

**CURRICULUM
OF
DIPLOMA OF ASSOCIATE ENGINEER
IN
Leather Technology**

(3 Years)

Course Code

Revised (April, 2026)

Curriculum Section, TEVTA

CURRICULUM SALIENT	
Qualification Title	3-Year Diploma of Associate Engineer (DAE) in LEATHER Technology
Qualification Stream	Technical
Duration of Course	3 Years (Annual System)
Total Training Credit Hours	71
Entry Level	Entry Level Matric with Science.
Annual Intake	As approved by the respective TEVTA
Methodology	Theory 39.5% ; Practical 60.5%
Instructional Medium	Urdu / English

Scheme of Studies-DAE LEATHER Tech., Revised-2026

1st Year

Code		Subject	T	P	C
Gen	111	Islamiat and Pak Studies	1	0	1
TTQ/Civic	111	Tarjumat-ul-Quran / Civics	1	0	1
ENG	112	English	2	0	2
Math	113	Applied Mathematics	3	0	3
Phy	122	Applied Physics	1	3	2
Ch	112	Applied Chemistry	1	3	2
Comp	142	Computer Application	1	3	2
LT	104	Principles of Leather Manufacturing – I	2	6	4
LT	144	Heavy Leather Manufacture	2	6	4
LT	133	Tannery Machinery Practice	2	3	3
TOTAL			16	24	24

2nd Year

Code		Subject	T	P	C
Gen	201	Islamiat and Pak Studies	1	0	1
TTQ/Civic	211	Tarjumat-ul-Quran / Civics	1	0	1
Phy	212	Applied Physics/Applied Mechanics	1	3	2
Math	212	Applied Mathematics-II	2	0	2
MGM	262	Business Communication & Soft Skills	2	0	2
LT	204	Principles of Leather Manufacturing – II	2	6	4
LT	223	Crusting of upper and soft Leather	2	3	3
LT	254	Principles of Shoe Manufacturing	2	6	4
LT	264	Applied Chemistry - II	2	3	3
LT	272	Safety Practice & Procedure	2	0	2
TOTAL			17	21	24

3rd Year

Code		Subject	T	P	C
GEN	301	Islamiat & Pak Studies	1	0	1
LT	304	Principles of Leather Manufacturing – III	2	3	3
LT	313	Upper, Light and Specialized Finishes	2	3	3
LT	323	Applied Chemistry-III	2	3	3
LT	363	Quality Control & Leather Testing	2	3	3
LT	373	Evaluation of Chemical Materials and Procedures	1	3	2
LT	381	Final Design Project	0	6	2
FTW	353	Leather Goods Pattern Making & Manufacturing	2	3	3
FTW	373	Entrepreneurship & E-Commerce	2	3	3
TOTAL			14	27	23

اسلامیات/مطالعہ پاکستان

حصہ اول اسلامیات Gen III ٹی پی سی
1 0 1

حصہ دوم مطالعہ پاکستان

موضوعات حصہ اول اسلامیات سال اول

کتاب و سنت کل وقت: 20 گھنٹے

قرآن مجید

1- تعارف قرآن مجید 2- نزول قرآن 3- مکی و مدنی سورتوں کی خصوصیات 4- وحی کی اقسام 3

5- پندرہ منتخب آیات مع ترجمہ

1- لن تنالوا البر حتی تنفقوا مما تحبون

4- ان الله يامرکم ان تودوا الامانات الى اهلها

5- ان الله يامر بالعدل والاحسان

6- ان الصلوة تنهى عن الفحشاء والمنکر

7- لقد کان لکم فی رسول الله اسوة حسنة

8- ان اکرمکم عند الله اتقاکم

9- وما اتاکم الرسول فنخذوه ومانهاکم عنه فانتهو

10- واولو بالعهد

11- وعاشروهن بالمعروف

12- یمحق الله الربو ویربى الصدقات

13- واصبر علی ما اصابک

14- وقولوا قولا سديدا

15- ان الدين عند الله الاسلام

(ب) سفت

- 1- سفت کی اہمیت
- 1- انما الاعمال بالنیات
- 2- انما بعث لاتمم مکارم الاخلاق
- 3- لایومن احدکم حتی یحب الاخیه ما یحب لنفسه
- 4- المسلم من سلم المسلمون من لسانه ویده
- 5- قل امنت باللہ ثم استقم
- 6- خیرکم خیرکم لاہلہ
- 7- سباب المسلم فسوق وقتالہ کفر
- 8- المؤمن اخو المؤمن
- 9- کل المسلم علی المسلم حرام دمه وماله وعرضه
- 10- آية المنافق ثلاثة اذا حدث کذب واذا اوتمن خان واذا وعد اخلف

(5)

دین اسلام

2.1 اسلام کے بنیادی عقائد کی وضاحت اور انسان کی انفرادی و اجتماعی زندگی پر ان کے اثرات

1- توحید

2- رسالت

3- آخرت

4- ملائکہ

5- آسمانی کتب

(5)

2.2 عبادات

1- نماز 2- روزہ 3- حج 4- زکوٰۃ

مندرجہ بالا عبادات کی اہمیت و فضیلت، حکمتیں اور انسان کی انفرادی و معاشرتی زندگی پر اس کے اثرات

4- دین اسلام

عمومی مقصد۔ دین اسلام کے بنیادی عقائد اور عبادات کے بارے میں جان سکے اور بیان کر سکے
خصوصی مقاصد:

- ☆ لفظ دین اسلام کے لغوی اور اصطلاحی معنی بیان کر سکے۔
- ☆ اسلام کے بنیادی عقائد کی اہمیت بیان کر سکے۔
- ☆ اسلام کے بنیادی عقائد کے انسان کی انفرادی و اجتماعی زندگی پر پڑنے والے اثرات بیان کر سکے
- ☆ عبادت کے لفظی و اصطلاحی معنی بیان کر سکے۔
- ☆ عقیدے اور عبادت کا فرق بیان کر سکے۔
- ☆ عبادات (نماز، روزہ، حج، زکوٰۃ) کے فوری احکامات اور انسانی زندگی پر ان کے اثرات بیان کر سکے
- ☆ اسلامی عقائد و عبادات کے مطابق اپنی زندگی ڈھال کر ایک اچھا مسلمان بن سکے۔

نصاب اخلاقیات سال اول

تدریسی مقاصد

عمومی مقصد۔ اعلیٰ اخلاق کی وجہ سے ملکی ترقی میں قابل قدر اضافہ کر سکے۔

خصوصی مقاصد۔ طالب علم اس قابل ہوگا کہ:

- موضوعات کا مطلب بیان کر سکے۔
- عملی زندگی سے مثالوں کی نشاندہی کر سکے۔
- اپنی شخصیت اور معاشرے پر موضوعات کے مثبت اثرات پیدا کرنے کے طریقے بیان کر سکے۔
- دیانت داری کی اہمیت بیان کر سکے۔
- وفاداری کی اہمیت بیان کر سکے۔
- نظم و ضبط کی افادیت بیان کر سکے۔
- صدق بیان کی ضرورت بیان کر سکے۔
- حوصلہ مندی کے فوائد بیان کر سکے۔
- وقت کی پابندی کے فوائد بیان کر سکے۔
- صفائی اور باہمی اعتماد سے حسن کارکردگی کو بیان کر سکے۔
- مصلحت کے فوائد بیان کر سکے۔

مطالعہ پاکستان

حصہ دوم

تدریسی مقاصد - حریت فکر:
عمومی مقصد - طالب علم یہ جان لے کہ اسلام میں اور مسلمان قوم میں آزادی فکر کی کیا اہمیت ہے۔
خصوصی مقاصد:

- حریت فکر کا معنی و مفہوم بیان کر سکے۔
- آزادی فکر کی اہمیت بیان کر سکے۔
- خصوصاً اسلام میں آزادی اظہار رائے کی اہمیت۔
- ذہنی غلامی کے قومی سطح پر نقصانات بیان کر سکے۔
- جسمانی غلامی کے قومی سطح پر نقصانات بیان کر سکے۔

نظریہ پاکستان

عمومی مقصد - نظریہ پاکستان (دین اسلام) سے پوری طرح واقف ہو جائے
خصوصی مقاصد:

- نظریہ کی تعریف بیان کر سکے اور اس کی وضاحت کر سکے۔
- نظریہ پاکستان کی تعریف کر سکے اور اس کا مفہوم بیان کر سکے۔
- علامہ اقبال اور قائد اعظم کے فرمودات کی روشنی میں نظریہ پاکستان بیان کر سکے۔

نظریہ پاکستان کا تاریخی پہلو

عمومی مقصد - نظریہ پاکستان کے تاریخی پس منظر سے واقفیت حاصل کر سکے۔
خصوصی مقاصد - محمد بن قاسم کے بارے میں بیان کر سکے۔

کل وقت: 12 گھنٹے

حریت فکر

مسلمان قوم میں آزادی فکر کی تاریخ۔ مسلمانوں میں سیاسی آزادی کی اہمیت اور ضرورت۔ ذہنی و جسمانی غلامی کے نقصانات
نظریہ پاکستان

قیام پاکستان کی اساس (دین اسلام) قیام پاکستان کی غرض و غایت۔ نظریہ پاکستان کی وضاحت۔ نظریہ پاکستان
علامہ اقبال اور قائد اعظم کے ارشادات کی روشنی میں
نظریہ پاکستان کا تاریخی پہلو

محمد بن قاسم کی آمد۔ مجدد الف ثانی اور شاہ ولی اللہ کی تبلیغی خدمات، سید احمد شہید کی تحریک مجاہدین
تعلیمی تحریکیں

