and preservation and understand the various method of preserving hides/skins. 1.3 Distinguish between long and short-term preservation of hides and skins. 1.4 Explain the chenicals used in hides and skins preservation. 1.5 Describe the various methods of hides and skin storage. 1.6 Describe the effects of poor preservation and storage of hides and skins	• Explain with the aid of diagrams the structure and sources, of hides/skin to include cattle, sheep, goats, reptiles etc • Explain hides and skin curing and preservation and the various methods such as air drying, dry salting, wet salting etc • Explain long term preservation techniques such as wet and dry	Classroom Audio visuals Whiteboard Projector Marker Text books Relevant journals Internet Lecture notes Charts, Diagram.			

		salting etc, and short term techniques such as freezing. • Discuss chemicals used for hides and skins to include salt, boicides, soaps detergent etc • Explain the methods of hides and skins storage to include balling, stack pilling ,etc • Explain effect of poor hides and skin preservation and storage to include hair slip, putrefaction, red heat etc				
GENERAL OBJECTIVE 2.0: Understand the different layers of the hide/skins, and their functions						
6-10	2.1 Name various layers, of hides/skins and their features. 2.2 Describe the chemical composition of hides and skins 2.3 Distinguish structural and non-structural proteins of hides/skins	• Explain the major layers of hide/skin to include epidermis, dermis etc with features such as hair, wool, follicles, erector pili muscle, sweet glands, veins, arteries etc • Explain the chemical	Classroom Audio visuals Whiteboard Projector Marker Text books Relevant journals Internet Lecture notes Charts, Diagram.		.	

		components of the hide/skin to include water: 60 -70%, protein: 25 -30%, fat: 0.5-1% etc • Explain and give examples of structural proteins to include collagen, keratin and non-structural proteins to include globulin, albumins, etc.				
General Objective 3.0: Understand the chemistry of hide/skin protein and its chemical components						
11-15	3.1 Define protein as it relates to animal skin, its nature and chemical building blocks 3.2 Explain the first twenty (20) simple amino acids commonly associated with the protein of the skin. 3.3 Recognize the quarter stagger array of collagen alignment 3.4 Identify the building blocks of polypeptide chain in a sequential order 3.5 Classify skin proteins and their properties. 3.6 Explain the chemistry of the different forms of collagen types. 3.7 Describe the concept of ISO	• Explain the chemistry of skin protein, its nature (triple helical structure) and chemical building blocks i.e amino acids • Explain the various amino acids in skin protein e.g. glycine, proline, hydroxy-proline etc. • Illustrate the staggered nature of collagen fibre	Classroom Audio visuals Whiteboard Projector Marker Text books Relevant journals Internet Lecture notes Charts, Diagram.			

	electric point. 3.8 Explain the concept of hydrothermal stability of collagen fibres. 3.9 Explain bonding in the collagen matrix	• Explain in sequence the building blocks of the polypeptide chain • Elaborate on the various types of proteins such as structural collagen, keratin and non-structural proteins (albumin, globulin gelatin) and their properties • Discuss the different forms of collagen e.g. type I, II, III, IV collagen etc. • Explain the concept of iso-electric point as a state of neutrality • Describe the stability of collagen fibres at different temperature regions in water as its shrinkage temperature • Describe bonding in the collagen matrix to include				

		the formation of peptide, coordinate bonds etc				

Course Assignments:

Course work:	20%
Test/Assignments:	20%
Examination:	60%
Total :	100%

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE: PHYSICAL AND FASTNESS TESTING OF LEATHER I	**COURSE CODE: LPT 313**	**Contact Hours:4 Hrs/Week**
	Credit Unit: 4	**Theoretical: 2 Hrs/Week**
Year: I Semester: I	**Pre-requisite: Leather Manufacture**	**Practical: 2 Hrs/Week**
GOAL: This course is designed to enable students to be able to physically test finished Leather and ascertain its quality		

GENERAL OBJECTIVES

On completion of this course, the student should be able to:

1.0 Know Testing principles and techniques of Leather sampling;
2.0 Know the measurement, effect and importance of shrinkage temperature on leather;
3.0 Know various tests for assessing the strength of Leather.

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
Course Title: PHYSICAL AND FASTNESS TESTING OF LEATHER I	**Course Code: LPT 313**	**Contact Hours: 4 Hrs/Week**
	Credit Unit: 4	**Theoretical: 2 hours/Week**
Year: I Semester: I	**Pre-requisite: Introduction to Leather Manufacture**	**Practical: 2hours/Week**

COURSE SPECIFICATION: THEORETICAL AND PRACTICAL

GENERAL OBJECTIVE1.0: Know testing principles and techniques of Leather sampling;

THEORETICAL CONTENT				**PRACTICAL CONTENT**		
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
1-5	1.1 Explain leather as a raw material to be use for the production of articles: i. Fashion appeal ii. Ease of manufacture iii. Properties important to the wearer or user 1.2 Explain the variations properties of processed leather from Hides and skin, intra/inter Hides and skin variation. 1.3 Explain physical testing as applied to leather technology. 1.4 Explain physical testing as application	• Discuss leather as a material processed with specific physical properties. • Explain the need for ease of handling of leather, and leather must have. . • Differentiate the various properties and standards required for physical test. • Distinguished between the various properties	Classroom Audio visuals Projector Marker Text books Relevant journals Internet Lecture notes Charts, Diagram Lecture note Quality control equipment and materials Physical testing standards tables Physical fastness and testing machines and equipment in the quality control	• Identify physical and fastness testing machines with specific test to be measured. • Identify the official sampling position for whole leather Butt; shoulder; belly; shank etc. • Demonstrate the use of micrometer screw gauge and presser knife Weight;	• Introduce the students to physical testing equipment. • Guide the students to identify the functions of each machines and equipment. • Identify the properties of eachleather and its significance.to the quality of the leather to be tested.	Leather material Physical fastness and testing machines and equipment in the quality control laboratory eg Tensometer; Wet and dry rubbing machine; Water permeability; Ruler Conditioning machine; cutting/press knives etc.

	of force on leather material 1.5 Explain: sampling, and sampling position in physical testing conditioning, in physical 1.6 Define thickness and describe its measurement. 1.7 Explain the use of Press knife, Dial micrometer gauge. 1.8 Explain apparent density and describe its application and significance in Physical testing. 1.9 Explain the significance of thickness in leather testing	leathers processed from hides and skins • Explain physical testing as a quality control measure for ensuring that standards are maintained. • Discuss physical testing as application of force on leather material; • Highlight the importance of thickness and describe its measurement • Described the use of Press knife, and their uses in cutting leather samples • Elaborate the significance of apparent density and describe its application and significance in Physical testing • Describe the significance of thickness in	laboratory e.g. Tensiometer; Wet and dry rubbing machine; Water permeability; Ruler Conditioning machine; cutting/press knives etc.	Apparent density, Shrinkage temperature, • Perform sampling and identify the positions for sampling leather • Measure the parameters for conditioning leather such as humidity; duration (hrs) etc • Carry out thickness measurement of leathers • Perform physical test on leather e.g. tensile strength; Apparent density etc. •	• Guide the students how to cu the importance of physical testing in quality control • Demonstrate the measurement of thickness of leather • Demonstrate the measurement of apparent density • Demonstrate the measurement of Shrinkage temperature • Carryout the tests in 1.5 • Carryout the tests in 1.4 • Demonstrate on how to determine the official sampling position for whole leather, shoulder and	International and national standards for reference purpose

		leather testing			belly. • Demonstrate how to use micrometer screw gauge and press Knife, illustrate how to measure thickness using it and how to determine apparent density. • Compute the mathematical formula -- • Show them how to measure shrinkage temperature	
General Objective 2.0: Know the measurement, effect and importance of shrinkage temperature on leather						
6-10	2.1 Explain shrinkage temperature of leather. 2.2 Discuss the effects of temperature on the leather samples being tested. 2.3 Explain measurement of shrinkage temperature by immersion in boiling water.	• Discuss the measurement of shrinkage temperature of leather and elaborate the effects of temperature on the leather samples being tested	Classroom Audio visuals Projector Marker Text books Relevant journals Internet Lecture notes Charts, Diagram Lecture note	2.1 Measure shrinkage temperature by immersion in boiling water. 2.2 Demonstrate the measurement of thickness of leather. 2.3 Demonstrate	• Introduce the students to physical testing equipment. • Identify the functions of each machines and equipment. • Identify the	Leather material Physical fastness and testing machines and equipment in the quality control laboratory eg Tensometer;

	2.4 Explain the factors affecting measurement of shrinkage temperature e.g. boiling temperature and time etc. 2.5 Explain the importance of measuring shrinkage temperature by immersion in boiling water as it affects the quality of leather.	• Explain briefly the measurement procedures in shrinkage temperature by immersion in boiling water • Dial micrometer gauge • Explain the importance of carrying the process by immersion. • Explain shrinkage temperature and how it is measured with emphasis on the variations in different types of tannages, e.g. -low T^S with vegetable tanned leathers, -high T^S with mineral tanned leathers, etc. stating the importance of T^S in leather • Define sampling as the process of taking a part to	Quality control equipment and materials Physical testing standards tables Physical fastness and testing machines and equipment in the quality control laboratory e.g. Torsometer; Wet and dry rubbing machine; Water permeability; Ruler Conditioning machine; cutting/press knives etc.	the measurement of apparent density 2.4 Demonstrate on how to determine the official sampling position for whole leather, shoulder and belly. 2.5 Use micrometer screw gauge and press knife to measure thickness 2.6 Determine apparent density.	properties of each leather and its significance.to the quality of the leather to be tested. • Guide the students how to cu the importance of physical testing in quality control • Demonstrate the measurement of thickness of leather • Demonstrate the measurement of apparent density • Demonstrate the measurement of Shrinkage temperature • Carryout the tests in 1.5 • Carryout the tests in 1.4 • Demonstrate	Wet and dry rubbing machine; Water permeability; Ruler Conditioning machine; cutting/press knives etc. International and national standards for reference purpose

		represent the whole, with emphasis on sampling positions, and explaining conditioning of leather and the parameters. • Define thickness of leather and explain the importance of its measuring. • Define and differentiate between apparent density from real density explaining its significance to both the end user and manufacturer			on how to determine the official sampling position for whole leather, shoulder and belly. • Demonstrate how to use micrometer screw gauge and press Knife, illustrate how to measure thickness using it and how to determine apparent density. • Compute the mathematical formula -- • Show them how to measure shrinkage temperature	
GENERAL OBJECTIVE 3.0: Know the various tests for assessing the strength of Leather.						
11-15	3.1 Explain sampling and Sample preparation. to be done before any test e.g. conditioning	• Discuss sampling and procedure of sampling • Explain the	Classroom Audio visuals Whiteboard Projector	• Operate simple machines and equipment eg. tensometer;	• Demonstrate the mechanisms, principles and	Physical fastness and testing machines and

	3.2 Explain the techniques and measurement of the various types of test to ascertain leather quality: i. Tensile strength ii. Percentage elongation iii. Tearing load iv. Buckle tear strength v. Grain crack resistance by Bull burst test vi. Abrasion resistance vii. Shape retention by fullness. viii. Resistance to compression. ix. Indentation index. x. Flexing endurance. i scuff damage by impact ii Apparent stiffness 3.3 Explain the significances and factors influencing 3.2 above 3.4 Explain wear trial. 3.5 Explain the merits of wear trial as a physical testing technique 3.6 Apply wear trial technique in physical testing of leather 3.7 Describe flexing endurance of light and	significance of sampling • Explain to students the importance of measuring the parameters mentioned in 3.1 emphasizing the significance of such measurements and the factors. • Explaining the concept of wear and tear as applied to leather stating the advantages derive with emphasis on the test that measure wear of leather. • Defining flexing endurance and explaining why it is important to determine the flexing endurance of leather. • Explain other properties that relate to or affect the flexing	Marker Text books Practical Manual; Sketch boards; Illustrative diagrams Practical manual Lecture Notes Physical testing equipment	• Perform the following test: i Tensile strength ii Percentage elongation iii Tearing load iv Buckle tear strength v Grain crack resistance by Ball burst test vi Abrasion resistance. vii Shape retention by fullness. viii Resistance to compression. ix Indentation index. x Flexing endurance. xi scuff damage by impact xii Apparent stiffness • Carry out test analysis and interpretation of results	functionality of some machines • Demonstrate to students how to determine the properties mentioned in 2.1 • Carry out the tests mentioned in 2.1 on a leather. • Demonstrates the following individual test; - Abrasion resistance. - Shape retention by fullness. - Resistance to compression - Indentation index. - scuff damage by impact - Apparent stiffness etc.	equipment in the quality control laboratory eg Tensometer; Wet and dry rubbing machine; Water permeability; Ruler Conditioning machine; cutting/press knives etc. International and national standards for refrence purpose . .

	heavy leathers and finishes 3.8 Enumerate the factors affecting 3.6 above 3.9 Describe scuff damage by impact 3.10 Explain the abrasion properties of sole leathers and upper leathers	endurance of leather such as resistance to compression of heavy leathers, indentation index and explaining the factors affecting them. • Explain the abrasion properties .e.g. sole leathers and upper leathers as a consequence of direct environmental impact. • Explain flexing endurance of light and heavy leathers and and factors affecting flexing endurance		reported	• Demontrates flexing endurance for various runs; 500, 1000, 1200 etc. • Illustrates wear and tear test etc.	

Course Assessment:	
Course work:	10%
Assignment:	10%
Practical:	40%
Examination:	40%
Total:	**100%**

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE: APPLIED SPECTROSCOPY	**COURSE CODE: LPT 314**	**Contact Hours:2 Hrs/Week**
	Credit Unit: 2	**Theoretical: 2 Hrs/Week**
Year: I Semester: I	**Pre-requisite:**	**Practical: 0**
GOAL: This course is intended to provide students with in-depth knowledge on the application of spectrophotometric techniques in the identification of organic compounds and their reactions.		

GENERAL OBJECTIVES

On completion of this course, the student should be able to:

1.0 Understand the interaction and effect of UV light on organic compounds
2.0 Understand the application of spectrophotometric techniques in the identification of organic compounds. ;
3.0 Understand the chemistry of mono-substituted aromatic compounds and compare their reactions with those of their aliphatic analogues.
4.0 Understand the principles of organic reaction mechanism applied to aromatic systems.

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
Course Title: APPLIED SPECTROSCOPY	**Course Code: LPT 314**	**Contact Hours: 2 Hrs/Week**
	Credit Unit:2	**Theoretical: 2 Hrs/Week**
Year: I Semester: I	**Pre-requisite:**	**Practical: 0**
COURSE SPECIFICATION: THEORETICAL:		
GENERAL OBJECTIVE 1.0: Understand the interaction and effect of UV light on organic compounds		

THEORETICAL CONTENT				**PRACTICAL CONTENT**		
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
1-4	1.1 Define frequency range in UV radiation. 1.2 Explain the effect of the interaction of UV light with organic compounds (electronic transitions). 1.3 Explain electronic transitions in terms of molecular orbital theory (p-p* and n-p*). 1.4 State intensity of band as ε 1.5 Mention the wavelength of maximum absorption and the intensity of absorption. 1.6 State the Beer-Lambert law relating absorbance to	• Explain frequency range in UV radiation. • Highlight the effect of interaction of UV light with organic compounds • Highlight electronic transitions in terms of molecular orbital theory. • Explain the units of intensity. • Explain that the wavelength of maximum	Teaching Tools Classroom resources like charts, etc.			

	concentration. 1.7 Describe the relationships between structures and wavelength of maximum absorption 1.8 Explain the use of UV spectrum in identification of unsaturated bonds, chromophores and aromatic systems. 1.9 Explain the interaction of infra-red electromagnetic radiation with organic molecules. 1.10 Explain how the interaction of infra-red radiation with organic molecules gives rise to stretching, bending, vibration and wagging of the molecules. 1.11 Assign absorption frequencies to the following functional groups: OH; -OR; -NH_2; -X-C; HC=O; C=O; 1.12 Describe absorption frequencies to the following functional groups: alkene, alkyne, nitrile, 1.13 Explain how the	absorption is called λ_{max} and the intensity of absorption at λ_{max} is ε_{max}. • Explain absorption frequencies to the following functional groups: alkene, alkyne, nitrile. • Interpret the spectrum of a simple known compound. • Describe chemical shifts of simple compounds. • Explain that chemical shift is affected by the electronic environment of the nucleus - deshielding and shielding effects.				

	"finger print' region between 1450 - 650 cm^{-1} is unique for any compound. 1.14 Explain how the substituent groups attached to a functional group affects the absorption frequency of the functional group e.g. ketones, esters, amides, conjugated carbonyls, substituted aromatic compounds, etc. 1.15 Interpret the spectrum of a known compound. 1.16 Explain the concept of magnetic moments to the nuclei of the following atoms. H^1, N_7^{15}, F_9^{19}, P_{15}^{39}, C_6^{13}					
GENERAL OBJECTIVE 2.0: Understand the application of spectrophotometric techniques in the identification of organic compounds						
5-8	2.1 Explain the theory of NMR. 2.2 Explain the term chemical shift with particular attention to chemical shift values for H^1. 2.3 Explain the characteristic chemical shift ranges for	• Describe chemical shifts of simple compounds. • Explain that chemical shift is affected by the electronic environment of the nucleus -	Teaching Tools Classroom resources like charts, etc.			

	common functional groups. 2.4 Recognize the equivalence of hydrogen atoms in a molecule. 2.5 State the scales adopted for H^1 NMR spectrum. 2.6 Define the concept of mass spectrometry. 2.7 Explain how a mass spectrometer distinguishes between ions of different mass to charge (m/e ratio). 2.8 Identify fragmentation patterns of molecules e.g. for CH_4 as CH_3^+, CH_2^+, CH^+ and C^+ having m/e = 15, 14, 13 and 12. 2.9 Identify parent ion in the mass spectrum of a compound. 2.10 Explain X-ray diffraction technique as a means of determining the structures of crystalline complex organic molecules. 2.11 Describe the application of X-ray diffraction in the determination of	deshielding and shielding effects. • Identify chemical shifts for different types of protons e.g. -OH, CH_2, -Ar-H, etc. • Explain the working principles of mass spectrometer. • Describe possible fragmentation patterns for simple organic compounds e.g. CH_3CH_2-CH_3. • Explain parent ion in the mass spectrum of a compound. • Explain the use of integration (peak or signal integration) • Describe fragmentation patterns of molecules e.g. for CH_4 as				

	structures of organic molecules.	CH_3^+, CH_2^+, CH^+ and C^+ having m/e = 15, 14, 13 and 12. • Describe, in general terms, the interpretation of X-ray diffraction pattern to give a model of the organic molecule making up the crystal. • Explain the conversion of an X-ray diffraction pattern into a map of electron density				
GENERAL OBJECTIVE 3.0: Understand the chemistry of monosubstituted aromatic compounds and compare their reactions with those of their aliphatic analogues.						
9-11	3.1 State the general formulae for mono-substituted aromatic compounds. 3.2 Describe the physical and chemical properties of monosubstituted aromatic compounds. 3.3 State IUPAC names for	• Explain physical and chemical properties of monosubstitute d aromatic compounds.	Classroom resources			

	monosubstituted aromatic compounds. 3.4 Explain how to prepare monosubstituted aromatic compounds (by halogenation, nitration, sulphonation, alkylation, acylation) from non-substituted aromatic compounds. 3.5 Compare reactions of monosubstituted aromatic compounds with non-aromatic compounds. 3.6 List uses of monosubstituted aromatic compounds.					
General Objective 4.0: Understand the principles of organic reaction mechanism applied to aromatic system.						
12-15	4.1 Describe the following types of reactions, encountered in organic chemistry - addition, elimination, substitution and re-arrangement reactions. 4.2 Explain the following: Inductive effects Mesomeric and Electrometric 4.3 Identify ortho, para and meta positions on a monosubstituted aromatic compound. 4.4 Explain the term	• Explain types of reactions, encountered in organic chemistry - addition, elimination, substitution and re-arrangement reactions. • Explain the mechanism of aromatic electrophilic substitution.	Classroom resources etc			

	electrophiles and nucleophiles. 4.5 Describe the mechanism of electrophilic aromatic substitution and nucleophilic aromatic substitution 4.6 Explain the mechanism of aromatic electrophilic substitution with respect to the following: Halogenation of benzene, Nitration of benzene, Sulphonation of benzene, Friedel craft reactions. 4.7 Draw diagrams of energy against reaction co-ordinate for the above reactions and relate the shape of the energy curves to the mechanism of the reaction (i.e. label the diagram) 4.8 List examples of ortho-para directing and meta directing groups. 4.9 List the differences between electrophilic aromatic substitution and nucleophilic					

	aromatic substitution. 4.10 List other reactions of aromatic hydrocarbons like addition and oxidation reactions. 4.11 Describe SN^1 and intermediate complex mechanism to aromatic nucleophilic substitution. 4.12 Identify selected reactions of arenes: (oxidation of alkyl side chains, reduction of benzylic alcohols and ketones, chlorination of toluene) 4.13 Identify selected reactions of aromatic substituents (reduction of the nitro group, oxidation of amino)					

Course Assessment:

Course work:	20%
Test/Assignments:	20%
Examination:	60%
Total :	100%

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE TITLE: CHEMICAL ANALYSIS I	**Course Code: LPT 315**	**Contact Hours: 4Hours/Week**
	Credit Unit: 4	**Theoretical: 2Hours/Week**
Year: I Semester: I	**Pre-requisite: General Laboratory Techniques; Leather quality control; Basic analytical chemistry**	**Practical: 2Hours/Week**
GOAL: This course is designed to provide students with in-depth knowledge and practical skills in chemical analysis for testing and quality control in leather processing		

GENERAL OBJECTIVES:

On completion of this module, students should be able to:

1.0 Know chemical testing methods for tanning chemicals and leather;
2.0 Know the **a**nalysis of the process main material: Water- quality parameters;
3.0 Know principles of analytical and instrumental methods employed in analysis of leather chemicals and process liquor;
4.0 Know the determination of swelling curve and titration curve;
5.0 Understand the standards for various leather chemical and leather products.

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE TITLE: CHEMICAL ANALYSIS I	**COURSE CODE: LPT 315**	**Contact Hours: 4 Hrs/Week**
	Credit Unit: 4	**Theoretical: 2 Hrs/Week**
Year: I Semester: I	**Pre-requisite: General Laboratory Techniques; Leather quality control; Basic analytical chemistry**	**Practical: 2 Hrs/Week**
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL		
GOAL: This course is designed to provide students with in-depth knowledge and practical skills in chemical analysis for testing and quality control in leather processing		
GENERAL OBJECTIVE 1.0: Know chemical testing methods for tanning chemicals and leather		

THEORETICAL CONTENT				**PRACTICAL CONTENT**		
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
1-3	1.1 Explain the purpose of chemical testing in leather processing. 1.2 Identify common tanning chemicals and state their functions. 1.3 Describe proper sampling methods for analysis. 1.4 Explain, simple qualitative test for tanning chemicals 1.5 Explain basic tests on leather samples 1.6 Interpret results for quality control purposes.	• Introduce the concept of chemical testing in tanning operations. • Explain types and roles of tanning chemicals, (e.g. Vegetable tannins, chromium salts, syntans, dyes, fatliqours), using samples and illustrations • Explain procedures for collecting test	Classroom, Projector, Text books, Internet, Relevant journals, Lecture notes Charts, Diagrams, sample containers Charts, Demonstration kits, test procedure manuals, Diagrams, sample leather	• Identify the common tanning chemicals and their functions in leather tanning process • Collect representative samples of Tanning chemicals and leather, prepare sample for testing, label and store samples properly • Perform simple qualitative test on tanning chemicals, observe colour changes/precipitates	• Guide the students in recognizing and labelling tanning chemical samples. • Demonstrate sampling and sample preparation methods • Demonstrate and supervise simple identification tests • Supervise testing of leather samples and	Samples of tanning chemicals: (e.g. chromium salts, dyes, fatliqours), labels, PPE Leather samples, tanning chemical samples, sample tools and containers, Glassware, reagents, weighing

		samples. • Explain principles of common qualitative tests, e.g. Ferric chloride test, Sodium hydroxide test, Dye absorption /colour reaction test, etc. • Explain simple methods used to test leather properties • Explain how results are used judge chemical suitability and product quality.	pieces, Sample result sheets.	• Report observation accurately • Prepare leather extracts; carryout simple tests on leather samples, observe and document results • Relate observed reactions to the presence of specific tanning agents; draw simple conclusions from test results; present findings clearly	observation of changes. • Guide the students in recording observation and interpreting results.	balance, Record sheets, calculators, laboratory notebooks
General Objective 2.0: Know the analysis of the process main material: Water- quality parameters						
4-7	2.1 Explain the role of water in soaking, liming, pickling, tanning and finishing processes. 2.2 Identify common impurities found in process water (e.g., Ca/Mg carbonates) and their effects on leather quality. 2.3 Explain pH values of water samples. 2.4 Explain water hardness	• Explain the various uses of water in different stages of leather processing; relate water quality to product quality. • Discuss sources of process water and typical contaminants, explain their effects on	Charts diagrams , pH charts and diagrams, Charts showing hardness effects, Titration charts,Charts, diagrams, sample data sheets,	• Collect water samples from different sources, observe and record physical characteristics (colour, odour, turbidity) • Classify the water samples based on observed impurities • Measure pH using pH paper and pH	• Guide students in observing physical characteristics of water samples • Demonstrate and supervise pH testing using indicators or pH meter • Demonstrate and guide students in hardness testing	Water samples from different sources, sample bottles, pH meter, pH papers/indicators, glassware, Glassware,

	and its effect on leather processing 2.5 Discuss alkalinity/acidity levels in water. 2.6 Describe the effect of turbidity and dissolved solids on processing efficiency. 2.7 Explain acceptable water quality for leather processing and describe consequences of deviation from standards	chemicals and leather • Explain concept of pH and its importance in tanning operations • Describe types of hardness (temporary and permanent) and their effects • Explain causes and significance of alkalinity/acidity in process water. • Explain turbidity and total dissolved solids (TDS) and their significance • Explain standard values for process water and their importance	Standard specification sheets/tables (NASREA)	meter, • Calibrate pH meter, record and interpret pH readings accurately • Perform hardness determination using titration (e.g., EDTA method); calculate hardness values; record and interpret results • Carryout titration to determine alkalinity/acidity; identify end points using indicators; compute and record results. • Measure turbidity using Turbidimeter, turbidity tube, or visual comparison; determine TDS using TDS meter, record and interpret findings. • Compare practical test results with standard limits; draw conclusion on water suitability; prepare and present simple laboratory report.	using titration method • Guide students in titration to determine alkalinity/acidity accurately • Demonstrate simple turbidity observation and TDS estimation methods • Assist students in recording results and comparing with standard values	EDTA solution, indicators, Standard acid/base solutions, indicators, Turbidimeter, Turbidity tubes (or visual comparison jars) TDS meter (if available) Record sheets, calculators, laboratory notebooks
General Objective 3.0: Know principles of analytical and instrumental methods employed in analysis of leather chemicals and						

process liquor.						
8-11	3.1 Explain the basic principles of qualitative and quantitative analysis. 3.2 Describe principles and applications of titration in leather chemical analysis. 3.3 Explain how substances are determined by weighing methods. 3.4 Identify common analytical instruments and state their functions. 3.5 Describe how process liquor are analyzed during production (e.g. tannery wastewater) 3.6 Explain the need for analyzing tanning chemicals before use; identify properties commonly tested such as pH, concentration, and purity, interpret results for process control. 3.7 Interpret instrument reading and analytical data correctly.	• Introduce types of analytical methods and their relevance in leather processing • Explain acid-base reactions and calculations • Describe steps involved in gravimetric analysis and its applications. • Explain working principles and uses of each instrument in leather processing • Explain sampling and testing at different stages of leather processing • Explain the importance of testing tanning chemicals for quality assurance; describe analytical methods used for different tanning agents; illustrate typical parameters tested	Charts, lecture notes, diagrams of titration setup, procedure notes, calculations, lecture notes, Instrument charts, manuals, projector, Process flow charts, Charts showing types of tanning chemicals, process flow diagrams. Sample data sheets	• Perform simple qualitative identification tests; carryout basic quantitative measurements; record observations accurately. • Prepare standard solutions; setup titration apparatus; perform acid-base titration; detect end points using indicators; calculate concentration of solutions. • Carryout simple precipitation and filtration; dry and weigh samples; record measurements accurately • Operate pH meter using buffer solutions; clean and maintain instruments before and after use; ensure accuracy of readings. • Collect process liquor samples;	• Demonstrate simple identification tests for selected chemicals • Guide students in performing simple titration experiments. • Demonstrate simple precipitation and weighing procedures • Demonstrate the operation and basic handling of instruments • Guide students in testing process liquor samples for pH and concentration. • Demonstrate sampling and preparation of tanning chemical	Chemical samples, glassware, droppers, reagents, Glassware, indicators, standard solutions, Weighing balance, filter paper, oven, crucibles, pH meter, conductivity meter, spectrophotometer, atomic adsorption spectrophotometer (AAS) Samples of process liquors, glassware, pH meter, Samples of tanning chemicals (chrome liquor, vegetable tannin extract, acid/alkalis), pH meter, glassware,

		(pH, strength, concentration) • Explain result recording, calculations and presentation methods		measure pH and concentration; perform titration where required; record and interpret readings. • Prepare chemical samples for analysis; determine Ph and concentration; perform simple tests to check chemical strength; record results accordingly. • Record results in tables; perform simple calculations, interpret readings from titration and instruments; present findings in laboratory reports.	solutions; guide students in determining pH and concentration using titration and meters; Supervise observation and recording of test results. • Assist students in recording observation and analyzing results.	indicators, distilled water, weighing balance, laboratory notebooks, record sheets, calculators
General Objective 4.0: Know the determination of swelling curve and titration curve						
12-13	4.1 Explain the meaning of swelling and its importance in leather processing. 4.2 Describe how swelling curve are obtained and plotted. 4.3 Interpret swelling curves for process adjustment and quality control. 4.4 Describe how titration	• Explain the structure of hides/skins and how water and chemicals cause swelling, relate swelling in fibre opening • Explain data collection methods and	Diagram of hide structure, Graph sheets, samples of plotted curves, Samples result sheets, Sample graphs,	• Observe and describe swelling of hide/skin in water, acid, and alkaline solutions; Record visible changes over time • Measure changes in hide thickness/weight at intervals; record	• Guide students to: Demonstrate observation of the hide swelling in water/alkaline solution • Supervise measurement of hide thickness/weight	Hide/skin sample, water, containers. Hide samples, Vernier caliper/ruler, weighing balance, stop watch, graph

	data are used to draw titration curve . 4.5 Interpret titration curves to determine concentration and chemical strength	curve interpretation using diagrams. • Explain how to use curves to detect over-swelling or under-swelling • Explain neutralization reactions, end points, and equivalence point; describe the use of titration in leather chemical analysis. • Explain applications in determining acidity/alkalinity of process liquors and tanning chemicals	lecture notes, Charts, sheets,	data systematically; plot swelling curve on graph sheets. • Interpret plotted swelling curves; relate results to process conditions; suggest adjustments based on observations. • Setup titration apparatus properly; prepare standard sample solutions; carryout acid-base titration accurately • Calculate concentration from titration data; interpret curve to determine chemical strength; relate findings to process control	at intervals and plotting of curves • analyzing plotted curves and drawing conclusions • collecting pH/volume data and plotting titration curves • Assist students in analyzing curves to estimate end point and concentration	sheets Graph sheets, calculators laboratory notebooks pH meter or indicators, graph sheets, titration setup, sample solution Laboratory notebooks, calculators, titration results sheets.
General Objective 5.0: Understand the standards for various leather chemical and leather products						
14-15	5.1 Explain the importance of standards in leather production and safety 5.2 Identify requirement and acceptable limits for common tanning chemicals 5.3 Recognize acceptable standards for water and	• Introduce the concept of standardization and its role in ensuring product quality • Explain standard properties such as purity, pH, and	Classroom, lecture notes, charts, Charts showing standard values, sample of chemical specification,	• Examine chemical labels and technical data sheets; compare laboratory test results with standard specifications; Determine level of compliance • Compare water	• Guide the students in checking labels and comparing chemical properties with standard values • Supervise comparison of	Samples of tanning chemicals, labels, specification sheets, Water analysis results,

	auxiliary chemicals 5.4 Identify standard quality parameters for finished leather (strength, flexibility, colour fastness, thickness). 5.5 Compare laboratory results with standard values for quality control. 5.6 Recognize the role of standard organization in leather production.	concentration for tanning agents. • Discuss recommended limits for water quality and chemical strength in processing • Explain criteria the criteria used to judge finished leather quality • Explain how standards are used to accept or reject materials and products • Discuss organizations responsible for setting standards and ensuring compliance	Standard reference charts, lecture notes, diagrams, sample leather grading guide, Sample result sheets, Printed standard documents, projector	analysis results with recommended standards; classify level of suitability of water sample. • Inspect finished leather samples; measure thickness using appropriate tools; assess physical properties according to given criteria. • Match laboratory results with standard limits; make decisions on acceptability; justify decisions based on standard criteria • Participate in simple quality control exercise; record observations; recommend corrective actions where standards are not met.	water/chemical test results with standard values • Demonstrate simple physical examination of leather samples • Support students in matching test results with standard limits and drawing conclusions • reviewing standard documents and specifications	auxiliary chemicals, record sheets, calculators Finished leather samples, measuring tools (ruler, thickness gauge) Laboratory test records, calculators, notebooks. Copies of standard specification sheets, reference manuals