علی گڑھ۔ ندوۃ العلماء۔ دیوبند۔ مدرسۃ الاسلام (سندھ)۔ اسلامیہ کالج (پشاور)۔ انجمن حمایت اسلام (لاہور)

محمد بن قاسم کے ہندوستان پر حملہ کی وجہ بیان کر سکے

محمد بن قاسم کے ہندوستان پر حملہ کے اثرات بیان کر سکے

وہ بیان کر سکے کہ ہندوستان میں ہندو مسلم دو قومی نظریہ کا نکتہ آغاز کیا ہے۔

مجدد الف ثانی کی علمی خدمات بیان کر سکے

شاہ ولی اللہ کی علمی خدمات بیان کر سکے

مجدد الف ثانی اور شاہ ولی اللہ نے جو تبلیغ دین اور مسلمانوں میں سیاسی شعور پیدا کیا اسے بیان کر سکے۔

علمی تحریکیں

عمومی مقصد۔

برصغیر کی علمی تحریکوں سے آگاہی حاصل ہو سکے

خصوصی مقاصد

علی گڑھ۔ دیوبند۔ ندوۃ العلماء۔ مدرسۃ الاسلام۔ اسلامیہ کالج۔ انجمن حمایت اسلام نے تعلیم کے ذریعہ جو سیاسی شعور

مسلمانوں میں پیدا کیا اسے بیان کر سکے۔

آزادی ہند کے سلسلہ میں تحریک مجاہدین کی خدمات بیان کر سکے۔

Tarjumat-ul-Quran / Civics

TTQ-111 / Civic-111; Tarjumat-ul-Quran / Civics

T	P	C
1	0	1

Total Contact Hours:

Theory: 32

Practical: 0

Note: Syllabi for this subject would be as per BISEs/General education, developed by Punjab Curriculum TextBook Board (PCTB)

Total contact hours

Theory	64	T	P	C
Practical	0	2	0	2

AIMS At the end of the course, the students will be equipped with cognitive skill to enable them to present facts in a systematic and logical manner to meet the language demands of dynamic field of commerce and industry for functional day-to-day use and will inculcate skills of reading, writing and comprehension.

COURSE CONTENTS
ENGLISH PAPER "A"
1. PROSE/TEXT **16 hrs**

1.1 First eight essays of Intermediate. English Book-II

2. CLOZE TEST **4 hrs**

1.2 A passage comprising 50-100 words will be selected from the text. Every 11th word or any word for that matter will be omitted. The number of missing word will range between 5-10. The chosen word may or may not be the one used in the text, but it should be an appropriate word.

ENGLISH PAPER "B"
3. GRAMMAR **26 hrs**

3.1 Sentence Structure.

3.2 Tenses.

3.3 Parts of speech.

3.4 Punctuation,

3.5 Change of Narration.

3.6 One word for several

3.7 Words often confused

4. COMPOSITION **8 hrs**

4.1 Letters/Messages

4.2 Job application letter

4.3 For character certificate/for grant of scholarship

4.4 Telegrams, Cablegrams and Radiograms, Telexes, Facsimiles

4.5 Essay writing

4.6 Technical Education, Science and Our life, Computers,

Environmental Pollution, Duties of a Student. **4 hrs**

5. TRANSLATION **6 hrs**

5.1 Translation from Urdu into English.

For Foreign Students: A paragraph or a dialogue.

RECOMMENDED BOOKS

1. Intermediate English Book-II.

2. An English Grammar and Composition of Intermediate Level.

3. A Hand Book of English Students by Gatherer

INSTRUCTIONAL OBJECTIVES

PAPER-A

1. DEMONSTRATE BETTER READING, COMPREHENSION AND VOCABULARY

- 1.1 Manipulate, skimming and scanning of the text.
- 1.2 Identify new ideas.
- 1.3 Reproduce facts, characters in own words
- 1.4 Write summary of stories

2. UNDERSTAND FACTS OF THE TEXT

- 2.1 Rewrite words to fill in the blanks recalling the text.
- 2.2 Use own words to fill in the blanks.

PAPER-B

3. APPLY THE RULES OF GRAMMAR IN WRITING AND SPEAKING

- 3.1 Use rules of grammar to construct meaningful sentences containing a subject and a predicate.
- 3.2 State classification of time, i.e. present, past and future and use verb tense correctly in different forms to denote relevant time.
- 3.3 Identify function words and content words.
- 3.4 Use marks of punctuation to make sense clear.
- 3.5 Relate what a person says in direct and indirect forms.
- 3.6 Compose his writings.
- 3.7 Distinguish between confusing words.

4. APPLY THE CONCEPTS OF COMPOSITION WRITING TO PRACTICAL SITUATIONS

- 4.1 Use concept to construct applications for employment, for character certificate, for grant of scholarship.
- 4.2 Define and write telegrams, cablegrams and radiograms, telexes, facsimiles
- 4.3 Describe steps of a good composition writing.
- 4.4 Describe features of a good composition.
- 4.5 Describe methods of composition writing.
- 4.6 Use these concepts to organize facts and describe them systematically in practical situation;

5. APPLIES RULES OF TRANSLATION

- 5.1 Describe confusion.
- 5.2 Describe rules of translation.
- 5.3 Use rules of translation from Urdu to English in simple paragraph and sentences.

Math-113 APPLIED MATHEMATICS**Total contact hours** 96

Theory

T	P	C
3	0	3

Pre-requisite: Must have completed a course of Elective Mathematics at Matric level.

AIMS After completing the course the students will be able to

1. Solve problems of Algebra, Trigonometry, vectors. Menstruation, Matrices and Determinants.
2. Develop skill, mathematical attitudes and logical perception in the use of mathematical instruments as required in the technological fields.
3. Acquire mathematical clarity and insight in the solution of technical problems.

COURSE CONTENTS

1	QUADRATIC EQUATIONS	6 Hrs
1.1	StandardForm	
1.2	Solution	
1.3	Nature of roots	
1.4	Sum &Productof roots	
1.5	Formation	
1.6	Problems	
2	ARITHMETIC PROGRESSION AND SERIES	3Hrs
2.1	Sequence	
2.2	Series	
2.3	nth term	
2.4	Sum of the first n terms	
2.5	Means	
2.6	Problems	
3	GEOMETRIC PROGRESSION AND SERIES	3Hrs
3.1	nth term	
3.2	sum of the first n terms	
3.3	Means	
3.4	Infinite Geometric progression	
3.5	Problems	
4	BINOMIAL THEOREM	6 Hrs
4.1	Factorials	
4.2	Binomial Expression	
4.3	Binomial Co-efficient	
4.4	Statement	
4.5	The General Term	
4.6	The Binomial Series.	

4.7	Problems	
5	PARTIAL FRACTIONS	6 Hrs
5.1	Introduction	
5.2	Linear Distinct Factors Case I	
5.3	Linear Repeated Factors Case II	
5.4	Quadratic Distinct Factors Case III	
5.5	Quadratic Repeated Factors Case IV	
5.6	Problems	
6	FUNDAMENTALS OF TRIGONOMETRY	6 Hrs
6.1	Angles	
6.2	Quadrants	
6.3	Measurements of Angles	
6.4	Relation between Sexagesimal & circular system	
6.5	Relation between Length of a Circular Arc & the Radian Measure of its central Angle	
6.6	Problems	
7	TRIGONOMETRIC FUNCTIONS AND RATIOS	6 Hrs
7.1	trigonometric functions of any angle	
7.2	Signs of trigonometric Functions	
7.3	Trigonometric Ratios of particular Angles	
7.4	Fundamental Identities	
7.5	Problems	
8	GENERAL IDENTITIES	6 Hrs
8.1	The Fundamental Law	
8.2	Deductions	
8.3	Sum & Difference Formulae	
8.4	Double Angle Identities	
8.5	Half Angle Identities	
8.6	Conversion of sum or difference to products	
8.7	Problems	
9	SOLUTION OF TRIANGLES	6 Hrs
9.1	The law of Sines	
9.2	The law of Cosines	
9.3	Measurement of Heights & Distances	
9.4	Problems	
10	MENSURATION OF SOLIDS	30 Hrs
10.1	Review of regular plane figures and Simpson's Rule	
10.2	Prisms	
10.3	Cylinders	
10.4	Pyramids	
10.5	Cones	
10.6	Frusta	
10.7	Spheres	

11	VECTORS	9 Hrs
11.1	Scalars & Vectors	
11.2	Addition & Subtraction	
11.3	The unit Vectors $\mathbf{i}, \mathbf{j}, \mathbf{k}$	
11.4	Direction Cosines	
11.5	Scalar or Dot Product	
11.6	Deductions	
11.7	Dot product in terms of orthogonal components	
11.8	Deductions	
11.9	Analytic Expression for $\mathbf{a} \times \mathbf{b}$.	
11.10	Problems.	
12	MATRICES AND DETERMINANTS	9 Hrs
12.1	Definition of Matrix	
12.2	Rows & Columns	
12.3	Order of a Matrix	
12.4	Algebra of Matrices	
12.5	Determinants	
12.6	Properties of Determinants	
12.7	Solution of Linear Equations	
12.8	Problems	

REFERENCE BOOKS

1. GhulamYasinMinhas - Technical Mathematics Vol-I, IlmiKitabKhana Lahore.
2. Prof. Riazali Khan - Polytechnic Mathematic Series Vol I & II, Majeed Sons, Faisalabad
3. Prof. Sana UllahBhatti - A Text Book of Algebra and Trigonometry, Punjab Text Book Board, Lahore.