Course Assessments:

Course work:	10%
Tests:	10%
Practical:	40%
Examination:	40%
Total:	**100%**

YEAR I SEMESTER II

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE: LEATHER MANUFACTURE II	**COURSE CODE: LPT 321**	**Contact Hours: 4 Hrs/Week**
	Credit Unit: 4	**Theoretical: 2 Hrs/Week**
Year: I Semester: II	**Pre-requisite: Leather Manufacture I**	**Practical: 2 Hrs/Week**
GOAL: This course is intended to provide students within depth knowledge of principles and methods of tanning and post tanning processes and operations in leather productions		
GENERAL OBJECTIVES On completion of this course, the student should be able to: 1.0 Know the different methods of tanning (tannage) in leather production; 2.0 Comprehend various principles and methods of tanning (tannage); 3.0 Know the various post tanning operations for different Leather manufacture; 4.0 Understand the principles and methods of post-tanning processes/operations; 5.0 Comprehend various principles and methods of Leather finishing;		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
Course Title: Leather Manufacture II	**Course Code: LPT 321**	**Contact Hours: 4 Hrs/Week**
	Credit Unit: 4	**Theoretical: 2 Hrs/Week**
Year: I Semester: II	**Pre-requisite: Leather manufacture I**	**Practical: 2 Hrs/Week**

COURSE SPECIFICATION: THEORETICAL AND PRACTICAL

GENERAL OBJECTIVE 1.0: Know the different methods of tanning (tannage) in leather production

THEORETICAL CONTENT				**PRACTICAL CONTENT**		
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
1-2	1.1 Explain the purpose(s) of tanning and different tanning methods (tannage). E.g. inorganic and organic tannages. 1.2 Explain the tanning agents used in the various tannages identified in 1.1. 1.3 Explain different classes of tanning agents according to their properties i.e. Poly-aromatic, mineral, or aliphatic nature.	• Explain the objectives of tanning and mention different tanning methods (tannage) e.g., vegetables, minerals, synthetic, oil and aldehyde etc. • Outline the tanning agents used in the various tannage mentioned in 1.1. • Discuss the classification of the tanning agents according to their properties and give examples.	Classroom Audio visuals Projector Text books Relevant journals Internet Lecture notes	• Identify different tanning materials available in the Tannery Chemical store.	• Guide the students on how to locate and identify different tanning agents in the chemical store.	Laboratory/ Workshops Practical Manuals Chemicals, PPE, Tannery resources
GENERAL OBJECTIVE 2.0: Comprehend various principles and methods of tanning (tannage)						
3-5	2.1 Explain the major inorganic tanning materials used e.g. chromium, zirconium,	• Describe the commonly used mineral tanning material e.g.	Classroom Audio visuals Projector Text books	• Carry out chromium, zirconium and aluminum	• Guide the students to prepare recipes for production	Mineral tanning agent Sodium bicarbonate

	aluminum, etc. 2.2 Explain the manufacturing principles and methods of using the inorganic tanning agents identified in 2.1. 2.3 Outline the factors governing tanning effect. 2.4 Explain the principle of basification in mineral tannages and the effect of masking on chrome liquor/ chrome tanned leather. 2.5 Explain organic tanning materials e.g. vegetables, synthetics, aldehydes, oil, etc. 2.6 Describe the tanning principles and practices of using vegetable tanning materials for production of different types of leather. 2.7 Classify the vegetable tanning materials into their main groups e.g. Catechol (condensed tannins); Pyrogallol (hydrolysable tannins); Pyro-catechol (complex tannins). 2.8 Explain the major constituents of	chromium, zirconium, aluminum. • Explain the principles and the methods of using the tanning materials mentioned in 2.1 above. • Explain factors affecting the tannages, e.g. nature of anion, basicity, pH, time, concentration, temperature, tan liquor volume, etc. • Describe the principles of basification on chrome tannage and highlight its effects on chrome liquor and chrome tanned leather. • Define masking Enumerate the masking agents and explain their effect on chrome liquor • Mention the organic tanning materials and explain them briefly. • Explain the tanning principle and list various vegetable	Relevant journals Internet Lecture notes	tannage • Perform basification and masking on chrome tanned leather • Carryout vegetable tanning, using imported and locally available vegetable tanning materials. • Perform oil tannage using different oil combination. • Carryout aldehyde tannage.	of wet blue and wet white leathers using chromium, zirconium and aluminum. • Guide students to basify a chrome tanned leather • Supervise students to carry out tannage using different vegetable tanning materials. • Guide students to produce chamois, semi-chrome, chrome retan, full veg., and full chrome tanned leather. • Guide students in chamois leather production. • Guide students to produce leather using aldehyde tannage.	Oils, Formal-dehyde, Practical Manuals Chemicals, PPE etc

	vegetable tanning materials, e.g. tannins, non-tannins, etc. explain their physio-chemical properties and their effect on the physical properties of leathers. 2.9 State the properties of vegetable tanned leathers and explain the factors that affect the tanning process. 2.10 Explain the principles of using combination tanning materials. E.g. semi-chrome, chrome retan, full veg., full chrome, etc.	tanning materials such as chestnut, valonia, myrobalan, sumac, Dividivi, bagaruwa, etc. with their properties i.e. sources, pH, and concentration of tannins. • Explain the classification of vegetable tanning materials e.g. catechol, pyrogallol, and pyro-catechol. • Explain the constituents of major vegetable tanning materials e.g. tannin, sugar, salts, acid • Highlight the effect of these constituents listed on tanning. • Explain the properties of vegetable tanned leather • Enumerate the factors that affect the vegetable tanning process • Explain oil tannages • Define chamois leather • Describe the				

		principle underlying the oil tannage • Discuss the properties of chamois leather • Ask questions students questions on the aldehyde tannages • Formaldehyde, glutaraldehyde, chraconaldehyde, acriocin etc • Explain factors affecting aldehyde tannage viz				
General Objective 3.0: Know the various post tanning operations for different Leather manufacture						
6-7	3.1 Differentiate between wet and dry post tanning processes/operations of different types of leathers. 3.2 Enumerate wet-post tanning processes for different leathers. 3.3 List the post-tanning Mechanical operations involves in different types of leathers.	• Explain the chemical processes and the mechanical operations involved during post tanning operations processes. • Outline the wet-post tanning processes in light leather manufactures e.g. Re-chroming, Neutralization (for Mineral tannages), Stripping and Clearing (for Vegetable tannage), Retanning, Dyeing, Fatliquoring, etc.	Classroom Audio visuals Projector Text books Relevant journals Internet Lecture notes			

		• Outline the post tanning mechanical operations in leather manufacture e.g. Samming, Splitting, Shaving, Drying, setting (Conditioning), Staking, Toggling, Buffing, Trimming, etc.				
General Objective 4.0: Understand the principles and methods of post-tanning processes/operations						
8-11	4.1 Define neutralization (de-acidification) and state its purposes for mineral tannage. 4.2 Explain the choice of neutralizing agents and the degree of neutralization for different types of leather. 4.3 Explain the efficacy of neutralizing syntans. 4.4 Describe the controls of neutralization with various parameters (factors) in view. 4.5 State the principle of stripping and clearing processes and its application methods. 4.6 Explain the principle of re-tanning and its importance in leather	• Explain the objectives, the necessities and controls to achieve desired up-take of re-tanning agents, dyes and fatliquors. • Discuss the processes of stripping and clearing, outline their objectives in processing vegetable tanned leathers. • Outline the chemicals commonly used and the method of applications. • Highlight the effects of poor handling of these processes. • Define and briefly discuss the principle of re-tanning process	Classroom Audio visuals Projector Text books Relevant journals Internet Lecture notes	• Demonstrate the neutralization process of wet blue leathers. • Demonstrate stripping and clearing process for veg. pre-tanned leathers • Carry out retannage to produce semi-chrome, chrome re-tan, full veg. and full chrome tanned leather. • Apply different dyestuff on leathers • Applying	• Supervise the students to de-acidify wet blue leathers using neutralizing agents and neutralizing syntans. • Guide students should to carry out stripping and clearing processes for veg. tanned leathers. • Guide the students to produce semi-chrome, chrome re-tan, full veg. and full chrome	Neutralization chemical available in the chemical store e.g. sodium bicarbonate. Wet-blue Stripping agents, clearing agents Retanning chemicals e.g. syntans, chrome, etc. Different shades of dyes Formic acid fatliquors Formic acid

	production. 4.7 Explain the effects of different re-tanning agents on a particular leather and choice of combination of re-tanning agents with a view to the ultimate leather. 4.8 Explain dyeing process and its purposes in leather manufacture. 4.9 Discuss the choice of dyestuffs for leather dyeing. 4.10 Explain the influence of retanning on dyeing property of leather, penetration of dyes, and leveling of dyestuffs for uniform coloration. 4.11 Explain different methods of dyeing techniques, and fixation of dyestuffs. 4.12 Explain fatliquoring process and its purposes in leather manufacture. 4.13 Enumerate the classification/ types of oil use for fatliquors. 4.14 Describe different methods/control of fatliquoring for different types of leather.	and its objectives. • Discuss types of retannage, its purposes and effects of various agents on the properties of leather. • Outline their advantages /disadvantages. • Explain the principle of bonding of re-tanning materials as special reinforcing agent. • Outline differences /similarities between re-chroming and retanning • Explain the principle of dyeing process and objectives in light/soft leathers. • Enumerate the classification of dyes and methods of its application. • Highlight the importance of dyestuff affinity to a particular type of leather • Discuss the factors and problems associated with		fatliquors on different leathers • Demonstrate drying operation using different drying techniques. • Carry out the mechanical operations outline in 4.17	tanned leather. • Guide the students in applying dyestuff to leathers • Guide the students on application of fatliquors • Guide students on how to dry different leathers using different drying methods • Guide the students to carry out these operations	

	4.15 Explain the factors that affect fatliquoring process. 4.16 Explain drying and the influence of drying conditions on the properties of leathers. 4.17 Explain the purposes of the following mechanical treatment: samming, splitting, shaving, setting, staking, toggling, buffing, dusting, trimming, etc. in light leather manufacture.	dyeing process. • Describe different dyeing techniques e.g. drum dyeing, paddle dyeing, curtain coating, spray dyeing, etc. • Explain fixation of dyestuffs using different agents. • Explain the principle of fatliquoring and its objectives. • State the types of oils usually employed in the production of fatliquors. • Discuss different methods and control in fatliquoring of light and soft leathers to achieve desired properties of leather. • Explain the factors that affects fatliquoring process. • Highlight the problems associated with poor fatliquoring. • Explain the principle of drying operations and its role in leather manufacture. • List and explain				

		different drying systems of leather in wet conditions. • Explain the influence of humidity, temperature, time etc. on drying of leathers. • Explain the working principle of each mechanical operations mentioned. • Explain the importance of each operation and their effects on the qualities of leather produced.				
General Objective 5.0: Comprehend various principles and methods of Leather finishing						
12-15	5.1 Explain the aim and purposes of leather finishing. 5.2 Outline classification of leather finishing. 5.3 Explain the formulation of different leather finishes e.g. pigments, binders, plasticizers, wax, nitrocellulose lacquers, solvents and diluents etc. 5.4 Explain the requirements imposed on leather finishes. i.e. adhesion, rub fastness, fastness to water, elasticity, light	• Explain leather finishing and its influence on leather properties. • Enumerate various classification of leather finishing. • List and explain various finishing materials and their uses • Explain the application of the finishing coats and their characteristics. • Discuss different	Class room Audio visuals Projector Text books Relevant journals Internet Lecture notes	• Demonstrate how to apply finishes on the leather after mechanical treatment.	• Guide students to carry out finishing on crust leathers	Finishing agents such as pigments, wax, etc.

	fastness, heat resistance, cold crack resistance, resistance to solvents, resistance to washing, cleansing shoe dressing agents, polishability, bleeding in contact to with plasticizers, resistance to ageing, etc. 5.5 Describe the characteristics of different layers of finish coat. E.g. base coat (first layer) second coat (decorative layer), top coat (last layer) etc. 5.6 Explain the preparation of leather for finishing, finishing techniques and the application of finishes. 5.7 Explain the mechanical finishing operations e.g. plating, glazing, printing, embossing, polishing, etc.	methods of finishing techniques and give the effects of wrong formulation or applications • Explain the different finishing treatments. • Discuss the preparation of leather for finishing (i.e. grain clearing, wet pigmenting, buffing and snuffing of the leather surfaces, etc.), finishing techniques and the application of finishes (e.g. pad coating, spray coating, roller coating, design roller coaster, curtain coating, etc.). • Describe the mechanical finishing operations e.g. plating, glazing, printing, embossing, polishing, etc.				

Course Assessments:

Course work:	10%
Tests:	10%
Practical:	40%
Examination:	40%
Total:	**100%**

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE: LEATHER CHEMISTRY II	**COURSE CODE: LPT 322**	**Contact Hours: 2Hrs/Week**
	Credit Unit: 2	**Theoretical: 2 Hrs/Week**
Year: I Semester: II	**Pre-requisite: Leather chemistry I**	**Practical: 0**
GOAL: This course is intended to provide students with in depth knowledge of chemistry of pre-tanning processes		

GENERAL OBJECTIVES

On completion of this course, the student should be able to:

1.0 Comprehend the theory of soaking as the first beam house process and the parameters involved;
2.0 Understand the scientific principles underlying unhairing/liming and the chemistries involved;
3.0 Understand the principles and chemistry of deliming , drenching and bating processes

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
Course Title: LEATHER CHEMISTRY II	**Course Code: LPT 322**	**Contact Hours: 2 Hrs/Week**
	Credit Unit: 2	**Theoretical: 2 Hrs/Week**
Year: I Semester: II	**Pre-requisite: Leather Chemistry I**	**Practical: 0**

COURSE SPECIFICATION: THEORETICAL

GENERAL OBJECTIVE 1.0: Comprehend the theory of soaking as the first beam house process and the parameters involved

THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
1-5	1.1 Define the process of rehydration of hides/skins fibres. 1.2 Explain the chemical interactions between the substrate, the solvent and the soaking aids. 1.3 State the objectives of soaking hides/skins 1.4 Enumerate the parameters to be considered during soaking 1.5 Discuss the role of pH, time, temperature mechanical action 1.6 Explain the chemical components of soaking solution	• Explain soaking as a process of rehydration with the primary objective of restoring water lost during preservation and storage by the use of water as its primary solvent with the addition of soaking aids such as soaps detergents etc • Describe the chemical interaction of the substrate and solvents to include the formation of salt links, • Explain the major	Classroom Audio visuals Whiteboard Projector Marker Text books Relevant journals Internet Lecture notes Charts, Diagram.		.	.

		objectives of soaking to include rehydration, removal of dirts and dungs, removal of curing saltsetc • Explain the various parameters to be considered to include: Source of water, state of raw stock, pH, temperature of soak liquor etc. • Explain the role of these parameters as factors that facilitates the absorption of water thus enhancing the soaking process • Enumerate chemicals used during soaking to include water, biocides, soaps, detergents etc				
GENERAL OBJECTIVE 2.0: Understand the scientific principles underlying unhairing/liming and the chemistries involved						
6-10	2.1 Define the process of unharing and its main objective 2.2 List common chemicals used during unhauring	• Explain unhairing as alkaline hydrolysis of hair protein known as keratin with the	Classroom Audio visuals Whiteboard Projector Marker	.		

	process 2.3 Explain the chemical reaction that occur during unhairing 2.4 Define liming and its objectives in leather manufacture 2.5 State the process variables involved during lining processes 2.6 Describe the chemical reactions that are involved during liming 2.7 Explain the occurrence of lime blast and its causes in the tannery	primary aim of hair removal from the hide/skin • Enumerate common unhairing chemicals to include water, sodium sulphide, sodium hydroxide, calcium hydroxide etc • Explain the breaking of the disulphite bond of the cysteine amino acid of collagen as the major chemical reaction involved during the unhairing process • Describe liming as the treatment of pelts with a solution of calcium hydroxide with the objective of opening up of the collagen fibre structure • Enumerate liming process variables to include concentration, pH, temperature, time	Text books Relevant journals Internet Lecture notes Charts, Diagram.			

		etc • Illustrate the chemical reaction between hydroxyl ions from solution calcium or sodium hydroxide with the amino or carboxyl functional groups of the collagen fibres • Define lime blast as the precipitate of calcium carbonate formed as a result of the reaction of the limed pelt with carbon dioxide when exposed to air eg Ca(OH) 2 + CO2 = CaCO3 + H2 O				
General Objective 3.0: Understand the principles and chemistry of deliming , drenching and bating processes						
11-15	3.1 Define deliming and state the objectives of undertaking the process. 3.2 Name common deliming agents and their reactions 3.3 Explain chemical reaction involved during deliming process 3.4 Explain drenching process in leather	• Explain deliming as a neutralization process aimed at removing lime used during liming with additional objective of reducing pH of the pelt, saponification of	Classroom Audio visuals Whiteboard Projector Marker Text books Relevant journals Internet Lecture notes Charts,		.	

	manufacture 3.5 Distinguish between deliming and drenching 3.6 Explain the bating process in and its relevance in leather manufacture 3.7 Discuss the various types of bating enzymes used in leather manufacture 3.8 Discuss important factors that influence bating. Process	fats etc • List common deliming agents to include ammonium sulphate/chloride carbon dioxide, formic acid etc • Illustrate with chemical equations, reactions involved between calcium hydroxide and the various deliming acids such as ammonium sulphate/chloride • Define drenching as the treatment of pelts with weak organic acids such as oxalic, acetic formic acid prior to vegetable tanning • Explain deliming as a neutralization of pelts prior to mineral tannin while drenching as the neutralization of the pelts prior to vegetable tanning	Diagram. .			

		• Explain bating as an enzymatic treatment of pelts in order to remove unwanted non collagenous substances from the collagen fibres • Explain the various bating enzyme preparations to include enzyme protease, lipase, amylase etc • Explain factors that affects bating process to include pH, temperature, time etc				

Course Assessment:

Course work:	20%
Test/Assignments:	20%
Examination:	60%
Total:	100%

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE: PHYSICAL AND FASTNESS TESTING OF LEATHER II	**COURSE CODE: LPT 323**	**Contact Hours:4 hours/week**
	Credit Unit: 4	**Theoretical: 2 hours/week**
Year: I Semester: II	**Pre-requisite: LPT 313**	**Practical: 2 hours/week**
GOAL: This course is designed to enable students to be able to physically test finished Leather and ascertain its quality		

GENERAL OBJECTIVES

On completion of this course, the student should be able to:

1.0 Know the technique for assessing the water absorption characteristics of leathers;
2.0 Know water penetration pressure and water proofness test of leathers;
3.0 Know fastness properties and surface performance of finished leathers;

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
Course Title: PHYSICAL AND FASTNESS TESTING OF LEATHER II	**Course Code: LPT 323**	**Contact Hours: 4 Hrs/Week**
	Credit Unit: 4	**Theoretical: 2 Hrs/Week**
Year: I Semester: II	**Pre-requisite: LPT 313**	**Practical: : 2 Hrs/Week**
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL		
GENERAL OBJECTIVE1.0: Know the technique for assessing the water absorption characteristics of various leathers		

THEORETICAL CONTENT				**PRACTICAL CONTENT**		
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
1-5	1.1 Explain the water and percentage loss on soaking 1.2 Explain the significance of free water and percentage loss on soaking as they affect leather properties 1.3 Describe the water absorption characteristics of leather (sole leather) i By gravimetric method ii By kubelka method 1.4 Explain the major differences between the two methods mentioned in 1.3 above	• Define water and explain its role in leather processing, stating the significance of free water on collagen and how percentage loss affect the properties of leather produced. • Explain water absorption characteristics of sole leather by gravimetric method which has to do with measurement of sample weight, and by kubelka which is a	Classroom Audio visuals Whiteboard Projector Marker Text books Practical Manual; Sketch boards; Illustrative diagrams Practical manual Lecture Notes Physical testing equipment Textbook	• Carry out water absorption by gravimetric method • Demonstrate the Kubelka method	• Illustrate the procedure of water absorption. • Demonstrate how to use Kubelka apparatus • Guide the students to identify the effect of water loss on the properties of leather. • Illustrate gravimetric method from kubelka method	Quality control Lab. equipment Kubelka apparatus Gravimetric apparatus Practical manual Lecture Notes Physical testing equipment State standards for water absorption.

		function of v/v • Explain water penetration pressure of leather (light and heavy). • Explain water proofness property of various leathers. • Explain the significance of water vapour permeability and stating standards for water absorption and permeability of leathers.				
General Objective 2.0: Know water penetration pressure and water proofness test of leathers						
6-10	2.1 Explain water penetration pressure of leather 2.2 Describe the determination of penetration pressure of leather 2.3 Discuss water penetration pressure in light leather 2.4 Describe dynamic water proofness test for shoes uppers and gloving leathers 2.5 Describe water vapour	• Explain water penetration pressure of leather (light and heavy). • Explain water proofness property of various leathers. • Explain the significance of water vapour permeability and stating standards for water absorption and	Classroom Audio visuals Whiteboard Projector Marker Text books Practical Manual; Sketch boards; Illustrative diagrams, Lecture Notes Physical testing equipment, Textbook	• Demonstrate Dynamic water proofness • Demonstrate Water penetration • Water vapour permeability	• Demonstrate how to carry out water proofness test, water vapour permeability test, water penetration test	Quality control Lab. equipment Kubelka apparatus Gravimetric apparatus Practical manual Lecture Notes Physical testing equipment State standards for water absorption.

	permeability of leathers 2.6 Explain the significances of water vapour 2.7 Explain standards for water absorption characteristics of leather	permeability of leathers.				
GENERAL OBJECTIVE 3.0: Know fastness properties and surface performance of finished leathers						
11-15	3.1 Explain fastness tests 3.2 Discuss application of fastness tests 3.3 Describe the following fastness tests for finished leathers: i Light fastness test ii Heat fastness of finished leather iii Marking off Solvent Fastness iv Rub fastness (dry and wet) v Washing test vi Perspiration test vii Alkaline marring test viii Spirit marring test ix Water spotting test	• Define fastness and explain to state the importance of the fastness tests. • Explaining to students how to interpret or relate fastness or colour migration to grey scale reading. • Explaining the importance of proper application and adhesion of finish for good fastness properties	Physical Lab. Machinery and Equipment. Standards for fastness test, P or colour migration to grey scale reading, Lecture Notes etc.	• Determine the following fastness properties of finished leather: - Light fastness test - Heat fastness of finished leather - Marking off - Fastness to Solvent. - Rub fastness (dry and wet). - Fastness to Washing. - Perspiration test - Alkaline marring test. - Spirit marring test. - Water spoting test.	• Demonstrate supervise the carrying out of the aforementioned fastness tests.	Fastness interpretation for each grey scale number

Course Assessments:	
Course work:	10%
Tests:	10%
Practical:	40%
Examination:	40%
Total:	**100%**

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE: APPLIED CHEMISTRY	**COURSE CODE: LPT 324**	**Contact Hours: 2 Hrs/Week**
	Credit Unit: 2	**Theoretical: 2 Hrs/Week**
Year: I Semester: II	**Pre-requisite: LPT 314**	**Practical: 0**
GOAL: This course is intended to provide students with in-depth knowledge on Colour, Pigments and Dyes		

GENERAL OBJECTIVES

On completion of this course, the student should be able to:

1.0 Comprehend the concepts of colour, pigments and dyes
2.0 Understand types and characteristics of Pigments
3.0 Know the features and application of dyes and colourants
4.0 Understand the Classification of Dyes
5.0 Understand dyeing mechanism

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
Course Title: APPLIED CHEMISTRY	**Course Code: LPT 324**	**Contact Hours: 2 Hrs/Week**
	Duration: 2	**Theoretical: 2 Hrs/Week**
Year: I Semester: II	**Pre-requisite: Leather Chemistry I**	**Practical: 0**

COURSE SPECIFICATION: THEORETICAL

GENERAL OBJECTIVE 1.0: Comprehend the concepts of Colour, Pigments and Dyes

THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
1-2	1.1 Define the term "colour" 1.2 Discuss history of colour. 1.3 Explain the origin of 'colour'. 1.4 Discuss electromagnetic waves and visible spectrum. 1.5 Discuss wavelength and frequencies associated with colour. 1.6 List the properties of colour. 1.7 Discuss colour perception.	• Explain history/origin of colours, and the electromagnetic spectrum • Explain properties and perception of colours • To teach students to understand that pigments are generally described as insoluble colour materials (in the medium of use). • Demonstrate features of dyes and how colours can be altered. • Describe dyeing of fabrics, dyeing systems and	Classroom, Teaching Tools Dyes and pigment Classroom resources, Refractometer (to determine the refractive index of pigments) etc			

		difference between pigment and dyes.				
GENERAL OBJECTIVE 2.0: Understand types and characteristics of Pigments						
3-7	2.1 Define pigments. 2.2 Explain the features of pigments. 2.3 List types of pigments. 2.4 Differentiate between natural and synthetic organic pigments. 2.5 State differences among various types of pigments: natural pigments etc 2.6 Explain kinds of natural pigments i Annatto natural pigments ii Plant pigments iii Carotenoid pigments iv Betalain pigments v Anthocyanin pigments 2.7 Discuss limitations of natural pigments. 2.8 Explain the factors affecting the selection of pigments. 2.9 Discuss organic pigments. 2.10 List categories of organic pigments. 2.11 Discuss features of organic pigments.	• Explain that these natural pigments are made of diverse chemical structures which affects their colouring properties. • Discuss the various types of pigments and factors affecting the selection of pigments for various applications. • Discuss the various kinds of pigments and factors affecting the selection of pigments. •	Classroom, Teaching Tools Dyes and pigment Classroom resources, Refractometer (to determine the refractive index of pigments) etc			

	2.12 Explain inorganic pigments. 2.13 Discuss natural inorganic pigments. 2.14 Explain synthetic inorganic pigments. 2.15 List the shortcomings of inorganic pigments. 2.16 State difference between organic and Inorganic pigments. 2.17 Explain metallic pigments.					
GENERAL OBJECTIVE 3.0: Know the features and application of dyes and colourants						
8-9	3.1 Define dyes 3.2 Explain features of dyes. 3.3 Discuss how the colour of dyes be altered. 3.4 Explain dyes solubility and cohesiveness. 3.5 Explain dyeing of fabrics. 3.6 Discuss conventional pigments dyeing system. 3.7 State the differences between dyes and pigments. 3.8 List applications of dyes and pigments. 3.9 Explain the important applications of pigments. 3.10 Explain Industrial	• Discuss the applications of dyes and pigments. • Use different types of pigments to identify their colours, discuss the features of each type of pigments • Identify the differences and similarities between types of pigments • Explain identification of dyes and features of different types	Classroom, Teaching Tools Dyes and pigment Classroom resources, Refractometer (to determine the refractive index of pigments) etc			

	application of dyes and pigments. 3.11 Discuss colourants for: Plastic, cement, ceramic, paper, agriculture, wire and cable, and cosmetic industries. 3.12 Discuss pigments in security printing and dyes in medicine.	of dyes e.g., chromophores and auxochrome, C=C -OH, -CH_2 etc.				
GENERAL OBJECTIVE 4.0: Understand the Classification of Dyes						
10-11	4.1 State different bases for the classification of dyes. 4.2 Explain chemical classification of dyes 4.3 Discuss industrial classifications of dyes. 4.4 Discuss classification based on the source of materials. 4.5 Explain classification based on applications 4.6 Discuss classification based on International Trade Commission 4.7 Discuss dew retting and water retting.	• Teach the various classifications of dyes.	Classroom, Teaching Tools Dyes and pigment Classroom resources, Refractometer (to determine the refractive index of pigments) etc	.		
General Objective 5.0: Understand dyeing mechanism						
12-15	5.1 Explain types of dyeing processes. 5.2 Discuss batch dyeing 5.3 Describe features of Beam Dyeing Machine	• Discuss various types of dyeing processes • Guide students to mechanisms of	Classroom, Teaching Tools Dyes and pigment Classroom		.	

	5.4 State the advantages of Beam Dyeing Process 5.5 Explain Hank Dyeing Machine 5.6 Discuss features of Hank Dyeing Machine 5.7 Describe Jig Dyeing Machine 5.8 Explain types of Jig Dyeing Machines 5.9 Discuss continuous dyeing process, semi continuous dyeing and pad batch dyeing 5.10 Describe workings of cold pad dyeing process 5.11 List special features of pad batch dyeing Process. 5.12 Explain general dyeing mechanism.	the dyeing processes.	resources, Refractometer (to determine the refractive index of pigments) etc			

Course Assignments:

Course work:	20%
Test/Assignments:	20%
Examination:	60%
Total:	100%

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE: CHEMICAL ANALYSIS II	**COURSE CODE: LPT 325**	**Contact Hours: 4 Hrs/Week**
	Credit Unit: 4	**Theoretical: 2 Hrs/Week**
Year: II Semester: II	**Pre-requisite: LPT 315**	**Practical: 2 Hrs/Week**
GOAL: This course is intended to equip students with advanced knowledge and skills in chemical and instrumental analysis for process control, quality assurance and environmental safety in leather processing .		

GENERAL OBJECTIVES

On completion of this course, the student should be able to:

1.0 Know sampling and analytical procedures;
2.0 Know how to evaluate the quality of leather and leather products;
3.0 Know how to analyze and control process chemicals, auxiliaries, water and effluents;
4.0 Know the applications of standards, data interpretation, and laboratory management practice.