INSTRUCTIONAL OBJECTIVES

1 USE DIFFERENT METHODS FOR THE SOLUTION OF QUADRATIC EQUATIONS

- 1.1 Define a standard quadratic equation.
- 1.2 Use methods of factorization and method of completing the square for solving the equations.
- 1.3 Derive quadratic formula.
- 1.4 Write expression for the discriminant
- 1.5 Explain nature of the roots of a quadratic equation.
- 1.6 Calculate sum and product of the roots.
- 1.7 Form a quadratic equation from the given roots.
- 1.8 Solve problems involving quadratic equations.

2 UNDERSTAND APPLY CONCEPT OF ARITHMETIC PROGRESSION AND SERIES

- 2.1 Define an Arithmetic sequence and a series
- 2.2 Derive formula for the n th term of an A.P.
- 2.3 Explain Arithmetic Mean between two given numbers
- 2.4 Insert n Arithmetic means between two numbers
- 2.5 Derive formulas for summation of an Arithmetic series
- 2.6 Solve problems on Arithmetic Progression and Series

3 UNDERSTAND GEOMETRIC PROGRESSION AND SERIES

- 3.1 Define a geometric sequence and a series.
- 3.2 Derive formula for n th term of a G.P.
- 3.3 Explain geometric mean between two numbers.
- 3.4 Insert n geometric means between two numbers.
- 3.5 Derive a formula for the summation of geometric Series.
- 3.6 Deduce a formula for the summation of an infinite G.P.
- 3.7 Solve problems using these formulas.

4 EXPAND AND EXTRACT ROOTS OF A BINOMIAL

- 4.1 State binomial theorem for positive integral index.
- 4.2 Explain binomial coefficients: $(n,0), (n,1), \dots, (n,r), \dots, (n,n)$
- 4.3 Derive expression for the general term.
- 4.4 Calculate the specified terms.
- 4.5 Expand a binomial of a given index. -
- 4.6 Extract the specified roots
- 4.7 Compute the approximate value to a given decimal place.
- 4.8 Solve problems involving binomials.

5 RESOLVE A SINGLE FRACTION INTO PARTIAL FRACTIONS USING DIFFERENT METHODS.

- 5.1 Define a partial fraction, a proper and an improper fraction.
- 5.2 Explain all the four types of partial fractions.

- 5.3 Set up equivalent partial fractions for each type.
- 5.4 Explain the methods for finding constants involved.
- 5.5 Resolve a single fraction into partial fractions.
- 5.6 Solve problems involving all the four types.
- 6 UNDERSTAND SYSTEMS OF MEASUREMENT OF ANGLES.**
- 6.1 Define angles and the related terms.
- 6.2 Illustrate the generation of angle.
- 6.3 Explain sexagesimal and circular systems for the measurement of angles
- 6.4 Derive the relationship between radian and degree.
- 6.5 Convert radians to degrees and vice versa.
- 6.6 Derive a formula for the circular measure of a central angle.
- 6.7 Use this formula for solving problems.

7 APPLY BASIC CONCEPTS AND PRINCIPLES OF TRIGONOMETRIC FUNCTIONS

- 7.1 Define the basic trigonometric functions/ratios of an angle as ratios of the sides of a right triangle.
- 7.2 Derive fundamental identities.
- 7.3 Find trigonometric ratios of particular angles.
- 7.4 Draw the graph of trigonometric functions.
- 7.5 Solve problems involving trigonometric functions.

8 USE TRIGONOMETRIC IDENTITIES IN SOLVING TECHNOLOGICAL PROBLEMS

- 8.1 List fundamental identities
- 8.2 Prove the fundamental law
- 8.3 Deduce important results
- 8.4 Derive-sum and difference formulas
- 8.5 Establish half angle, double angle & triple angle formulas
- 8.6 Convert sum or difference into product& vice versa
- 8.7 Solve problems

9 USE CONCEPTS, PROPERTIES AND LAWS OF TRIGONOMETRIC FUNCTIONS FOR SOLVING TRIANGLES

- 9.1 Define angle of elevation and angle of depression.
- 9.2 Prove the law of sines and the law of cosines.
- 9.3 Explain elements of a triangle.
- 9.4 Solve triangles and the problems involving heights and distances.

10 USE PRINCIPLES OF MENSTRUATION IN FINDING SURFACES, VOLUME AND WEIGHTS OF SOLIDS.

- 10.1 Define menstruation of plane and solid figures
- 10.2 List formulas for perimeters & areas of plane figure.
- 10.3 Define pyramid and cone.
- 10.4 Define frusta of pyramid and cone.
- 10.5 Define a sphere and a shell.
- 10.6 Calculate the total surface and volume of each type of solid.
- 10.7 Compute weight of solids.

10.8 Solve problems of these solids.

11. USE THE CONCEPT AND PRINCIPLES OF VECTORS IN SOLVING TECHNOLOGICAL PROBLEMS.

- 11.1 Define vector quantity.
- 11.2 Explain addition and subtraction of vector
- 11.3 Illustrate unit vectors $\mathbf{i}$, $\mathbf{j}$, $\mathbf{k}$.
- 11.4 Express a vector in the component form.
- 11.5 Explain magnitude, unit vector, direction cosines of a vector.
- 11.6 Derive analytic expression for dot product and cross product of two vector.
- 11.7 Deduce conditions of perpendicularity and parallelism of two vectors.
- 11.8 Solve problems

12. USE THE CONCEPT OF MATRICES & DETERMINANTS IN SOLVING TECHNOLOGICAL PROBLEMS

- 12.1 Define a matrix and a determinant.
- 12.2 List types of matrices.
- 12.3 Define transpose, adjoint and inverse of a matrix.
- 12.4 State properties of determinants.
- 12.5 Explain basic concepts.
- 12.6 Explain algebra of matrices.
- 12.7 Solve linear equation by matrices.
- 12.8 Explain the solution of a determinant.
- 12.9 Use Crammer's Rule for solving linear equations

Phy-122 APPLIED PHYSICS**Total Contact Hours**

Theory	32	T	P	C
Practical	96	1	3	2

AIMS: The students will be able to understand the fundamental principles and concept of physics, use these to solve problems in practical situations/technical courses and understand concepts to learn advance physics/technical courses,

COURSE CONTENTS

1	MEASUREMENTS.	2 Hrs
1.1	Fundamental units and derived units	
1.2	Systems of measurement and S.I. units	
1.3	Concept of dimensions, dimensional formula	
1.4	Conversion from one system to another	
1.5	Significant figures	
2.	SCALARS AND VECTORS.	4 Hrs
2.1	Revision of head to tail rule	
2.2	Laws of parallelogram, triangle and polygon of forces	
2.3	Resolution of a vector	
2.4	Addition of vectors by rectangular components	
2.5	Multiplication of two vectors, dot product and cross product	
3.	MOTION	4 Hrs
3.1	Review of laws and equations of motion	
3.2	Law of conservation of momentum	
3.3	Angular motion	
3.4	Relation between linear and angular motion	
3.5	Centripetal acceleration and force	
3.6	Equations of angular motion	
4.	TORQUE, EQUILIBRIUM AND ROTATIONAL INERTIA	2 Hrs
4.1	Torque	
4.2	Centre of gravity and centre of mass	
4.3	Equilibrium and its conditions	
4.4	Torque and angular acceleration	
4.5	Rotational inertia	
5.	WAVE MOTION	5 Hrs
5.1	Review Hooke's law of elasticity,	
5.2	Motion under an elastic restoring force.	
5.3	Characteristics of simple harmonic motion	
5.4	S.H.M. and circular motion	
5.5	Simple pendulum	
5.6	Wave form of S.H.M.	

5.7	Resonance	
5.8	Transverse vibration of a stretched string	
6.	SOUND	5 Hrs
6.1	Longitudinal waves	
6.2	Intensity, loudness, pitch and quality of sound	
6.3	Units of Intensity of level and frequency response of ear	
6.4	Interference of sound waves silence zones, beats	
6.5	Acoustics	
6.6	Doppler effect	
7.	LIGHT	5 Hrs
7.1	Review laws of reflection and refraction	
7.2	Image formation by mirrors and lenses	
7.3	Optical instruments	
7.4	Wave theory of light	
7.5	Interference, diffraction, polarization of light waves	
7.6	Applications of polarization in sunglasses, optical activity and stress analysis	
8.	OPTICAL FIBER	2 Hrs
8.1	Optical communication and problems	
8.2.	Review total internal reflection and critical angle	
8.3	Structure of optical fiber	
8.4	Fiber material and manufacture	
8.5	Optical fiber - uses.	
9.	LASERS	3 Hrs
9.1	Corpuscular theory of light	
9.2	Emission and absorption of light	
9.3	Stimulated absorption and emission of light	
9.4	Laser principle	
9.5	Structure and working of lasers	
9.6	Types of lasers with brief description.	
9.7	Applications (basic concepts)	
9.8	Material processing	
9.9	Laser welding	
9.10	Laser assisted machining	
9.11	Micro machining	
9.12	Drilling scribing and marking	
9.13	Printing	
9.14	Lasers in medicine	

RECOMMENDED BOOKS

1. TahirHussain, Fundamentals of Physics Vol-I and II
2. FaridKhawaja, Fundamentals of Physics Vol-I and II
3. Wells and Slusher, Schaum's Series Physics.
4. Nelkon and Oyborn, Advanced Level Practical Physics
5. MehboobIlahi Malik and Inam-ul-Haq, Practical Physics
6. Wilson, Lasers - Principles and applications
7. M. Aslam Khan and M. AkramSandhu, Experimental Physics Note Book

INSTRUCTIONAL OBJECTIVES

1 USE CONCEPTS OF MEASUREMENT TO PRACTICAL SITUATIONS AND TECHNOLOGICAL PROBLEMS

- 1.1 Write dimensional formulae for physical quantities
- 1.2 Derive units using dimensional equations
- 1.3 Convert a measurement from one system to another
- 1.4 Use concepts of measurement and significant figures in problem solving.