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
Course Title: CHEMICAL ANALYSIS II	**Course Code: LPT 325**	**Contact Hours: 4 Hrs/Week**
	Credit Unit: 4	**Theoretical: 2 Hrs/Week**
Year: I Semester: II	**Pre-requisite: LPT 315**	**Practical: 2 Hrs/Week**
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL		
GENERAL OBJECTIVE1.0: Know sampling and analytical procedures		

THEORETICAL CONTENT				**PRACTICAL CONTENT**		
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
1-4	1.1 Explain the purpose and importance of representative sampling; describe sampling techniques for hides, skins, and finished leather. 1.2 Explain methods for preparing and preserving samples for analysis; describe factors affecting sample stability 1.3 Outline common qualitative and quantitative tests applied to leather and chemicals; explain their significance. 1.4 Explain the principles, functions and applications of analytical instruments (pH meter, conductivity meter,	• Discuss leather sampling principles; demonstrate diagrams and flow of sampling procedures. • Explain procedures for sample preparation and preservation; show example of good and poor practice • Explain principles of chemical tests (e.g., pH, ash, fatliqour/oil content); show calculation examples • Discuss on the	Classroom, lecture notes, charts, diagrams, projector, sample preparation, flow diagram, calculation sheets, instrument diagrams,	• Collect representative samples of hides, skins, and finished leather; label and store samples correctly • Prepare samples for analysis (Grinding, drying, extraction) and store appropriately • Perform selected qualitative and quantitative tests on leather and chemical samples; record observations • Operate analytical instruments to determine pH, conductivity, and concentration of process liquors; record and interpret results	• Guide students on sampling of leather materials; ensure correct labeling and preservation • Guide students in sample preparation and preservation; demonstrate extraction and grinding technique. • Demonstrate chemical tests; guide students in performing tests and recording results • Demonstrate proper instruments use and their calibration;	Hides/skin samples, sample bags, labels, makers Mortar and pestle, sample containers, drying oven, PPE, Glassware, analytical balance, indicators, pH meter, conductivity meter, spectrophotometer, calibration solutions, sample containers, lab notebook

	spectrophotometer)	principles and applications of analytical instruments; explain calibration and data interpretation			supervise students in instrument operation and data recording	
GENERAL OBJECTIVE 2.0: Know how to evaluate the quality of leather and leather products						
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
5-8	2.1 Explain the purpose of chemical tests (moisture, fatliquor/oil, ash, chromium content); describe how they assess leather quality. 2.2 Describe key parameters (strength, flexibility, thickness, color fastness) and their influence on leather performance. 2.3 Explain chemical changes leading to defects (e.g., over-tanning, under-fatliquoring). 2.4 Explain how chemical and physical test results determine leather grade and quality class.	• Discuss the theory of leather composition and chemical tests; show reaction principles and sample calculations • Explain importance of quality parameter, illustrate with high- and low-quality leather • Discuss causes of defects on raw materials tanned /finished leathers illustrate effect on leather properties • Discuss grading systems;	Classroom, lecture notes, diagrams of chemical tests, charts, showing expected reactions, Charts, lecture notes, standard tables for leather quality, Diagrams, sample defect illustrations, Sample grading charts, standard specifications	• Perform chemical tests to determine moisture, fatliquor /oil, ash, chromium oxide content in leather samples • Measure and record physical and chemical properties of leather, determine quality compliance • Identify and test for chemical defect in leather; record observation • Analyze practical test results; assign quality grade according to standard specifications	• Demonstrate chemical tests; supervise students in performing tests; ensure accurate observation and recording • Demonstrate measurement techniques for thickness, flexibility and colour testing • Supervise practical testing for common defects; guide students in noting and interpreting results • Guide students in interpreting laboratory data; demonstrate grading based on	Leather samples, test tubes, beakers, pipettes, reagents, analytical balance, drying oven, PPE, thickness gauge/ruler, color fastness tester, flexibility tester, measuring tools, Leather samples with defects, reagents, lab equipment for chemical test, Lab notebooks, recorded results, grading sheets, calculator

		explain comparison of results with standard limits			results	
General Objective 3.0: Know how to analyze and control process chemicals, auxiliaries, water and effluents;						
9-11	3.1 Explain types, functions and composition of tanning agents and auxiliaries; describe their role in leather processing. 3.2 Explain methods for determining concentration, purity, and activity of chemicals; describe water quality parameters (pH, hardness, alkalinity, TDS, turbidity). 3.3 Explain chemical and environmental parameters in tannery effluents; describe significance of BOD, COD, TDS and regulatory limits.	• Describe the types and functions of tanning chemicals, Explain chemical composition and typical properties. • Explain the concept of chemical analysis and water quality standards; explain calculation and interpretation • Discuss the composition of tannery effluents and their environmental impacts. Explain the regulatory standards and significance	Lecture notes, charts, chemical diagrams, calculation charts, water quality tables, charts on environmental standards,	• Carry out identification, preparation, handling, and labeling of chemicals for water effluent treatment. • Demonstrate titration, water testing and instrument operation; supervise students in measurement and recording • Demonstrate effluent sampling and basic analysis. Guide students in documentation and reporting	• Guide the students to: identify, prepare, handle, and label chemicals. • Demonstrate titration, water testing and instrument operation; supervise students in measurement and recording • Demonstrate effluent sampling and basic analysis. • Guide students in documentation and reporting	Samples of chromium salts, vegetable tannins, syntans, auxiliaries; beakers, test tubes, pipettes, labels, Burettes, pipettes, indicators, standard solutions, pH/conductivity meters, water samples. Lab notebooks, Effluent samples, glassware, pH meter, TDS meter, titration reagents, lab notebooks, PPE.
General Objective 4.0: Know the applications of standards, data interpretation, and laboratory management practice.						
12-15	4.1 Explain national and international standards for leather quality and chemical usage; describe specification limits for process chemicals and finished leather.	• Discuss quality standards (e.g., ISO, national standards); explain specification requirements and tolerance	Lecture notes, standard specification charts, sample data sheets Worked examples, calculations,	• Compare test results with standard specifications; classify leather samples based on compliance with standards • Perform calculations from analytical results; interpret findings and draw	• Guide students in comparing laboratory results with standard values and documenting findings	Leather samples, chemical samples, standard manuals record sheets, Laboratory data sheets, calculators,

	4.2 Explain methods of data analysis, calculations, and presentation of results; describe importance of accuracy and precision in reporting. 4.3 Explain laboratory safety rules, quality control procedures, and proper handling/maintenance of equipment	limits • Explain the calculation methods, result interpretation, and report writing techniques • Explain laboratory safety, waste management and equipment care and maintenance.	reporting formats Safety manuals, charts, instructional materials	conclusions • Apply safety procedures in the laboratory, carryout basic equipment cleaning, calibration checks, and safe chemical handling	• Guide students in data analysis, report preparation, and presentation of results • Demonstrate safe handling of chemicals, use of PPE, and basic equipment maintenance; supervise students' practice	computers, report templates, PPE (gloves, lab coats, goggles), cleaning materials, basic lab equipment, safety signs, waste containers, practical manual etc

Course Assessments:

Course work:	10%
Tests:	10%
Practical:	40%
Examination:	40%
Total:	**100%**

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE: LEATHER DYEING AND FINISHING I	**COURSE CODE: LPT 326**	**Contact Hours: 2 Hrs/Week**
	Credit Unit: 2	**Theoretical: 2 Hrs/Week**
Year: I Semester: II	**Pre-requisite: Introduction to Leather Manufacture**	**Practical: 0**
GOAL: This course is designed to develop the student understanding and application of basic concepts in leather dyeing and finishing.		

GENERAL OBJECTIVES

On completion of this module studenst should be able to know:

1.0 Understand principles of leather dyeing and finishing;
2.0 Know Preparatory processes prior to leather dyeing and finishing;
3.0 Understand Dyestuff and dyeing methods;
4.0 Understand Process of fat-liquoring and the techniques.

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
Course Title: LEATHER DYEING AND FINISHING I	**Course Code: LPT 326**	**Contact Hours: 2 Hrs/Week**
	Credit Unit: 2	**Theoretical: 2 Hrs/Week**
Year: I Semester: II	**Pre-requisite: : Introductory Leather Manufacture**	**Practical: 0**

COURSE SPECIFICATION: THEORETICAL AND PRACTICAL

GENERAL OBJECTIVE 1.0: Understand principles of leather dyeing and finishing

THEORETICAL CONTENT				**PRACTICAL CONTENT**		
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
1-4	1.1 Explain the principles of leather dyeing and finishing. 1.2 Outline the reasons for effective leather dyeing and finishing 1.3 Explain the process of leather dyeing. 1.4 State the factors affecting effective dyeing and finishing of Leather. 1.5 Outline the major areas of leather dyeing and finishing	• Discuss the effectiveness of Leather dyeing and finishing to the student • Describe the process of leather dyeing and finishing. • Discuss the various factors that will enhance the process of dyeing and finishing of leather • Explain the major areas of leather dyeing and finishing	Classroom Audio visuals Whiteboard Projector Marker Text books Relevant journals Online Courses Lecture notes Smart board and, Lecture notes			

GENERAL OBJECTIVE 2.0: Know Preparatory processes prior to leather dyeing and finishing

5-8	2.1 Explain types of leather in use e.g. Chrome tanned leathers, Vegetable tanned leathers, etc. 2.2 Explain the properties of each of the leathers for dyeing process e.g. chrome tanned leathers, Vegetable tanned leathers, full vegetable tanned full chrome 2.3 Explain the process involved in the preparation of different leathers before leather dyeing and finishing 2.4 Explain machine operations required before the dyeing and finishing process: i Samming; ii setting out; iii splitting; iv shaving; v Neutralization; vi Stripping; vii Clearing; viii Bleaching; ix Retanning; (combination tannage); x Degreasing. 2.5 Explain the variation	• Discuss the effectiveness of preparatory processes prior to leather dyeing and finishing • Describe the properties of each of the leathers for dyeing process e.g. chrome tanned leathers, • Describe the mechanical processes involved in the preparation of different leathers before leather dyeing and finishing • Discuss the various preparatory chemical processes necessary before the dyeing and finishing process eg. samming, setting out, splitting, shaving Neutralization Stripping Clearing Bleaching,	Black board and chalk, smart board and white board and marker. Whiteboard Projector Marker Text books Relevant journals Online Courses Lecture notes Smart board and, Lecture notes			

	that occur in the preparation of various leathers for dyeing and finishing i Chrome leathers ii Vegetable leathers	Retanning (combination tannage) Degreasing • Describe the variation that occur in the preparation of various leathers for dyeing and finishing eg • Chrome leathers and • Vegetable leathers; then sizes eg medium and heavy then light and kids				
General Objective 3.0: Understand Dyestuff and dyeing methods						
9-11	3.1 Explain dyestuff and their properties required of dyeing of leathers: i Solubility ii Dye absorption iii Fastness 3.2 Explain the theory of dyeing on leather fibers (protein fibres) 3.3 Classify dyestuff into their major groups i Cationic (basic) ii Anionic (acidic) iii Nonionic	• General introduction of the subject matter • Describe the effectiveness of leather dyeing to the student • Describe the theory of dyeing on leather fibers (protein fibres. • Differentiate dyestuff into their major groups Cationic (basic)	Black board and chalk, smart board and white board and marker, Whiteboard, Projector, Marker Text books, Relevant journals , Online Courses, Lecture notes, Smart board and Lecture notes etc			

	3.4 Discuss preparation of acid dyes 3.5 Explain dyeing as a process of colouring 3.6 Explain penetration and fixation. 3.7 Explain factors affecting penetration and fixation 3.8 Explain the factors affecting choice of dyes 3.9 Explain the principles of dye fixation. 3.10 Outline the factors affecting choice of dyes. 3.11 Outline the various methods of dyeing viz. i Drum dyeing, Vat dyeing ii Brush dyeing etc	Anionic (acidic) iii Nonionic • Explain reasons for use of acid dyes in leather finishing. • Explain why basic dyes are not required in leather finishing. • Explain dyeing as a process of colouring • Explain penetration and fixation • List and explain factors affecting penetration • Described dye fixation • High light the factors affecting choice of dyes • Explain the principles of dye fixation and the factors affecting choice of dyes. • Describe the various methods of dyeing viz. Drum dyeing Vat dyeing Brush dyeing etc.				

		• Carry out dyeing operations.				
General Objective 4.0: Understand process of fat-liquoring and the techniques						
12-15	4.1 Define fat liquor 4.2 Explain the functions of fat-liquoring in tanning, lubrication and softness of leathers, and increased strength etc. 4.3 Classify fat liquors into: i Cationic Anionic ii Nonionic 4.4 Elaborate the properties of the various groups of fat liquoring 4.5 Define emulsion 4.6 Explain emulsion stability 4.7 Identify two types of emulsion: Water-in-oil and oil-in-water emulsions. 4.8 List the factors affecting emulsion stability e.g. pH, neutral salt effect. 4.9 Explain the factors affecting fat liquoring e.g. pH, temperature etc. 4.10 Explain the effects of fat liquoring on the	• Define fat liquor and describe the fat liquoring process the effectiveness of fat liquoring to the students • State the mechanism of fat liquoring • Explain the functions and the effects of fat liquors in leather • Explain in details classes of fat liquors: Cationic, Anionic Nonionic • Explain the properties of the various groups of fat liquors . • Explain the suitability of the various types of fat liquors to types of leathers • Define emulsion and explain emulsion stability • Identify the two	Black board and chalk, smart board and white board and marker, Whiteboard, Projector, Marker Text books, Relevant journals , Online Courses, Lecture notes, Smart board and Lecture notes etc			

	finishing processes.	types of emulsion. • Describe Water in oil and oil in water. • Explain the factors affecting emulsion stability e.g. pH, neutral salt effect				

Course Assessment:

Corse work:	20%
Test/Assignments:	20%
Examination:	60%
Total:	**100%**

YEAR II SEMESTER I

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE: LEATHER MANUFACTURE III	**COURSE CODE: LPT 411**	**Contact Hours: 4 Hrs/Week**
	Credit Unit: 4	**Theoretical: 2 Hrs/Week**
Year: II Semester: I	**Pre-requisite: Leather Manufacture II**	**Practical: 2 Hrs/Week**
GOAL: This course is intended to provide students with an in-depth knowledge of principles and skills of manufacturing different types of light leathers.		

GENERAL OBJECTIVES

On completion of this course, the student should be able to:

1.0 Know how to identify different classification of leather production;
2.0 Know various methods of leather production and produce leathers according to grain specification;
3.0 Know different methods of leather production according to tannages specification;
4.0 Understand different methods of leather production according to usages specification;
5.0 Know different methods of leather manufacture according to specialty specification;
6.0 Know the methods of producing leathers according to finishing specification.

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
Course Title: LEATHER MANUFACTURE III	**Course Code: LPT 411**	**Contact Hours: 4 Hrs/Week**
	Credit Unit: 4	**Theoretical: 2 Hrs/Week**
Year: II Semester: I	**Pre-requisite: : Leather manufacture II**	**Practical: 2 Hrs/Week**

COURSE SPECIFICATION: THEORETICAL AND PRACTICAL

GENERAL OBJECTIVE 1.0: Know how to identify different classifications of leather productions

THEORETICAL CONTENT				**PRACTICAL CONTENT**		
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
1	1.1 Explain various types of light and heavy leathers. 1.2 Classify leather according to their grain, tannage, usage, specialty, and finishing 1.3 Discuss the applications of each type of leather	• Explain various types of light and heavy leathers. • Classify them according to their grain, tannage, usage, specialty, and finishing. • Group the leathers discussed into light and heavy leathers.	Classroom Audio visuals Projector Text books Relevant journals Internet Lecture notes	• Carry our Identification and classification of available leathers in the tannery according to their grain, tannage, usage, specialty, and finishing related.	• Guide the students on how to identify and classify the light and heavy leathers available in the tannery according to various grain, tannage, usage, specialty, and finishing related.	Heavy leathers Light leathers, PPE, Practical manuals etc

GENERAL OBJECTIVE 2.0: Know various methods of leather production and produce leathers according to grain specification

Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
2-3	2.1 Enumerate the characteristic by which grain patterns can be	• Explain the characteristics to which grain patterns can be	Classroom Audio visuals Projector Text books	• Produce the following leather using the available raw material in the	• Guide the students into the production of the	Skins, tanning chemicals

	used to identify leathers resulting from each animal species e.g. pores from hair and wool. Feather follicles, scales, etc. 2.2 Explain the properties of the leathers classified according to grain specification e.g. full grain, corrected grain such as Suede or Nubuck etc. (which can either be produced as buffed grain, snuffed grain or paucing), shrunken grain and hair/ wool/fur-on. 2.3 Explain the production principles and methods of the leathers listed in 2.2.	identified from different species of animals i.e. outer side of leather once the hair, or wool and epidermis has been removed. • Discuss the terms such as full gain, corrected grain such as buffed, snuffed, paucing grain leathers, shrunken grain, hair/wool/fur-on leathers and give their properties. Differentiate and state the similarities between suede and Nubuck leathers. • Elaborate on the principles and the methods of producing the grain related leathers.	Relevant journals Internet Lecture notes	tannery: full grain, corrected grain, shrunken grain upper leathers, hair or wool-on leathers.	following leathers: Full grain, corrected grain, shrunken grain and hair or wool-on leathers	
General Objective 3.0: Know different methods of leather production according to tannages specification						
4-6	3.1 List various leathers classified according to their tannage e.g. vegetable tanned	• Group the leathers according to their tannage and explain the terms.	Classroom Audio visuals Projector Text books	• Carry out the productions of the following leathers: full- vegetable	• Guide the students to produce leathers	Tannery tools and resources

	i.e. basil leathers. Chrome- tanned i.e. Nappa, and box calf leathers. Chrome-free/ metal-free tanned leathers, such as full vegetable tanned leathers etc. 3.2 Explain the production principles or techniques of various leathers according to tannage specifications	• Define the leathers listed in and explain their properties. • Explain their production principles or techniques.	Relevant journals Internet Lecture notes	tanned leather – Basil leathers; full- chrome tanned leathers – Nappa, box calf leathers, etc.	mentioned in 3.1.	
General Objective 4.0: Understand different methods of leather production according to usages specification						
7-9	4.1 Outline several leathers classified according to their usage e.g. Lining, clothing/ garment, gloving, upholstery, etc. 4.2 Outline the raw materials used for the production of these leathers and explain their properties. 4.3 Explain the principles and methods of production	• Explain the uses and the properties requirements of these leathers. • Highlight the similarities and differences between the properties of lining and upper leathers; properties of clothing and gloving leathers. • Describe their production techniques.	Classroom Audio visuals Projector Text books Relevant journals Internet Lecture notes	• Produce lining, clothing, gloving and Leather goods leathers according to the requirements	• Supervise the students in carrying out these productions according to guidelines.	Skins, Tannery tools and resources etc

General Objective 5.0: Know different methods of leather manufacture according to specialty specification.						
10-13	5.1 Explain what specialty leather is. 5.2 Explain the techniques and methods of production of each specialty leathers listed. 5.3 Discuss the properties and application of the leathers.	• Define specialty leathers. • Mention various specialty leathers and their uses e.g. water repellent, diaphragm/gas meter, picking band, reptiles, pig skin leathers etc. • State and explain the properties of the leathers. • Enumerate the raw materials for the production of the listed leathers. • Briefly explain the specific features of reptiles and pig skin leathers which make them different from other leathers. • Describe the method of production of each specialty leathers. • Formulate a working recipe to use in the production.	Classroom Audio visuals Projector Text books Relevant journals Internet Lecture notes	• Demonstrate how to handle the specialty leather raw material during the production processes.	• Guide students on how to produce a specialty leathers.	Exotic skins, tannery tools and resources etc

General Objective 6.0: Know the methods of producing leathers according to finishing specification						
14-15	6.1 Explain various finishing related terms given to leathers according to their finishes, e.g. aniline, semi-aniline, and pigmented, patent leathers, etc. 6.2 Explain the finishes used for each leather. 6.3 Explain the application methods of the finishes to each leather defined.	• Define various finishing related terms given to leather. • List the finishes used for each leather. • Show application methods of the finishes to each leather defined using audio visual aids.	Classroom Audio visuals Projector Text books Relevant journals Internet Lecture notes	• Carry out finishing to produce the following leathers: aniline, semi-aniline, pigmented and patent leathers	• Guide the students to identify the finishes and how to apply them to produce the finishing related leathers.	Finishing agents, tannery tools and resources

Course Assessments:	
Course work:	10%
Tests:	10%
Practical:	40%
Examination:	40%
Total:	**100%**

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE: LEATHER CHEMISTRY III	**COURSE CODE: LPT 412**	**Contact Hours: 2Hrs/Week**
	Credit Unit: 2	**Theoretical: 2 Hrs/Week**
Year: II Semester: I	**Pre-requisite: : Leather Chemistry II**	**Practical: 0**
GOAL: This course is intended to provide students with in-depth knowledge of chemistry of tanning processes		

GENERAL OBJECTIVES

On completion of this course, the student should be able to:

1.0 Understand the chemistry of tanning processes;
2.0 Understand the chemistry and the application of vegetable tanning;
3.0 Understand the chemistry and principles of reaction mechanism of other tannages such as oil, aluminium, aldehyde etc.

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
Course Title: LEATHER CHEMISTRY III	**Course Code: LPT 412**	**Contact Hours: 2 Hrs/Week**
	Credit Unit: 2	**Theoretical: 2 Hrs/Week**
Year: II Semester: I	**Pre-requisite: Leather chemistry I and II**	**Practical: 0**

COURSE SPECIFICATION: THEORETICAL

GENERAL OBJECTIVE 1.0: Understand the Chemistry of Tanning processes.

THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
1-5	1.1 Define tanning 1.2 Name the major tanning methods employed in the leather industry 1.3 Explain the major processes involved in leather tanning 1.4 Discus Mineral tanning processes 1.5 Explain chrome tanning process and the various factors affecting it 1.6 Explain the mechanism of chrome tanning. 1.7 Discuss the reactions that occur forming complexes during chrome tanning	• Explain the tanning as the conversion of hides/skins into leather by treatment with different chemicals referred to as tannins • Explain the major tanning method to include, mineral, vegetable, synthetic tanning etc • Outline the major tanning processes to include beam-house operations ie, soaking, liming, delimimg, etc; tanyard operations ie, tanning, neutralization, retanning, dyeing etc; finishing	Classroom Audio visuals Whiteboard Projector Marker Text books Relevant journals Internet Lecture notes Charts, Diagram			

		operations ie, setting out, staking, buffing, pigmentation etc • Explain mineral tanning processes to include the following; chrome , aluminium, iron, zirconium tanning etc • Explain chrome tanning as a mineral tanning process that involves the use of basic chromium sulphate as the major tanning agent. • Discuss factors such as concentration, pH, time, temperature, mechanical action etc that affect the tanning process • Explain mechanism of chrome tanning such as penetration and absorption of the tannin into the collagen matrix and fixation or reaction of the chromium				

		complex with the collagen fibres • Illustrate with chemical equations reactions such as hydrolysis, olation, oxolation etc that occur during chrome tanning process				
GENERAL OBJECTIVE 2.0: Understand the chemistry and the application of vegetable tanning						
6-10	2.1 Classify vegetable tanning materials. 2.2 Explain the major vegetable tannins obtained from tanniferous plant. 2.3 Distinguish between hydrolysable and condensed vegetable tannins. 2.4 Explain the chemical reactions involved during vegetable tanning.	• Explain vegetable tanning materials as natural tannins derived from plant origin which can be classified as hydrolysable, or condensed tannins depending on its chemical composition • Explain the sources of vegetable tannins from tanniferous plant to include quebracho, mimosa, myrobolam, chestnut etc • Explain hydrolysable tannins as tannins that are chemically unstable and easily	Classroom Audio visuals Whiteboard Projector Marker Text books Relevant journals Internet Lecture notes Charts, Diagram.			

		hydrolysed while condensed tannins are chemically stable and do not easily undergo hydrolysis • Illustrate with chemical equations the reaction of the phenolic OH groups of vegetable tannins forming hydrogen bond with the amino and carboxyl groups of the collagen fibres				
General Objective 3.0: Understand the chemistry and principles of reaction mechanism of other tannages such as oil, aldehyde, aluminium tanning etc						
11-15	3.1 Explain the principles behind Oil Tanning. 3.2 Name the type of leather obtained from oil tanning and its properties. 3.3 Explain the mechanism of oil tannage. 3.4 Explain Aldehyde Tanning: 3.5 Express the reaction of aldehyde and the collagen fibres 3.6 Express the mechanism of action involved in aldehyde tanning.	• Explain the principles of oil tanning which occurs as a result of the oxidation of unsaturated oils to form aldehydes which then crosslinks and stabilizes the collagen fibres • Discuss chamois leather as the leather produced from oil tanning and its properties to include	Classroom Audio visuals Whiteboard Projector Marker Text books Relevant journals Internet Lecture notes Charts, Diagram.			

	3.7 Explain the principles of aluminium Tanning. 3.8 Explain the mechanism of action during alum tanning. 3.9 Explain Combination Tanning. 3.10 Explain the types of combination tanning. 3.11 Discuss the contributions of the various tanning agents in combination tanning	good wash-fastness properties, softness and flexibility • Explain the mechanism of oil tannage to include impregnation, oxidation, interaction with the collagen fibres, degreasing to remove excess unreacted oil, • Explain aldehyde tanning as the treatment of the collagen fibres with solution of formaldehyde to produce a leather referred to as wet white leather • Discuss the reaction mechanism to involve the reaction of the aldehyde group (-CHO) with the amino group (-NH2) of the collagen fibres • Explain the mechanism to involve the following; penetration of the aldehyde, reaction				

		with the amino groups, crosslinkage and tanning the collagen fibre • Discuss the principles of aluminium tanning based on the reaction between trivalent aluminium salts and the functional groups of the skin collagen to form stable complexes • Discuss the mechanism of action to include the ionization of alum in water to release Al^{3+} ions, attraction of the ions to the carboxyl groups of collagen, coordinate bound formation, crosslinking and stabilization of the fibres • Explain combination tanning as the process of combining two or more tanning agents to tan so as to improve on the properties of the leather produced				

		• Explain the types of combination tanning to include chrome retanning, semi-chrome tanning, chrome –alum tanning etc • Explain the contribution of chrome in the formation of coordinate bonds bonding, vegetable tannins in hydrogen bonding, synthetic tannins as fillers and to improve light fastness, oil and aldehyde tannins in the formation of covelent bonds				

Course Assessment:

Course work:	20%
Test/Assignments:	20%
Examination:	60%
Total:	**100%**

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE: LEATHER DYEING AND FINISHING II	**COURSE CODE: LPT 413**	**Contact Hours:2 Hrs/Week**
	Credit Unit: 2	**Theoretical: 2 Hrs/Week**
Year: II Semester: I	**Pre-requisite: Leather Dyeing and Finishing I**	**Practical: 0**
GOAL: This course is designed to provide the student with the knowledge and skills of the materials, principles and metthods involved in leather dyeing and finishing		
GENERAL OBJECTIVES On completion of this module studenst should be able to : 1.0 Understand principles and other operations prior to finishing, drying and drying methods; 2.0 Know Pigments and their uses; 3.0 Understand types of finish and the finishing materials; 4.0 Understand theory of colour and colour matching;		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
Course Title: LEATHER DYEING AND FINISHING II	**Course Code: LPT 413**	**Contact Hours: 2 Hrs/Week**
	Credit Unit: 2	**Theoretical: 2 Hrs/Week**
Year: II Semester: I	**Pre-requisite: Leather Dyeing and Finishing**	**Practical: 0**
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL		
GENERAL OBJECTIVE 1.0: Understand principles and other operations prior to finishing, drying and drying methods		

THEORETICAL CONTENT				**PRACTICAL CONTENT**		
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
1-3	1.1 Explain all the processes involved prior to finishing viz. horse up to drain, samming, setting out, drying, conditioning, staking, toggling, buffing, trimming and finishing. 1.2 Define drying 1.3 Explain different drying methods viz; paste drying, turned drying, vacuum drying, etc. 1.4 Explain merits and demerits of each of the drying	• Describe the following operations step by step prior to finishing; horse up to drain, samming, setting out, drying, conditioning, staking, toggling, buffing, trimming and finishing • Describe the process of drying and how drying is carried out under controlled atmosphere • Describe different, drying	Class room, Whiteboard, Projector, Markers, Text books, Relevant journals Online Courses, Lecture notes, Smart board, Lecture notes, Practical Manuals etc			

	methods 1.5 Explain the factors that govern choice of drying methods. 1.6 Explain the following operations: i conditioning ii staking iii buffing iv brushing v trimming etc. 1.7 Define tannage and enumerate its purposes. 1.8 Classify tanning materials according to their properties and give examples.	methods viz. paste drying, turned drying, vacuum drying, etc • Explain the merits and demerits of each of the drying methods and describe each of the methods • Explain the factors that govern choice of drying methods. • State the importance and signficance of each operation as listed: conditioning; staking; buffing; brushing and trimming etc				
GENERAL OBJECTIVE 2.0: Know Pigments and their uses						
4-6	2.1 Define pigments 2.2 Explain the properties of pigments such as imparting colour and easthetic appeal. 2.3 Classify pigments into Organic	• Explain pigments as the colour imparting material, providing covering for grain patterns and defects • Explain pigments	Class room, Whiteboard, Projector, Markers, Text books, Relevant journals Online Courses, Lecture notes, Smart board,			

	Inorganic 2.4 Classify inorganic pigments to sub groups viz. lakes, toners and dyestuff 2.5 Explain the process of preparation of pigments	as covering property and colour carrier. • Explain different types of pigments eg. Organic and Inorganic • Explain sub groups of pigments viz. lakes, toners and dyestuff. • State the procedure of pigments preparation before its application	Lecture notes, Practical Manuals etc			
General Objective 3.0: Understand types of finish and the finishing materials						
7-10	3.1 Define finishing 3.2 Explain types of finishes viz. pigment finish, protein finish, nitrocellulose finish and acrylic finish. 3.3 Describe raw materials used in the different types of finishes e.g. Pigment finish; Pigment casein, e.g. egg albumin,	• Describe pigments and pigments finishing • Explain types of finishes viz. pigment finish, protein finish, nitrocellulose finish and acrylic finish • Describe the following types of finishing: Pigment casein,	Class room Whiteboard Projector Marker Text books Relevant journals Online Courses Lecture notes Smart board and, Lecture notes			

	shellac, glue, isinglass etc.Protein Casein egg albumin, blood albumin, Nitrocellulose, Nitrocellulose solvent, diluents, plasticizer, Acrylics, Polyurethane, acrylic, polymers etc. 3.4 Explain the composition of each types of finish e.g. Pigment finish Pigment- 1 part Casein- 2 parts Plasticizers- $^1/_2$ part Water- 3 parts 3.5 Explain the properties of each finish	e.g. egg albumin, shellac, glue, isinglass etc. Protein Casein egg albumin, blood albumin Nitrocellulose Nitrocellulose solvent, diluents, plasticizers. Acrylics Polyurethane, acrylic polymers etc. • State the functions of each component of pigment finish as listed in 3,5 e.g. Pigment finish Pigment- 1 part Casein- 2 parts Plasticizers- $^1/_2$ part Water- 3 parts				
General Objective 4.0: Understand theory of colour and colour matching						
11-15	4.1 Define colour 4.2 Explain the principles of colour vision. 4.3 Explain theories of colour vision 4.4 Discuss the relationship	• Describe colours as perception and sensation. • Explain the principles of colour vision • Explain theories of colour vision	Class room Whiteboard Projector Marker Text books Relevant journals Online Courses			

	between light and colour. 4.5 Explain the following terms associated with colour viz. metamerism and metameric, colour blindness, standard illuminant. 4.6 Explain the nature of light and list the characteristics of light. 4.7 Explain colour grouping: Additive Subtractive 4.8 Classify colour into Primary- red, blue and yellow, Secondary- orange, green and violet Tertiary- brown, grey and olive 4.9 Draw and explain colour circle. 4.10 Explain colour matching and color match. 4.11 Explain the	• Differentiate between light and colour • Describe these terms as associated with colour viz. metamerism and metameric, colour blindness, standard illuminant, • Explain how the terms related to colour matching • Describe the nature of light and list its characteristics of light • Identify groups of colour and differentiate between additive and subtractive colors • Identify the various classes of colours; Primary- red, blue and yellow -Secondary- orange, green and violet -Tertiary- brown,	Lecture notes, Smart board Lecture notes			

	factors affecting colour matching e.g. Purity of colour source of light substrate, etc.	grey and olive • Describe a colour circle giving eg. Primary, secondary and tertiary colours. • Describe colour matching and color match • Explain challenges associated with colur matching eg colour blindness. • Enumerate factors affecting colour matching e.g. Purity of colour				

Course Assessment:

Course work:	20%
Test/Assignments:	20%
Examination:	60%
Total:	**100%**

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY		
COURSE: RESEARCH METHODOLOGY	**COURSE CODE: LPT 414**	**Contact Hours: 2 Hours/Week**
Year: II Semester: I	**Credit Unit: 2**	**Theoretical: 2 Hours/Week**
	Pre-requisite:	**Practical: 0**

GOAL: This course is to equip students with essential research skills and methodologies to collect and interpret data, review relevant literatures, and prepare structured research proposals and reports.