2 USE CONCEPTS OF SCALARS AND VECTORS IN SOLVING PROBLEMS INVOLVING THESE CONCEPTS

- 2.1 Explain laws of parallelogram, triangle and polygon offorces
- 2.2 Describe method of resolution of a vector into components
- 2.3 Describe method of addition of vectors by rectangular components
- 2.4 Differentiate between dot product and cross product of vectors
- 2.5 Use the concepts in solving problems involving addition resolution and multiplication of vectors

3 USE THE LAW OF CONSERVATION OF MOMENTUM AND CONCEPTS OF ANGULAR MOTION TO PRACTICAL SITUATIONS

- 3.1 Use law of conservation' of momentum to practical/technological problems
- 3.2 Explain relation between linear and angular motion
- 3.3 Use concepts and equations of angular motion to solve relevant technological problems

4 USE CONCEPTS OF TORQUE, EQUILIBRIUM AND ROTATIONAL INERTIA TO PRACTICAL SITUATION/PROBLEMS

- 4.1 Explain Torque
- 4.2 Distinguish between Centre of gravity and centre of mass
- 4.3 Explain rotational Equilibrium, and its conditions
- 4.4 Explain. Rotational Inertia giving examples
- 4.5 Use the above concepts in solving technological problems.

5 USE CONCEPTS OR WAVE MOTION IN SOLVING RELEVANT PROBLEMS

- 5.1 Explain Hooke's Law of Elasticity
- 5.2 Derive formula for Motion under an elastic restoring force
- 5.3 Derive formulae for simple harmonic motion and simple pendulum
- 5.4 Explain wave form with reference to S.H.M. and circular motion
- 5.5 Explain Resonance
- 5.6 Explain Transverse vibration of a stretched 'string
- 5.7 Use the above concepts and formulae of S.H.M. to solve relevant problems.

6 UNDERSTAND concepts OF SOUND

- 6.1 Describe longitudinal wave and its propagation
- 6.2 Explain the concepts: Intensity, loudness, pitch and quality of sound
- 6.3 Explain units of Intensity of level and frequency response of ear
- 6.4 Explain phenomena of silence zones, beats
- 6.5 Explain Acoustics of buildings.

- 6.6 Explain Doppler Effect giving mathematical expressions.
- 7 USE THE CONCEPTS OF GEOMETRICAL OPTICS TO MIRRORS AND LENSES**
- 7.1 Explain laws of reflection and refraction
- 7.2 Use mirror formula to solve problems
- 7.3 Use the concepts of image formation by mirrors and lenses to describe working of optical instruments, e.g. microscopes, telescopes, camera and sextant.
- 8 UNDERSTAND WAVE THEORY OF LIGHT**
- 8.1 Explain wave theory of light
- 8.2 Explain phenomena of interference, diffraction, polarization of light waves
- 8.3 Describe uses of polarization given in the course contents.
- 9 UNDERSTAND THE STRUCTURE, WORKING AND USES OF OPTICAL FIBER**
- 9.1 Explain the structure of the Optical Fiber
- 9.2 Explain its principle of working
- 9.3 Describe use of optical fiber in industry and medicine.

LIST OF PRACTICALS

1. Draw graphs representing the functions:
 - a) $y=mx$ for $m=0, 0.5, 1, 2$
 - b) $y=x^2$
 - c) $y = 1/x$
2. Find the volume of a given solid cylinder using vernier calipers.
3. Find the area of cross-section of the given wire using micrometer screw gauge.
4. Prove that force is directly proportional to (a) mass, (b) acceleration, using fletchers trolley
5. Verify law of parallelogram of forces using Grave-sands apparatus.
6. Verify law of triangle of forces and Lami's theorem
7. Determine the weight of a given body using
 - a) Law of parallelogram of forces
 - b) Law of triangle of forces
 - c) Lami's theorem
8. Verify law of polygon of forces using Grave-sands apparatus.
9. Locate the position and magnitude of resultant of like parallel forces.
10. Determine the resultant of two unlike parallel forces.
- II. Find the weight of a given body using principle of moments.
12. Locate the centre of gravity of regular and irregular shaped bodies.
13. Find Young's Modules of Elasticity of a metallic wire.
14. Verify Hooke's Law using helical spring.
15. Study of frequency of stretched string with length.
16. Study of variation of frequency of stretched string with tension.
17. Study resonance of air column in resonance tube and find velocity of sound.
18. Find the frequency of the given tuning fork using resonance tube.
19. Find velocity of sound in rod by Kundt's tube
20. Verify rectilinear propagation of light and study shadow formation.
21. Study effect of rotation of plane mirror on reflection.
22. Compare the refractive indices of given glass slabs.
23. Find focal length of concave mirror by locating centre of curvature.
24. Find focal length of concave mirror by object and image method
25. Find focal length of concave mirror with converging lens.
26. Find refractive index of glass by apparent depth.
27. Find refractive index of glass by spectrometer.
28. Find focal length of converging lens by plane mirror.
29. Find focal length of converging lens by displacement method.
30. Find focal length of diverging lens using converging lens.
31. Find focal length of diverging lens using concave mirror.
32. Find angular magnification of an astronomical telescope.

33. Find angular magnification of a simple microscope (Magnifying Glass)
34. Find angular magnification of a compound microscope.
35. Study working and structure of camera.
36. Study working and structure of sextant.
37. Compare the different scales of temperature and verify the conversion formula.
38. Determine the specific heat of lead shots.
39. Find the coefficient of linear expansion of a metallic rod.
40. Find the heat of fusion of ice.
41. Find the heat of vaporization.
42. Determine relative humidity using hygrometer:

Ch-112 APPLIED CHEMISTRY

T	P	C
1	3	2

Total Contact HoursTheory **32**Practical **96**

Pre-requisite: The student must have studied the subject of elective chemistry at Secondary, school level.

AIMS After studying this course a student will be able to;

1. Understand the significance and role of chemistry in the development of modern technology.
2. Become acquainted with the basic principles of chemistry as applied in the study of relevant Technology.
3. Know the scientific methods for production, properties and use of materials of industrial & technological significance.
4. Gains skill for the efficient conduct of practical's in a Chemistry lab.

COURSE CONTENTS

1	INTRODUCTION AND FUNDAMENTAL CONCEPTS	2 Hrs
1.1	Orientation with reference to this technology	
1.2	Terms used & units of measurements in the study of chemistry	
1.3	Chemical Reactions & their types	
2	ATOMIC STRUCTURE	2 Hrs
2.1	Sub-atomic particles	
2.2	Architecture of atoms of elements, Atomic No. & Atomic Weight	
2.3	The periodic classification of elements periodic law	
2.4	General characteristics of a period and group	
3	CHEMICAL BOND	2 Hrs
3.1	Nature of chemical Bond	
3.2	Electrovalent bond with examples	
3.3	Covalent Bond (Polar and Non-polar, sigma & Pi Bonds with examples	
3.4	Co-ordinate Bond with examples	
4	WATER	2 Hrs
4.1	Chemical nature and properties.	
4.2	Impurities	
4.3	Hardness of water (types, causes & removal)	
4.4	Scales of measuring hardness (Degrees Clark	
4.5	Boiler feed water, scales & treatment	
4.6	Sea-water desalination, sewage treatment	
5	ACIDS, BASES AND SALTS	2 Hrs
5.1	Definitions with examples	

5.2	Properties, their strength, basicity & Acidity	
5.3	Salts and their classification with examples	
5.4	pH-value and scale	
6	OXIDATION & REDUCTION	2 Hrs
6.1	The process, definition& examples	
6.2	Oxidizing and reducing agents	
6.3	Oxides and their classifications	
7	NUCLEAR CHEMISTRY	2 Hrs
7.1	Introduction	
7.2	Radioactivity (alpha, beta and gamma rays)	
7.3	Half life process	
7.4	Nuclear reaction & transformation of elements	
8	CEMENT	2 Hrs
8.1	Introduction	
8.2	Composition and manufacture	
8.3	Chemistry of setting and hardening	
8.4	Special purpose cements	
9	GLASS	2 Hrs
9.1	Composition and raw material	
9.2	Manufacture	
9.3	Varieties and uses	
10	PLASTICS AND POLYMERS	2 Hrs
10.1	Introduction and importance	
10.2	Classification	
10.3	Manufacture	
10.4	Properties and uses	
11	PAINTS, VARNISHES AND DISTEMPER	2 Hrs
11.1	Introduction	
11.2	Constituents	
11.3	Preparation and uses	
12	CORROSION	2 Hrs
12.1	Introduction with causes	
12.2	Types of corrosion	
12.3	Rusting of iron	
12.4	Protective measures against-corrosion	
13	REFRACTORY MATERIALS AND ABRASIVE	2 Hrs
13.1	Introduction to Refractories	
13.2	Classification of Refractories	
13.3	Properties and Uses	

13.4	Introduction to Abrasives	
13.5	Artificial and Natural Abrasives and their uses	
14	ALLOYS	2 Hrs
14.1	Introduction with need	
14.2	Preparation and Properties	
14.3	Some Important alloys and their composition	
14.4	Uses	
15	FUELS AND COMBUSTION	2 Hrs
15.1	Introduction of fuels	
15.2	Classification of fuels	
15.3	Combustion	
15.4	Numerical Problems of Combustion	
16	LUBRICANTS	1 Hr
16.1	Introduction.	
16.2	Classification.	
16.3	Properties of lubricants.	
16.4	Selection of lubricants:	
17	POLLUTION	1 Hr
17.1	The problem and its dangers.	
17.2	Causes of pollution.	
17.3	Remedies to combat the hazards of pollution.	