GENERAL OBJECTIVES:

At the end of this course, the students should be able to:

1.0 Understand the scientific approach to research and the nature of research problems;
2.0 Understand how to identify and formulate research problems;
3.0 Know how to design a research study, including hypothesis formulation, validation, and variables;
4.0 Understand Literature Review and apply appropriate sampling techniques;
5.0 Know how to collect, analyze, and interpret research data using suitable tools and techniques, including data analytic software;
6.0 Know how to prepare structured research proposals and report findings effectively.

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY						
Course Title: RESEARCH METHODOLOGY			**Course Code: LPT 414**		**Contact Hours: 2 Hours/Week**	
			Credit Unit: 2		**Theoretical: 2 Hours/Week**	
Year: II Semester: I			**Pre-requisite:**		**Practical: 0**	
COURSE SPECIFICATION: Theoretical and Practical						
GOAL: This course is to equip students with essential research skills and methodologies to collect and interpret data, review relevant literatures, and prepare structured research proposals and reports.						
General Objectives 1.0: Understand the scientific approach to research and the nature of research problems						
THEORETICAL CONTENT				**PRACTICAL CONTENT**		
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
1-2	1.1 Explain the meaning and importance of research. 1.2 Describe the characteristics of scientific research. 1.3 Differentiate research from routine operational inquiry. 1.4 Discuss research ecosystem.	• Lecture, class discussion with examples • Use real-life situations where research can improve operations. • Case study discussion, group activity.	Journals, articles, reports, internet, online databases etc.			
General Objective 2.0: Understand how to identify and formulate research problems.						
3-5	2.1 Define a research problem. 2.2 Identify research problems related to the fields. 2.3 Explain how to identify research gap in related fields. 2.4 Prioritize problems	• Brainstorming, guided discussion, case studies. • Select research problems for mini-study Group exercises, peer discussion.	Laptop Computers, Smart Board, Projector, Writing Materials, White Board, Markers, Multi Media etc			

	based on relevance and feasibility.					
General Objective 3.0: Understand research design, including hypothesis formulation, validation, and variables						
6-8	3.1 Explain the meaning and types of hypotheses in research. 3.2 Formulate testable hypotheses . 3.3 Identify independent, dependent, and control variables	• Lecture, real-life examples . • Explain how to formulate hypotheses and identify variables • Group exercises, guided practice.	Laptop Computers, Smart Board, Projector, Writing Materials, White Board, Markers, Multi-Media etc ,.			
GENERAL OBJECTIVE 4.0: Understand literature review and apply appropriate sampling techniques.						
9-11	4.1 Explain the importance of reviewing research literature. 4.2 Conduct literature search on maritime and related field. Explain sample and sampling techniques suitable for maritime and related field. 4.3 Select sampling method for a small-scale study.	• Lecture, demonstration, library, online search. Explain how to Conduct a mini literature review and select sampling method maritime and related field. • Practical library/online search, group work study	Laptop Computers, Smart Board, Projector, Writing Materials, White Board, Markers, Multi-Media etc	• Conduct literature search on multi-media resources.	• Guide students to use to download papers.	Computers, Multi-media resources. Practical manuals etc.
General Objective 5.0: Know how to collect, analyze, and interpret research data using suitable tools and techniques.						
12-13	5.1 Explain data collection methods for research (Questionnaires, interviews, logs, surveys, and instruments).	• Lecture with examples. • Demonstration, guided practice. • Explain data collection from fields to perform basic	SPSS, Excel, Laptop Computers, Smart Board, Projector, Writing Materials,	• Use software package to collect, process and analyse data.	• Guide students to collect data. Assist student to use	Computer, Data, Practical manual etc

	5.2 Explain data analysis techniques applicable to maritime and related field. 5.3 Interpret results from data analysis.	analysis.	White Board, Markers, Multi-Media etc		software package.	
General Objective 6.0: Understand application of basic research methods to prepare structured research proposals and report findings.						
14-15	6.1 Outline components of research proposal. 6.2 Prepare a structured research proposal on maritime and related field problems. 6.3 Present research findings in written and oral form relevant to maritime and related field.	• Lecture, review of sample • Prepare a mini research proposal and present findings to class. • Guide project work, peer review.	Laptop Computers, Smart Board, Projector, Writing Materials, White Board, Markers, Multi-Media etc	• Write a research proposal.	• Guide students to research proposal.	Computer, Data, Practical manual etc.

Course Assessment:

Course work: 10%
Test/Assignments: 10%
Practical: 40%
Examination: 40%
Total:100%

YEAR II SEMESTER II

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE: LEATHER MANUFACTURE IV	**COURSE CODE: LPT 421**	**Contact Hours: 4 Hrs/Week**
	Credit Units: 4	**Theoretical: 2 Hrs/Week**
Year: II Semester: II	**Pre-requisite: Leather Manufacture III**	**Practical: 2 Hrs/Week**
GOAL: This course is intended to provide students with in depth knowledge of principles and skills of manufacturing different kinds of heavy leathers		

GENERAL OBJECTIVES

On completion of this course, the student should be able to:

1.0 Know how to identify the different types/kinds of heavy leathers;
2.0 Know various raw materials and portions used in the production of heavy leathers;
3.0 Know pre-tanning principles and methods of heavy leather productions;
4.0 Comprehend various tanning materials used in heavy leather manufacture;
5.0 Know different principles and methods of tanning heavy leathers;
6.0 Know the post-tanning processes and techniques involved in the manufacture of heavy leathers.

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
Course Title: LEATHER MANUFACTURE IV	**Course Code: LPT 421**	**Contact Hours: 4 Hrs/Week**
	Credit unit: 4	**Theoretical: 2 Hrs/Week**
Year: II Semester: II	**Pre-requisite: Leather Manufacture III**	**Practical: 2 Hrs/Week**
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL		
GENERAL OBJECTIVE1.0: Know how to identify the different types/kinds of heavy leathers		

THEORETICAL CONTENT				**PRACTICAL CONTENT**		
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
1-2	1.1 Outline various types of heavy leathers, e.g. side leathers, sole & insole leathers, Belting leather, industrial gloving leathers, mechanical/ industrial leathers, pump/ seal leathers, picking band leathers, case/ luggage leathers, etc. 1.2 Group the heavy leathers according to tannage and uses. 1.3 Classify the heavy leathers according to tannage, i.e. vegetable, mineral, and combination tannage etc. and uses i.e. side, sole, insole, belting,	• Discuss various types or kinds of heavy leathers and classify them according to their tannage, usage and specialty e.g. side leathers, sole & insole leathers, Belting leather, industrial gloving leathers, mechanical/ industrial leathers, pump/ seal leathers, picking band leathers, case/ luggage leathers, etc	Classroom, audio visuals charts, text books, relevant journals, lecture notes, internet etc.	• Classify available leathers in the tannery according to tannage, usage, and specialty.	• Guide the students to identify and classify heavy leathers from light leathers.	Various kinds of heavy leathers etc

	mechanical/industrial leathers etc.					
GENERAL OBJECTIVE 2.0: Know various raw materials and portions used in the production of heavy leathers						
3-4	2.1 List the possible sources of raw materials for heavy leather manufacture e.g. cattle- ox, cow, and bull, buffalo etc. Others from Horse, Donkey and wild animals etc. 2.2 Explain rounding process and its objectives. 2.3 Explain the purpose of rounding in the production of sole and other heavy leathers.	• Discuss various raw materials for the production of heavy leathers and mention their sources. • Describe rounding of hides and briefly outline the process with the aid of diagrams. • Differentiate between rounding and sidding operations. • Explain the purposes of rounding hides and outline the use of every portion of the hide e.g. belly, shank/flank etc. for case leathers; the bends or butt for sole, belting leathers etc. neck region for harnessed and other leathers	Classroom, audio visuals charts, text books, relevant journals, lecture notes, internet etc.	• Identify the raw materials for heavy leather production and carry out rounding.	• Guide the student to identify the raw material and demonstrate rounding operations on the fresh or soaked hides.	Soaked hides and tannery tools etc

		etc.				
General Objective 3.0: Know Pre-tanning principles and methods of heavy leather productions						
5-8	3.1 Outline the pre-tanning processes/ operations in the production of sole and other heavy leathers e.g. soaking, unhairing/liming, deliming/bating. 3.2 Explain the principles/methods involved in the processes/ operations outlined in 3.1. 3.3 Explain different methods of soaking the following hides for sole and other heavy leather production; domestic/market hides, wet salted hides, dry salted hides, dry hides, etc. 3.4 Explain different depilation/ liming methods used in the manufacture of sole and other heavy leathers.	• Explain the pre-tanning processes/operations involved in the production of sole and other heavy leathers. • Explain the principles/methods involved. • Explain the advantages and disadvantages of each methods employed in these processes/operations. • Explain various types of depilation/ liming methods used in the manufacture of sole and other heavy leathers e.g. flat liming in pits, suspension liming in pits, paddle liming, drum liming etc.	Classroom, audio visuals charts, text books, relevant journals, lecture notes, internet etc.	• Carry out pre-tanning processes and operations for production of heavy leathers. e.g. Sole leathers and Insole leathers	• Supervise the students in carrying out these processes and operations.	All pre-tanning chemicals

		• Explain the reasons of omitting deliming and bating in some of production of heavy leathers especially sole leathers. • Explain the purposes of deliming/ bating in some production of heavy leathers except for sole and industrial or mechanical leathers. • Outline the parameters or factors that affects these processes/ operations.				
General Objective 4.0: Comprehend various tanning material used in heavy leather manufacture						
9-10	4.1 Explain the types of tanning materials employed in the production of sole and other heavy leathers, e.g. vegetable, syntans, minerals etc. 4.2 Classify the	• Enumerate various tanning agents commonly used in the production of sole and other heavy leathers. • List the types of vegetable	Classroom, audio visuals charts, text books, relevant journals, lecture notes, internet etc.	• Tan heavy leathers using various tanning agents available. i.e. mineral, vegetable and their combination	• Guide the students to carry out tannage for heavy leathers.	Vegetable tanning materials available in the chemical store, Practical Manual, PPE etc

	vegetable tanning materials listed in 4.2, according to their chemical classification. 4.3 Explain the factors affecting the penetration (diffusion) and fixation (combination) of the tannins during tannage with vegetables tanning materials classified in 4.2, e.g. pH, Temperature, Time, Concentrations, particle size, etc. 4.4 Explain how to deduce the conditions of tannage during the production of heavy leathers, i.e. describing tan liquors in terms of "mellow" or "astringency".	tanning materials available for heavy leather tannages. • categorize them according to their chemical classification (natures and Properties) e.g. catechols (condensed), Pyrogallols (hydrolyzed), and pyro-catechols (complex) etc. • Enumerates the factors that affect penetration (diffusion) and fixation (combination) of tannins in the production of heavy leathers separately. • Discuss the effects of these factors in relation to production of soles and other				

		heavy leathers. • Discuss various means to measure the concentration of tannins in tan liquor, e.g. by analyzing the liquor using hide powder, and by determining the amount of tannins and non-tannins using rapid methods etc.				
General Objective 5.0: Know different principles and methods of tanning heavy leathers.						
11-12	5.1 Outline the various techniques of producing sole and other heavy leathers, e.g. Long (old), Normal, Rapid or modern methods. 5.2 State the merits and demerits of the techniques /methods discussed in 5.1. 5.3 Discuss the principles involve in each techniques or methods listed. 5.4 Explain various pit	• Explain the techniques used in the production of heavy leathers. • Discuss the principles involve in each techniques or methods listed. • Explain various pit systems involved e.g. suspenders, handlers, circulators, layering, feeders, hot pitting etc. • Explain the advantages and	Classroom, audio visuals charts, text books, relevant journals, lecture notes, internet etc.	• Carry out production of sole leather and other heavy leathers using normal and rapid techniques.	• Monitoring the students when carry out these productions	Tannery resources

	systems involved e.g. suspenders, handlers, circulators, layering, feeders, hot pitting etc.	disadvantages of these techniques. • Compare the processes with the conventional ones				
General Objective 6.0: Know the post-tanning processes and techniques involved in the manufacture of heavy leathers.						
13-15	6.1 Explain the parameters by which sole leathers are judged in the warehouse or in shoe factory, e.g. colour. 6.2 Explain types of bleaching giving to sole leathers during production, e.g. English, American or soda ash-acid, syntan bleaching. 6.3 Outline various drying and finishing processes involve in the production of sole and other heavy leathers 6.4 Explain the finishing processes of sole and other heavy leathers. 6.5 Explain the significance and functions of each of	• Discuss the precautions to take in order to preserve good properties during tanning processes, e.g. avoid oxidation, keep the liquors free from iron contamination, etc. • Explain different types of bleaching process for production of sole leathers and state their purposes. • Explain the importance of various drying and finishing processes involve in the production of sole and other heavy leathers e.g. samming -filling and oiling -first	Classroom, audio visuals charts, text books, relevant journals, lecture notes, internet etc.	• Carry out bleaching on the sole and Insole leathers using soda-acid or syntans. • Carryout drying process performed on sole and other heavy leathers • Perform how to impregnate sole leather using fats. • Demonstrate how to polish sole and other heavy leather	• Guide the student to carry out bleaching on Sole and Insole leathers • Guide the student to carry out drying processes on sole and other heavy leathers. • Guide the student to carry out stuffing operation on sole and other heavy leathers • Guide the student to carry out polishing operation on sole and other heavy leathers	Soda ash, bleaching syntan, etc. Canouba wax, Fish oil, etc. Fats and oils Nitrocellulose, wax, etc.

	the finishing processes	drying -setting out second drying • Explain the finishing processes of sole and other heavy leather e.g impregnation or stuffing - rolling - polishing or pouring • Explain the significance and functions of each of the finishing processes				

Course Assessments:

Course work:	10%
Tests:	10%
Practical:	40%
Examination:	40%
Total:	**100%**

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE: LEATHER CHEMISTRY IV	**COURSE CODE: LPT 422**	**Contact Hours:2 Hrs/Week**
	Credit Unit: 2	**Theoretical: 2 Hrs/Week**
Year: II Semester: II	**Pre-requisite: Leather Chemistry I, II and III**	**Practical: 0**
GOAL: This course is intended to provide students with in-depth knowledge of principles and the application of post-tanning operations		

GENERAL OBJECTIVES

On completion of this course, the student should be able to:

1.0 Understand the principles and the application of neutralization, bleaching and stripping as post tanning operations;
2.0 Understand the principles and the application of retanning and Fatliquoring as post tanning operations;
3.0 Understand the principles mechanism of dyeing, Water proofing & Leather Drying as post tanning operations.

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
Course Title: LEATHER CHEMISTRY IV	**Course Code: LPT 422**	**Contact Hours: 2 Hrs/Week**
	Credit Unit: 2	**Theoretical: 2 Hrs/Week**
Year: II Semester: II	**Pre-requisite: Leather Chemistry III**	**Practical: 0**
COURSE SPECIFICATION: THEORETICAL		
GENERAL OBJECTIVE1.0: Understand the principles and the application of post-tanning operations: neutralization, bleaching and stripping as post tanning operations		

THEORETICAL CONTENT				**PRACTICAL CONTENT**		
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
1-5	1.1 Explain neutralization stating the principles behind the operation 1.2 Explain the objective of neutralization 1.3 List the chemicals used during neutralization 1.4 Explain bleaching and the principles behind the process 1.5 Name the various chemicals used in bleaching leathers 1.6 Explain stripping and the objective behind the process 1.7 Name the various chemicals used in stripping vegetable tanned leathers.	• Explain neutralization as a post tanning process aimed at partially reducing excess acidity in particularly chrome tanned leather by adjusting its pH level to 4.0 – 5.5 without distorting its properties • Explain neutralization as process aimed at reducing	• Classroom Audio visuals Whiteboard Projector Marker Text books Relevant journals Internet Lecture notes Charts, Diagram.			

		acidity in leather before retanning , dyeing etc • Enumerate the chemicals used in neutralization to include sodium bicarbonate, sodium formate.etc • Explain bleaching as a process of aimed at lightening the natural colour of leathers based on the principle of chemical oxidation • List chemicals used in bleaching to include hydrogen peroxide, sodium perborate, etc • Explain stripping as a corrective				

		operation carried out on vegetable tanned leathers to remove excess and unreacted tannins from the surface of the leather • List the chemicals used in stripping to include sodium bicarbonate, borax, etc.				
GENERAL OBJECTIVE 2.0: Understand the principles and the application of retanning and Fatliquoring as post tanning operations						
6-10	2.1 Explain retanning and the principles behind the process 2.2 Name the various chemicals used in retanning leathers 2.3 Explain fatliquors and the objective of fatliquoring as a process 2.4 Describe the mechanisms involved during fatliquoring	• Explain retanning as the treatment of leathers with additional tannins to improve on properties such as softness, fullness, colour etc • List retanning	• Classroom Audio visuals Whiteboard Projector Marker Text books Relevant journals Internet Lecture notes Charts, Diagram.			

	.	chemicals to include vegetable tannins, syntans, chrome alum etc • Explain fatliquors as oil in water emulsions and fatlilquoring as the • Process in which fatliquors are used to lubricate collagen fibres to improve on their softness and flexibility • Explain the mechanisms of fatliquoring to include' penetration of the fatlliquors, fixation, oil separation from the emulsion, deposition of the oil into the				

		collagen matrix and its lubrication				
General Objective 3.0: Understand the principles mechanism of dyeing, Water proofing & Leather Drying as post tanning operation						
11-15	3.1 Explain leather dyeing and its primary objective. 3.2 Classify leather dyes. 3.3 Explain the properties of leather dyes. 3.4 Explain water proofing in leather manufacture . 3.5 Name the various chemicals used in water proofing leathers.	• Explain dyeing as the introduction of colouring material into the leather fibres with the primary objective of producing the desired shade. • Enumerate the various classes of dyes to include acid dyes, basic, direct, metal complex dye etc • Discuss the properties of dyes to include sustainable and uniform shade, good penetration, good , light, rub and wash	• Classroom Audio visuals Whiteboard Projector Marker Text books Relevant journals Internet Lecture notes Charts, Diagram.			

		fastness • Explain water proofing as the introduction of hydrophobic substances into the leather to reduce its ability to absorb or transmit water • Enumerate the various water proofing agents to include waxes, synthetic resins, silicon compound, fluorocarbon polymers etc.				

Course Assessments:

Course work:	20%
Test/Assignments:	20%
Examination:	60%
Total:	**100%**

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE TITLE: TANNERY WASTE MANAGEMENT	**Course Code: LPT 423**	**Contact Hours: 2 Hours/Week**
	Credit Unit: 2	**Theoretical: 2Hours/Week**
Year: II Semester: II	**Pre-requisite:**	**Practical: 0**
GOAL: This course is intended to equip students with the knowledge and skills required for pollution control and waste management in leather and leather product processing.		

GENERAL OBJECTIVES:

On completion of this course, the students should be able to:

1.0 Comprehend types, sources, and characteristics of tannery wastes;
2.0 Understand environmental and health effects of tannery wastes
3.0 Understand waste reduction and cleaner production methods;
4.0 Understand basic treatment of effluents and solid wastes;
5.0 Understand environmental legislation on industrial operations, waste management and safety practices;
6.0 Understand recycling and resource recovery in leather production.

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE TITLE: TANNERY WASTE MANAGEMENT	**COURSE CODE: LPT 423**	**Contact Hours: 2 Hrs/Week**
	Credit Unit: 2	**Theoretical: 2 Hrs/Week**
Year: II Semester: II	**Pre-requisite:**	**Practical: 0**
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL		
GOAL: This course is intended to equip students with the knowledge and skills required for pollution control and waste management in leather and leather product processing.		
GENERAL OBJECTIVE 1.0: Comprehend types, sources and characteristics of tannery wastes		

THEORETICAL CONTENT				**PRACTICAL CONTENT**		
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
1-3	1.1 Explain different categories of tannery wastes and their general properties. 1.2 Describe stages of leather and leather products processing where wastes are generated 1.3 Explain physical properties of tannery wastes (colour, odour, temperature, and turbidity) and chemical (pH, BOD, COD, chromium content). 1.4 Explain how waste characteristics	• Discuss the different categories (solid, liquid and gaseous types) of tannery wastes and their general properties; • Demonstrate using charts, photos/pictures, diagrams of waste types; guide the students to identify and classify tannery wastes • Explain tannery process flow; demonstrate using process low charts and guide the students in	• Classroom, charts, photos/pictures of tannery wastes, diagrams of tannery wastes, samples of tannery wastes, • Process flow diagrams, tannery process charts, models/videos of tannery operations, • Tannery effluent samples, sample containers, hand held pH meter, thermometer,			

	influence pollution levels.	mapping out waste sources • Discuss the physiochemical properties of tannery wastes; demonstrate observation methods; guide students in describing samples • Discuss the environmental impacts associated with the physiochemical properties of tannery wastes	observation sheets			
General Objective 2.0: Understand environmental and health effects of tannery wastes						
4-6	2.1 Explain how tannery wastes contaminate the environment (water, soil and air) 2.2 Describe health risks linked to exposure to tannery wastes 2.3 Explain a case studies/images of polluted sites, relate pollution signs to tannery activities 2.4 Explain a possible hazards and suggest	• Explain the pollution effects of tannery wastes on the environment (water, soil and air); guide students on analysing case studies • Explain health hazards and safe handling practices of tannery wastes; demonstrate safe handling practices	• Charts/pictures of polluted environments, videos of case study areas, PPE (gloves, nose masks, safety coats etc.), safety charts/posters, waste sample materials			

	basic safety measures during handling waste samples					
General Objective 3.0: Understand waste reduction and cleaner production methods						
7-8	3.1 Explain principles and methods of reducing waste through improved process control, efficient chemical use, and recycling 3.2 Discuss a simple waste reduction practices by identifying points where materials can be conserved or reused using process flow charts/models.	• Describe cleaner processing/ production techniques; • Demonstrate examples using process charts; guide students in identifying waste production points	• Process flow charts, instructional videos, production layout diagrams			
General Objective 4.0: Understand basic treatment of effluents and solid waste						
9-11	4.1 Explain waste water treatment. 4.2 Explain screening of effluents. 4.3 Discuss the sedimentation process. 4.4 Explain neutralization. 4.5 Explain safe solid waste disposal.	• Discuss tannery waste treatment methods (wastewater, effluents and solid wastes)	• Charts, diagrams etc			

General Objective 5.0: Understand environmental legislation on industrial operations, waste management and safety practices						
12-13	5.1 Explain key environmental laws /standards and basic safety guidelines for waste handling and disposal. 5.2 Explain simple regulatory documents. 5.3 Identify compliance requirements for waste handling and disposal.	• Discuss relevant environmental laws, regulations and standards guiding waste management in industrial/tannery operations; present summaries of guidelines; guide students in interpreting regulatory documents	Copies of environmental guidelines/standards, charts/posters			
General Objective 6.0: Understand recycling and resource recovery in leather production						
14-15	6.1 Explain methods of recycling tannery wastes into useful products. 6.2 Discuss the benefits of recycling tannery wastes into useful products. 6.3 Discuss reuse of tannery wastewater and chemicals	• Discuss tannery waste recycling methods and benefits	• Charts/diagrams of recycling systems			

Course Assessments:	
Course work:	20%
Test/Assignments:	20%
Examination:	60%
Total:	**100%**

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)		
COURSE TITLE: GLOBAL LEATHER ECONOMICS	**Course Code: LPT 424**	**Contact Hours: 2 Hours/Week**
	Credit Unit: 2	**Theoretical: 2 Hours/Week**
Year: II Semester: II	**Pre-requisite:**	**Practical: 0**
GOAL: This course is intended to equip students with the knowledge and skills required for pollution control and waste management in leather and leather product processing.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know the global leather industry's structure and dynamics; 2.0 Understand Nigeria's position in the global leather market; 3.0 Understand market trends and Nigeria's policies affecting leather industry; 4.0 Know key concepts and terminology in leather economics		

PROGRAMME: HIGHER NATIONAL DIPLOMA IN LEATHER AND LEATHER PRODUCTS TECHNOLOGY (LEATHER TECHNOLOGY OPTION)						
COURSE TITLE: GLOBAL LEATHER ECONOMICS		**COURSE CODE: LPT 424**		**Contact Hours: 2 Hrs/Week**		
		Credit Unit: 2		**Theoretical: 2 Hrs/Week**		
Year: II Semester: II		**Pre-requisite:**		**Practical: 0**		
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip students with the knowledge of the leather industry's economic aspects, focusing on Nigeria's context, global market trends, production, trade policies and their impact on the leather industry.						
GENERAL OBJECTIVE 1.0: Know the global leather industry's structure and dynamics						
THEORETICAL CONTENT				**PRACTICAL CONTENT**		
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
1-3	1.1 Explain the term Global Leather Economics 1.2 Discuss the history of leather industry in Nigeria. 1.3 Discuss the structure of leather industry in Nigeria 1.4 Explain the significance of leather industry in Nigeria, Africa and all over the world.	• Discuss an overview on global economic relevance of the leather industry. • Explain the origin of the leather industry in Nigeria with emphasis on common locations in the North especially in Kano, Sokoto etc	• Classroom Audio visuals, Whiteboard, Projector, Marker, Textbooks, Relevant journals, Internet, Lecture notes, Charts, Diagram.			
General Objective 2.0: Understand Nigeria's position in the global leather market						
4-7	2.1 Discuss Leather Production and Trade 2.2 Explain the opportunities and challenges	• Explain trends in global leather production. • Explain the involvement of leather sector in	• Classroom Audio visuals, Whiteboard, Projector, Marker, Textbooks,			

	associated with leather production and trade. 2.3 Explain International trade policies and agreements related to leather and leather products industry	global trade policies such as WTO, AGOA etc	Relevant journals, Internet, Lecture notes, Charts, Diagram.			
General Objective 3.0: Understand market trends and Nigeria's policies affecting leather industry						
8-11	3.1 Discuss the forces of demand and supply 3.2 Explain global Leather market trends 3.3 Analyze global Leather market trends 3.4 Discuss segmentation of leather markets 3.5 Explain policies affecting leather industry in Nigeria.	• Explain Global demand and supply dynamics - • Discuss segmentation (luxury, mid-range, low-end)	• Classroom Audio visuals, Whiteboard, Projector, Marker, Textbooks, Relevant journals, Internet, Lecture notes, Charts, Diagram.			
General Objective 4.0: Know key concepts and terminology in leather economics						
12-15	4.1 Explain global Leather Industry, challenges and opportunities. 4.2 Discuss on raw	• Discuss on government policies including private sector partnership	• Classroom Audio visuals, Whiteboard, Projector, Marker,			

	material sourcing and sustainability 4.3 Explain contributions of the leather industry to development in Nigeria.	investment. • Explain raw materials sourcing from leather and competition with synthetic materials • Explain the contributions of the leather industry along its Value chain, including job creation.	Textbooks, Relevant journals, Internet, Lecture notes, Charts, Diagram.			

Course Assessments:

Course work:	20%
Test/Assignments:	20%
Examination:	60%
Total:	**100%**

LIST OF MINIMUM RESOURCES

A. Footwear Workshop

S/No	Description of Items	Quantity
1	Flat Bed Industrial Sewing Machine	10
2	Roughing Filling Machine	2
3	Sole attaching Machine	4
4	Arm Cylinder stitching Machine	4
5	Shoe Lasts	200
6	Heat Setting Machine	2
7	Stamping Machine	2
8	Lasting Pincers	60
9	Mallets	60
10	Scissors	60
11	Pinches sets	60
12	Cutting Knives	60
13	Skiving Knives	60
14	Skiving Machines	2
15	Clicking Machines	2
16	Back part Molding Machine	2
17	Fore Part Lasting Machine	2
18	Hammer	60
19	Insole Molding Machine	2
20	Zig-Zag Sewing Machine	2

B. Tannery Workshop

S/No	Description of Items	Quantity
1	Tanning drum	4
2	Beam	4
3	Fleshing Machine	1
4	Setting out Machine	1
5	Toggling frame	1

6	Buffing machine	1
7	Glazing machine	1
8	Plating/Embossing Machine	1
9	Roto-press	1
10	Spray gun	3
12	Compressor	2
13	Spray Cabin	1
14	Drying Cabin	1
15	Toggling Pegs	200
15	Weighing scale 100kg	1
17	Weighing scale 1000kg	1
18	Fleshing Knives	5
19	Plastic bowls 30 Liters	20
20	Measuring cylinder 1000mls	5
21	Trimming knives	20
22	Thickness gauge	3
23	Roll of summon paper	1

C. Quality Control Laboratory

S/No	Description of Items	Quantity
1	Tensometer	1
2	Flexometer	2
3	Lasso meter	2
4	Kubelka (water absorption)	3
5	Rub fastness tester	2
6	Thickness gauge	2
7	Kjeldal apparatus	2
8	Ovens	2
9	Water baths	2
10	Water Vapor testing apparatus	1
11	Milling machine	1
12	Distiller	1
13	Soxhlet extraction set	1

14	Shrinkage measurement apparatus	2
15	Furnace	1
16	Form extractor	1
17	Digital weighing balance	2
18	Vacuum pump	1
19	Glass wares	
	100ML Conical Flask	30
	250mls	30
	500mls	30
	100ml Beakers	30
	250ml	30
	500ml	30
	100ml measuring cylinders	30
	250ml	30
	500ml	30
	Test tubes	60
	Round button flask (250)	10
	Round button flask (500)	10
	Burettes	30
	Mechanical shakers	4
	Burcher funnel	4
	Fumes Assorted	20
	Separating Flask	5
	Mechanical Stirrer100	5
	Thermometers	4
	Fire Extinguishers	5

D. Hides and Skins Improvement Laboratory

S/No	Description of Items	Quantity
1	Slaughter Hanger	2
2	Flaying Knives	20
3	Steel Sharpener	20
4	Filling Machine	1
5	Compressor (mobile)	1

6	Manual Pump	2
7	Dressing Tables	2
8	Initial Ripping Knives	20
9	Dagger/Cutlass	5

LIST OF WORKSHOP PARTICIPANTS

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