BOOKS RECOMMENDED

1. Text Book of Intermediate Chemistry (I & II)
2. Ilmi Applied Science by Sh. Atta Muhammad
3. Polytechnic Chemistry by J. N. Reedy Tata McGraw Hill (New Delhi)
4. Chemistry for Engineers by P.C. Jain (New Delhi, India)

INSTRUCTIONAL OBJECTIVES**1 UNDERSTAND THE SCOPE, SIGNIFICANCE AND FUNDAMENTAL ROLE OF THE SUBJECT**

- 1.1 Define chemistry and its important terms
- 1.2 State the units of measurements in the study of chemistry
- 1.3 Write chemical formula of common compounds
- 1.4 Describe types of chemical reactions with examples

2 UNDERSTAND THE STRUCTURE OF ATOMS AND ARRANGEMENT OF SUB ATOMIC PARTICLES IN THE ARCHITECTURE OF ATOMS

- 2.1 Define atom.
- 2.2 State the periodic law of elements.
- 2.3 Describe the fundamental sub atomic particles
- 2.4 Distinguish between atomic no. and mass no.; isotopes and isobars
- 2.5 Explain the arrangements of electrons in different shells and sub energy levels
- 2.6 Explain the grouping and placing of 'elements' in the periodic table

3 UNDERSTAND THE NATURE OF CHEMICAL BOND

- 3.1 Define chemical bond
- 3.2 Describe the nature of chemical bond
- 3.3 Differentiate between electrovalent and covalent bonding
- 3.4 Explain the formation of polar and non polar, sigma and pi-bond with examples
- 3.5 Describe the nature of coordinate bond with examples

4 UNDERSTAND THE CHEMICAL NATURE OF WATER

- 4.1 Describe the chemical nature of water with its formula
- 4.2 Describe the general impurities present in water
- 4.3 Explain the causes and methods to removing hardness of water
- 4.4 Express hardness in different units like mg/liter, p.p.m, degrees Clark and degrees French
- 4.5 Describe the formation and nature of scales in boiler feed water
- 4.6 Explain the method for the treatment of scales
- 4.7 Explain the sewage treatment and desalination of sea water

5 UNDERSTAND THE NATURE OF ACIDS, BASES AND SALTS

- 5.1 Define acids, bases and salts with examples
- 5.2 State general properties of acids and bases
- 5.3 Differentiate between acidity and basicity and use the related terms
- 5.4 Define salts, state their classification with examples
- 5.5 Explain p-H value of solution and pH scale

6 UNDERSTAND THE PROCESS OF OXIDATION AND REDUCTION

- 6.1 Define oxidation
- 6.2 Explain the oxidation process with examples
- 6.3 Define reduction
- 6.4 Explain reduction process with examples

- 6.5 Define oxidizing and reducing-agents and give it least six examples of each
- 6.6 Define oxides
- 6.7 Classify the oxides and give example

7 UNDERSTAND THE FUNDAMENTALS OF NUCLEAR CHEMISTRY

- 7.1 Define nuclear chemistry and radio activity
- 7.2 Differentiate between alphas, Beta and Gamma particles
- 7.3 Explain half-life process
- 7.4 Explain at least six nuclei reactions resulting in the transformation of some elements
- 7.5" State important uses of isotopes

8 UNDERSTAND THE MANUFACTURE, SETTING AND HARDENING CEMENT

- 8.1 Define port land cement and give its composition
- 8.2 Describe the method of manufacture
- 8.3 Describe the chemistry of setting and hardening of cement
- 8.4 Distinguish between ordinary and special purpose cement

9 UNDERSTAND THE PROCESS OF MANUFACTURE OF GLASS.

- 9.1 Define glass
- 9.2 Describe its composition and raw materials
- 9.3 Describe the manufacture of glass
- 9.4 explain its varieties and uses

10 UNDERSTAND THE NATURE AND IMPORTANCE OF PLASTICS POLYMERS

- 10.1. Define plastics and polymers
- 10.2 Explain the mechanism of polymerization
- 10.3 Describe the preparation and uses of some plastics/polymers

11 KNOW THE.CHEMISTRY OF PAINTS, VARNISHES AND DISTEMPERS

- 11.1 Define paints, varnishes and distemper
- 11.2 State composition of each
- 11.3 State methods of preparation of each and their uses

12 UNDERSTAND THE PROCESS OF CORROSION WITH ITS CAUSES AND TYPES

- 12.1 Define corrosion
- 12.2 Describe different types of corrosion
- 12.3 State the causes of corrosion
- 12.4 Explain the process of rusting of iron
- J2.5 Describe methods to prevent/control corrosion

13 UNDERSTAND THE NATURE OF REFRACTORY MATERIALS AND ABRASIVE

- 13.1 Define refractory materials
- 13.2 Classify refractory materials
- 13.3 Describe properties and uses of refractories

- 13.4 Define abrasive.
- 13.5 Classify natural and artificial abrasives
- 13.6 Describe uses of abrasives

14 UNDERSTAND THE NATURE AND IMPORTANCE OF ALLOYS

- 14.1 Define alloy
- 14.2 Describe different methods for the preparation of alloys
- 14.3 Describe important properties of alloys
- 14.4 Enlist some important alloys with their composition, properties and uses

15 UNDERSTAND THE NATURE OF FUELS AND THEIR COMBUSTION

- 15.1 Define fuels
- 15.2 Classify fuels and make distinction of solid, liquid & gaseous fuels
- 15.3 Describe important Fuels
- 15.4 Explain combustion
- 15.5 Calculate air quantities in combustion, gases

16 UNDERSTAND THE NATURE OF LUBRICANTS.

- 16.1 Define a lubricant
- 16.2 Explain the uses of lubricants
- 16.3 Classify lubricants and cite examples
- 16.4 State important properties of oils, greases and solid lubricants
- 16.5 State the criteria for the selection of lubricant for, particular purpose/job

17 UNDERSTAND THE NATURE OF POLLUTION

- 17.1 Define Pollution (air, water, food)
- 17.2 Describe the causes of environmental pollution.
- 17.3 Enlist some common pollutants.
- 17.4 Explain methods to prevent pollution

1. To introduce the common apparatus, glassware and chemical reagents used in the chemistry lab.
2. To purify a chemical substance by crystallization.
3. To separate a mixture of sand and salt.
4. To find the melting point of substance.
5. To find the pH of a solution with pH paper.
6. To separate a mixture of inks by chromatography.
7. To determine the co-efficient of viscosity of benzene with the help of Ostwald viscometer.
8. To find the surface tension of a liquid with a stalagmometer.
9. To perform electrolysis of water to produce Hydrogen and Oxygen.
10. To determine the chemical equivalent of copper by electrolysis of Cu SO.
11. To get introduction with the scheme of analysis of salts for basic radicals.
12. To analyse 1st group radicals (Ag^+ - Pb^{++} - Hg^+).
13. To make practice for detection 1st group radicals.
14. To get introduction with the scheme of II group radicals.
15. To detect and confirm II-A radicals (Hg^{++} , Pb^{++++} , Cu^+ , Cd^{++} , Bi^{+++}).
16. To detect and confirm II-B radicals Sn^{+++} , Sb^{+++} , As^{+++}).
17. To get introduction with the scheme of III group radicals (Fe^{+++} - Al^{+++} , Cr^{+++}).
18. To detect and confirm Fe^{+++} , Al^{+++} and Cr^{+++} .
19. To get introduction with the scheme of IV group radicals.
20. To detect and confirm An^{++} and Mn^{++} radicals of IV group.
21. To detect and confirm Co^{++} and Ni^{++} radicals of IV group.
22. To get introduction with the Acid Radical Scheme.
23. To detect dilute acid group.
24. To detect and confirm CO_3^{--} and HCO_3^- radicals.
25. To get introduction with the methods/apparatus of conducting volumetric estimations.
26. To prepare standard solution of a substance.
27. To find the strength of a given alkali solution.
28. To estimate HCO_3^- contents in water.
29. To find out the %age composition of a mixture solution of KNO_3 and KOH volumetrically.
30. To find the amount of chloride ions (Cl^-) in water volumetrically.

COMP-142

COMPUTER APPLICATIONS

Total Contact Hours

Theory: 32 Hrs
Practical: 96 Hrs

T	P	C
1	3	2

Pre-requisites: None

AIMS: This subject will enable the student to be familiar with the fundamental concepts of Computer Science. He will also learn MS-Windows, MS-Office, and Internet to elementary level.

Course Contents:

- | | |
|--|--------------|
| 1. ELECTRONIC DATA PROCESSING (E.D.P.) | 6 Hrs |
| 1.1 Basic Terms of Computer Science Data & its, types, Information, Hardware, Software | |
| 1.2 Computer & its types | |
| 1.3 Block diagram of a computer system | |
| 1.4 BIT, Byte, RAM & ROM | |
| 1.5 Input & Output devices | |
| 1.6 Secondary storage devices | |
| 1.7 Types of Software | |
| 1.8 Programming Languages | |
| 1.9 Applications of computer in different fields | |
| 1.10 Application in Engineering, Education & Business | |
| 2, MS-WINDOWS | 2 Hrs |
| 2.1 Introduction to Windows | |
| 2.2 Loading & Shut down process | |
| 2.3 Introduction to Desktop items (Creation of Icons, Shortcut, Folder & modify Taskbar) | |
| 2.4 Desktop properties | |
| 2.5 Use of Control Panel | |
| 2.6 Searching a document | |
| 3. MS-OFFICE (MS-WORD) | 8 Hrs |
| 3.1 Introduction to MS-Office | |
| 3.2 Introduction to MS-Word & its Screen | |
| 3.3 Create a new document | |
| 3.4 Editing & formatting the text | |
| 3.5 Saving & Opening a document | |
| 3.6 Page setup (Set the Margins & Paper) | |
| 3.7 Spell Check & Grammar | |

- 3.8 Paragraph Alignment
- 3.9 Inserting Page numbers, Symbols, Text box & Picture in the document
- 3.10 Use the different Format menu drop down commands(Drop Cap, Change Case, Bullet & Numbering and Border & Shading)
- 3.11 Insert the 'Table and it's Editing
- 3.12 Printing the document
- 3.13 Saving a document file as PDF format

4.MS-OFFICE (MS-EXCEL)

9 Hrs

- 4.1 Introduction to MS-Excel & its Screen
- 4.2 Entering data & apply formulas in worksheet
- 4.3 Editing & Formatting the Cells, Row & Colum
- 4.4 Insert Graphs in sheet
- 4.5 Page setup, Print Preview & Printing
- 4.6 Types & Categories of Charts

5.MS. OFFICE (MS-POWER POINT)

4 Hrs

- 5.1 Introduction to MS-Power point
- 5.2 Creating a, presentation
- 5.3 Editing & formatting a text box
- 5.4 Adding pictures & colors to a slide
- 5.5 Making slide shows
- 5.6 Slide Transition

6.INTERNET & E-MAIL

3Hrs

- 6.1 Introduction to Internet & browser window
- 6.2 Searching, Saving and Print a page from internet
- 6.3 Creating, Reading & Sending E-Mail
- 6.4 Explain some advance features over the internet and search engines

Instructional Objectives:**1. UNDERSTAND ELECTRONIC DATA PROCESSING (E.D.P)**

- 1.1. Describe Basic Terms of Computer Science. Data & its Types, Information, Hardware, Software
- 1.2. Explain Computer & its types
- 1.3. Explain Block diagram of a computer system
- 1.4. State the terms such as BIT, Byte, RAM & ROM
- 1.5. Identify Input & Output devices
- 1.6. Describe Secondary Storage devices
- 1.7. Explain Types of Software
- 1.8. Introduction to Programming Language
- 1.9. Explain Applications of computer in different fields
- 1.10. Application in Engineering, Education & Business

2. UNDERSTAND MS-WINDOWS

- 2.1 Explain Introduction to Windows
- 2.2 Describe Loading & Shut down process
- 2.3 Explain Introduction to Desktop items (Creation of Icons, Shortcut, Folder & modify Taskbar)
- 2.4 Explain Desktop properties
- 2.5 Describe Use of Control Panel (add/remove program, time & date, mouse and create user account)
- 2.6 Explain the method of searching a document

3. UNDERSTAND MS-OFFICE (MS-WORD)

- 3.1 Explain Introduction to MS-Office
- 3.2 Describe -Introduction to MS-Word & its Screen
- 3.3 Describe create a new document
- 3.4 Explain Editing & formatting the text
- 3.5 Describe saving & Opening a document
- 3.6 Explain Page setup, (Set the Margins & Paper)
- 3.7 Describe Spell Check & Grammar
- 3.8 Explain Paragraph Alignment
- 3.9 Explain Inserting Page numbers, Symbols, Text box & Picture in the document
- 3.10 Describe Use the different Format menu drop down commands (Drop Cap, Change Case, Bullet & Numbering and Border & Shading)
- 3.11 Explain Insert the Table and its Editing and modifying
- 3.12 Describe printing the document

3.13 Describe the method of file saving as a PDF Format

4. UNDERSTAND MS-OFFICE (MS-EXCEL)

- 4.1 Explain Introduction to MS-Excel & its Screen
- 4.2 Describe Entering data & apply formulas in worksheet
- 4.3 Describe Editing & Formatting the, Cells, Row & Column
- 4.4 Explain Insert Graphs in sheet
- 4.5 Describe Page setup, Print preview & Printing
- 4.6 Explain in details formulas for sum, subtract, multiply, divide, average
- 4.7 Explain in details the types of charts e.g pie chart, bar chart

5. UNDERSTAND MS-OFFICE (MS-POWER POINT)

- 5.1 Describe Introduction to MS-Power point
- 5.2 Explain creating a presentation
- 5.3 Describe Editing & formatting a text box
- 5.4 Explain Adding pictures & colors to a slide
- 5.5 Describe Making slide shows
- 5.6 Explain Slide Transitions

6. UNDERSTAND INTERNET &E-MAIL

- 6.1 Explain Introduction to Internet and browser window
- 6.2 Explain Searching, Saving and Print a page from internet
- 6.3 Describe Creating, Reading & Sending E-Mail and attachments
- 6.4 Explain some advance features over the internet and how to search topics on different search engines

Recommended Textbooks:

- 1. **Bible Microsoft Office 2007 by John Walkenbach**
- 2. **Bible Microsoft Excel 2007 by John Walkenbach**
- 3. **Bible Microsoft PowerPoint 2007 by John Walkenbach**

List of Practical:

Identify key board, mouse, CPU, disk drives, disks, monitor, and printer and	3Hrs
MS WINDOWS XP	12 Hrs
1.1 Practice of loading and shutdown of operating system	
1.2 Creating items (icons, shortcut, folders etc) and modifying taskbar	
1.3 Changing of wallpaper, screensaver, and resolution	
1.4 Practice of control panel items (add/remove, time and date,mouse, and create user account)	
MS OFFICE (MS-WORD)	27 Hrs
1.5 Identifying the MS Word Screen and its menu	
1.6 Practice of create a new document, saving and re-opening it fromthe location and spell check & grammar	
1.7 Practice of Page Formatting (Borders, Character Spacing, Paragraph,Bullets& Numberings and Fonts)	
1.8 Practice of different tool bars like standard, format& drawing tool bars	
1.9 Practice of Insert pictures, clipart, and shapes	
1.10 Practice of header and footer	
1.11 Practice of insert table and also format of table	
1.12 Practice of page setup, set the page margins, and printing documents	
MS OFFICE (MS-EXCEL)	27 Hrs
1.13 Identifying the MS EXCEL Screen and its menu	
1.14 Practice of create a new sheet, saving and re-opening it from thelocation and spell check	
1.15 Practice of insert and delete of row and columns (format of cell)	
1.16 Practice of entering data and formulas in worksheet(Add, Subtract, Multiplying, and Divide & Average)	
1.17 Repeating practical serial number04	
1.18 Practice of insert chart and its types	
1.19 Practice of page setup, set the page margins, and printing	
MS OFFICE (MS-POWER POINT)	15 Hrs
1.20 Identifying the MS POWER POINT Screen and its menu	
1.21 Practice of create a new presentation and save	
1.22 Practice of open saves presentations	
1.23 Practice of inset picture and videos	
INTERNET & E-MAIL	12 Hrs
1.24 Identifying internet explorer	

- 1.25 Practice of searching data from any search engine
- 1.26 Practice of create an E-Mail account and how to send and receive mails, download attachments

LT - 104 Principles of Leather Manufacturing - I

Total Contact Hours

Theory	64	T	P	C
Practical	192	2	6	4

Learning Outcomes:

The students will be able to:

1. Explain the fundamentals of leather manufacture, including its history, uses, and the structure and chemical composition of animal hides and skins.
2. Identify and describe raw hides and skins, their sources, importance, and common pre-slaughter and post-mortem defects affecting leather quality.
3. Explain and perform curing and beam house operations such as soaking, depilation, liming, fleshing, deliming, and bating, with an understanding of their objectives and effects.
4. Describe and apply the principles and mechanisms of degreasing and pickling, including pH control, swelling behavior, and preservation methods.
5. Explain and compare various tanning processes, particularly chrome tanning, alum, zirconium, oil, aldehyde, and combination tannages, along with their properties and uses

COURSE CONTENTS

1. **General introduction to leather manufacture** **6 Hrs**
 - 1.1 Leather & its Uses
 - 1.2 History of Leather Manufacture
 - 1.3 Leather Industry in Pakistan
 - 1.4 Flow Chart Operation & Processes in Chrome Leather Manufacture
2. **Raw hides & skins** **6 Hrs**
 - 2.1 Importance of Animal Skin for Living Body
 - 2.2 Definitions, Sources & Uses of Hides & Skin
 - 2.3 Pre-slaughter & Post Mortem Defects in Animal Hides
3. **General structure of animal hide & skin** **7 Hrs**
 - 3.1 Epidermal System True Skin
 - 3.2 Adipose Tissues
 - 3.3 Cross-section of Animal Skin (Labeled Diagram)
 - 3.4 Non-fibrous Proteins
 - 3.5 Chemical Composition of Animal Skin
4. **Curing of hides & skins** **7 Hrs**
 - 4.1 Objectives & Principles of Curing
 - 4.2 Methods of Curing
 - 4.2.1 Drying
 - 4.2.2 Wet Salting
 - 4.2.3 Dry Salting
 - 4.2.4 Brine Curing

	4.3 Curing by Chilling	
	4.4 Curing Defects	
5.	Principles & practice of beam house processes	7 Hrs
	5.1 Soaking	
	5.1.1 Objectives of Soaking	
	5.1.2 Soaking of Dry Cured Hides & Skins	
	5.1.3 Soaking of Wet-salted Hides & Skins	
	5.1.4 Different Types of Soaking Vessels	
	5.1.5 Use of Antiseptic during Soaking	
	5.2 Depilation	
	5.2.1 Objectives	
	5.2.2 Theory of Hair Destruction by Alkalis & Sulfides	
	5.2.3 Hair Loosening by Bacterial Action & Enzymes	
	5.2.4 Oxidation Un-haring	
	5.2.5 Depilation by Amines	
	5.2.6 Depilation by Hair Saving Processes	
	5.3 Liming	
	5.3.1 Objectives & pH	
	5.3.2 The Liming Action upon Various Skin Components	
	5.3.3 Effects of Liming on Leather Properties	
	5.3.4 Practical Consideration during Liming	
	5.3.5 Straight & Sharpened Liming	
	5.3.6 Counter Current System of Liming	
	5.3.7 Drum Liming	
	5.4 Fleshing & Pelt Weight	
6.	Principles & mechanism of deliming & bating	5 Hrs
	6.1 Deliming	
	6.1.1 Functions	
	6.1.2 DE liming Materials & their Chemical Reactions	
	6.2 Bating	
	6.2.1 Objectives of Bating.	
	6.2.2 Characteristics of Bating Enzymes	
	6.2.3 Action of Bating on Skin Components	
	6.2.4 Factors Influencing the Efficiency of Bating	
	6.2.5 Effect of Bating on the Properties of Leather	
	6.3 Scud & its Removal	
7.	Degreasing	5 Hrs
	7.1 Reasons for Degreasing	
	7.2 Aqueous Degreasing	
	7.3 Solvent Degreasing	
	7.4 Factors Influencing Efficiency of Bating	
8.	Principles & mechanism of pickling	5 Hrs
	8.1 Introduction	
	8.2 Objectives of Pickling	
	8.3 Pickling Chemicals	
	8.4 Pickling pH	
	8.5 Acid Uptake & Rate of Pickling	

8.6 Acid Swelling & Negative Swelling	
8.7 Pickling Techniques	
8.8 Buffered Pickle	
8.9 Pickling for Preservation	
8.10 Pickle for Degreasing	
9. Theory & principles of chrome tanning	6 Hrs
9.1 Brief History & Importance of Chrome Tanning	
9.2 Properties of Chrome Tanned Leather	
9.3 Chrome Tanning Salt	
9.3.1 Organically Reduced Salt	
9.3.2 Sulphur dioxide Reduced Salt	
9.3.3 Synthetically Reduce Chrome Salt	
9.3.4 Masking Agents & Masked Chrome Tanning Salts	
9.4 Basicity	
9.4.1 Concept of Basicity with reference to Chrome Tanning Salt	
9.5 Reaction of Chrome with Pelt	
9.6 Information of Two Bath Chrome Tanning	
9.7 One Bath Chrome Tanning	
9.7.1 Method	
9.7.2 Factors Effecting on One Bath Chrome Tanning	
9.8 pH & Boil Test of Chrome Tanned Leather	
9.9 Aging of Chrome Tanned Leather	
9.10 Preservation & Storage of Wet Blue Stock	
10. Introduction of alum and zirconium tannage	4 Hrs
10.1 Introduction	
10.2 Materials & Method of Alum Tannage	
10.3 Properties & Uses of Alum Tanned Leather	
10.4 Materials, Method & Applications of Zirconium Tannage	
11. Oil & combination tannage	6 Hrs
11.1 Introduction	
11.2 Materials & Methods of Oil Tannage	
11.3 Properties & Uses of Oil Tanned Leather	
11.4 Fundamentals of aldehyde tannage	
11.5 Mechanism of Oil Tannage	
11.6 Combination Tanning	

Instructional Objectives

1. General Introduction to Leather Manufacture

1. Define leather and explain its major uses in different industries.
2. Describe the historical development of leather manufacture.
3. Explain the structure and role of the leather industry in Pakistan.
4. Illustrate and interpret the flow chart of chrome leather manufacturing processes.

2: Raw Hides & Skins

1. Explain the biological importance of animal skin for living bodies.
2. Define hides and skins and identify their sources and end uses.
3. Recognize and classify pre-slaughter and post-mortem defects in raw hides and skins.

3: General Structure of Animal Hide & Skin

1. Identify and explain the epidermis, true skin, and adipose tissues.
2. Interpret a labeled cross-section of animal skin.
3. Describe non-fibrous proteins and their role in leather processing.
4. Explain the chemical composition of animal skin and its relevance to tanning.

4: Curing of Hides & Skins

1. Explain the objectives and principles of curing.
2. Compare different curing methods (drying, wet salting, dry salting, brine curing, chilling).
3. Identify curing defects and suggest preventive measures.

5: Principles & Practice of Beam House Processes

1. Explain the objectives and techniques of soaking for different cured materials.
2. Identify soaking vessels and justify the use of antiseptics.
3. Explain theories and methods of depilation, including hair-saving and chemical processes.
4. Describe the principles, objectives, and effects of liming.
5. Compare straight, sharpened, drum, and counter-current liming systems.
6. Perform fleshing operations and calculate pelt weight.

6: Deliming & Bating

1. Explain the functions and chemistry of deliming.
2. Identify different deliming materials and reactions.
3. Describe the objectives, enzymes, and mechanisms of bating.
4. Analyze factors affecting bating efficiency.
5. Explain the effect of deliming and bating on leather quality.
6. Identify scud and demonstrate its removal techniques.

7: Degreasing

1. Explain the need for degreasing in leather processing.
2. Differentiate between aqueous and solvent degreasing.
3. Identify factors influencing the efficiency of degreasing.

8: Pickling

1. Explain the principles and objectives of pickling.
2. Identify pickling chemicals and control pickling pH.
3. Explain acid uptake, swelling, and negative swelling.
4. Apply different pickling techniques, including buffered and preservative pickles.
5. Explain pickling used for degreasing purposes.

9: Theory & Principles of Chrome Tanning

1. Explain the history and importance of chrome tanning.
2. Describe the properties of chrome-tanned leather.
3. Differentiate between various chrome tanning salts and reduction methods.
4. Explain the concept of basicity and chrome-pelt reactions.
5. Compare one-bath and two-bath chrome tanning methods.
6. Perform and interpret pH and boil tests.
7. Explain aging, preservation, and storage of wet-blue leather.

10: Alum & Zirconium Tannage

1. Explain the principles of alum and zirconium tannage.
2. Identify materials, methods, and applications of alum tanning.
3. Describe the properties and uses of zirconium-tanned leather.

11: Oil & Combination Tannage

1. Explain the principles and methods of oil tanning.
2. Describe the mechanism of oil and aldehyde tanning.
3. Explain combination tanning techniques and their industrial applications.

RECOMMENDED REFERENCE BOOKS

1. Kazi, S. H. (2016). *Principles of leather manufacturing*.
2. Hashmi, A. S., & Rafique, Z. (n.d.). *A short view of leather chemistry*.
3. Sarkar, K. T. (1981). *Theory and practice of leather manufacture*. Ajoy Sorcar.
4. Ogiwara, C. (n.d.). *Practical guidelines to light leather processing*.
5. Briggs, P. S. (n.d.). *Gloving, clothing and special leather*. Tropical Products Institute (TPI). (With J. C. Barrett).
6. Ogilvie, E. (n.d.). *Leather finishing*. Nene College, Northampton, England.
7. Covington, A. D. (n.d.). *Tanning chemistry: The science of leather*. RSC Publishing.
8. Watt, A. (n.d.). *Leather manufacture*. William Clowes and Sons Ltd., London.

LIST OF PRACTICAL

192 Hrs

1 Evaluate Raw Material

- 1.1 Physical Appearance
- 1.2 Softness, Flexibility
- 1.3 Hair slip, Puncture Strength
- 1.4 Area Substance & Weight

2 Perform Curing Procedure

- 2.1 Wet salting
- 2.2 Dry curing on frame
- 2.3 Dry salting

3. Perform Soaking Procedure

- 3.1 Soaking of Wet Salted, Dry Cured & Dry Salted Raw Material
- 3.2 Softness, Flexibility after Soaking
- 3.3 Hair slip, Putrefaction & Puncture
- 3.4 Strength after Soaking
- 3.5 Soak Weight

4. Perform Depilation & Liming as per Process

- 4.1 Sodium Sulfide
- 4.2 Breaking of Drum
- 4.3 Dissolving
- 4.4 Lime
- 4.5 Slaking
- 4.6 Sieving
- 4.7 Dissolving to make Slurry
- 4.8 Painting
- 4.9 Preparation of Paint
- 4.10 Application of Paint
- 4.11 Liming
- 4.12 Plumping
- 4.13 Pelt Weight
- 4.14 New Lime & its Effect

5. Perform De-Liming

- 5.1 Use of different De liming Material
- 5.2 Pelt Condition (Degree of Swelling)
- 5.3 Grain Clearance & Physical Appearance
- 5.4 Degree of De liming
- 5.5 De liming pH

6. Execute Bating Process

- 6.1 Use of Enzymatic Bates
- 6.2 Study of Physical Effects of Bating
- 6.3 Degree & Test of Bating
- 6.4 Cross-section pH

7. Conduct Pickling

- 7.1 Use of different Pickling Agents
- 7.2 Acid Swelling
- 7.3 Negative Swelling

8. Perform Chrome Tanning Process

9. Carryout Zirconium Tanning Process

10. Perform Alum Tanning Process

11. Apply Aldehyde Tanning Process

LT-144 Heavy Leather Manufacturing

Total Contact Hours

Theory	64	T	P	C
Practical	192	2	6	4

Learning Outcomes:

The students will be able to:

1. Understand the fundamentals of heavy leather by identifying its types, terminology, manufacturing flow charts, and end-use applications including sole, belting, harness, saddlery, and upholstery leathers.
2. Analyze vegetable tanning materials and extracts with respect to their origin, chemical composition, processing methods, and functional role in heavy leather tanning, including diffusion behavior and liquor properties.
3. Apply practical tanning processes such as soaking, liming, deliming, pickling, pre-tanning, and vegetable tanning systems to achieve optimum pelt yield and desired leather characteristics.
4. Evaluate post-tanning and finishing operations including bleaching, loading, fat-liquoring, drying, conditioning, scouring, oiling, and rolling to enhance the physical, mechanical, and service properties of sole leather.
5. Identify defects in sole and heavy leathers and propose appropriate preventive measures and remedies while understanding the manufacture and performance requirements of different heavy leather products.

1. Heavy leather, types & uses

8 Hrs

- 1.1 Introduction
- 1.2 Basic Terms
- 1.3 Flow Chart Operation of Sole Leather
- 1.4 Heavy & Light Sole Leather
- 1.5 Flexible & Water Proof Sole Leather
- 1.6 Belting, Harness & Saddlery Leather
- 1.7 Insole Leather
- 1.8 General Properties Of Sole Leather

2. Vegetable tanning materials and preparation of tanning extracts

9 Hrs

- 2.1 Country of Origin & Chemical Composition
- 2.2 Characteristics & Tanning Properties of Various Tanning Materials
- 2.3 Leaching of Babool Bark as Practiced in Pakistan
- 2.4 Properties of Veg. Tan Liquor
 - 2.4.1 Concentration
 - 2.4.2 Solidification
 - 2.4.3 Spray Drying
 - 2.4.4 Bleaching
 - 2.4.5 Solubilization
- 2.5 Sulfated & Bleached Mimosa Extracts

2.6 Sulfated Quebracho	
2.7 Sweetened Chestnut	
2.8 Significance of Acid & Salts in Vegetable Tanning Extracts	
2.9 Blending of Tanning Extracts	
2.10 Factors Effecting Diffusion of Tanning Extract in Pelt.	
2.11 Tannins & Non-tannins	
3. Practical tanning process of heavy leather	8 Hrs
3.1 Soaking	
3.1.1 Objectives & Methods	
3.1.2 Soaking Aids	
3.2 Liming	
3.2.1 Counter Current System	
3.3 Pelt Yield	
3.3.1 Importance & Calculation of Pelt Yield	
3.3.2 Rounding & Rounding Percentage	
3.3.3 Causes & Remedies for Loss in Pelt Yield	
3.4 Deliming	
3.4.1 Objectives, Method & DE liming Degree of Sole Tannage	
3.5 Pickling & Pre-tanning	
3.5.1 Objectives & Methods	
3.5.2 Use of Syntans & Chrome for Pre-tannage	
4. Tanning of heavy leathers	7 Hrs
4.1 Pit Tanning Method	
4.2 Pit Drum Tanning System	
4.3 Rapid Vegetable Tannage	
4.4 Dry Powder Tannage	
4.5 Bag Tannage	
5. Post tanning treatment of heavy /sole leather	9 Hrs
5.1 Bleaching	
5.1.1 American Process	
5.1.2 Conventional Process	
5.1.3 Syntan bleaching	
5.2 Washing & sammying	
5.3 Loading Method, Material & Effects	
5.4 Fat-liquoring Objects & Methods	
5.5 Piling, Signification of Piling	
5.6 Method of Drying, Factors effecting the rate of drying	
5.7 Precautions during Drying, Drying chamber construction and working.	
6. Finishing of sole leather	7 Hrs
6.1 Introduction	
6.2 Conditioning & Drum Setting	
6.2.1 Importance of Conditioning	
6.2.2 Drum Setting Operations	

- 6.3 Scouring - Objectives & Method
- 6.4 Hand Oiling - Reasons & Materials for Hand Oiling
- 6.5 Hand Setting - Importance & Method
- 6.6 Final Drying Method
- 6.7 Rolling of Sole Leather
- 7. Defects of Sole Leather 8 Hrs**
 - 7.1 Causes and Remedies of following Sole Leather Defects
 - 7.1.1 Lime Blast
 - 7.1.2 Kiss Marks
 - 7.1.3 Darkening of Color
 - 7.1.4 Iron Stains
 - 7.1.5 Grain Cracking
 - 7.1.6 Drawn & Pebbled Grain
 - 7.1.7 Frizzed & Scuffed Grain
 - 7.1.8 Delaminate Grain
- 8. Manufacturing of different types of heavy leather 8 Hrs**
 - 8.1 Properties of Belting Leather
 - 8.2 Production of Belting, Saddlery & Harness Leather from Vegetable Crust Leather.
 - 8.3 Manufacture of Vegetable Upholstery Hides
 - 8.4 Full-chrome Upholstery Leather
 - 8.5 Manufacture, Properties & Uses of Flexible Chrome Retanned Sole Leather

Instructional Objectives

1: Heavy Leather, Types & Uses

- 1.1 Explain the concept and importance of heavy leather in the leather industry.
- 1.2 Define basic technical terms related to sole and heavy leather.
- 1.3 Describe the flow chart and sequence of operations involved in sole leather manufacture.
- 1.4 Differentiate between heavy sole leather and light sole leather.
- 1.5 Compare flexible sole leather with waterproof sole leather.
- 1.6 Identify the manufacture, properties, and uses of belting, harness, and saddlery leather.
- 1.7 Explain the function and characteristics of insole leather.
- 1.8 Describe the general physical and mechanical properties of sole leather.

2: Vegetable Tanning Materials & Preparation of Tanning Extracts

- 2.1 Identify major vegetable tanning materials and their countries of origin.
- 2.2 Explain the chemical composition of common vegetable tanning materials.
- 2.3 Describe the characteristics and tanning behavior of various vegetable tannins.
- 2.4 Explain the leaching process of Babool bark as practiced in Pakistan.
- 2.5 Describe the properties of vegetable tanning liquors.
- 2.6 Explain concentration, solidification, spray drying, bleaching, and solubilization of extracts.
- 2.7 Differentiate between sulfated and bleached mimosa extracts.
- 2.8 Explain the properties and uses of sulfated quebracho and sweetened chestnut.
- 2.9 Describe the role of acids and salts in vegetable tanning extracts.
- 2.10 Explain the importance and methods of blending tanning extracts.
- 2.11 Identify factors affecting diffusion of tanning extracts in pelts.
- 2.12 Differentiate between tannins and non-tannins.

3: Practical Tanning Process of Heavy Leather

- 3.1 Explain the objectives and methods of soaking for heavy leather.
- 3.2 Identify and use common soaking aids.
- 3.3 Explain the liming process and its objectives.
- 3.4 Describe the counter-current liming system.
- 3.5 Explain the concept and importance of pelt yield.
- 3.6 Calculate pelt yield and rounding percentage.
- 3.7 Identify causes of pelt yield loss and suggest remedies.
- 3.8 Explain objectives, methods, and degree of deliming for sole leather.
- 3.9 Describe pickling and pre-tanning processes.
- 3.10 Explain the use of syntans and chrome in pre-tannage.

4: Tanning of Heavy Leathers

- 4.1 Explain the principles and working of pit tanning.
- 4.2 Describe pit-drum tanning systems.
- 4.3 Explain rapid vegetable tanning techniques.
- 4.4 Describe dry powder tanning and its applications.
- 4.5 Explain the bag tanning method and its advantages.

5: Post-Tanning Treatment of Heavy / Sole Leather

- 5.1 Explain the purpose and methods of bleaching in sole leather.
 - 5.1.1 Differentiate between American, conventional, and syntan bleaching processes.
- 5.2 Describe washing and sammying operations.
- 5.3 Explain loading methods, materials used, and their effects on leather.
- 5.4 Describe the objectives and methods of fat-liquoring.
- 5.5 Explain piling and its significance in heavy leather processing.
- 5.6 Identify different drying methods and factors affecting drying rate.
- 5.7 Explain precautions during drying and describe drying chamber construction and operation.

6: Finishing of Sole Leather

- 6.1 Explain the purpose and importance of sole leather finishing.
- 6.2 Describe conditioning and drum setting operations.
 - 6.2.1 Explain the importance of conditioning prior to finishing.
- 6.3 Describe scouring objectives and methods.
- 6.4 Explain reasons for hand oiling and materials used.
- 6.5 Describe the importance and method of hand setting.
- 6.6 Explain final drying methods for sole leather.
- 6.7 Describe rolling operations and their effect on sole leather quality.

7: Defects of Sole Leather

- 7.1 Identify common defects that occur in sole leather.
 - 7.1.1 Explain causes and remedies of lime blast.
 - 7.1.2 Identify kiss marks and their prevention.
 - 7.1.3 Explain causes of color darkening and iron stains.
 - 7.1.4 Identify grain cracking and methods to prevent it.
 - 7.1.5 Explain drawn and pebbled grain defects.
 - 7.1.6 Describe frizzed, scuffed, and delaminated grain defects.
 - 7.1.7 Recommend corrective measures to improve sole leather quality.

8: Manufacturing of Different Types of Heavy Leather

- 8.1 Explain the properties of belting leather.
- 8.2 Describe the manufacture of belting, saddlery, and harness leather from vegetable crust leather.
- 8.3 Explain the production and properties of vegetable upholstery hides.
- 8.4 Describe the manufacture and applications of full-chrome upholstery leather.
- 8.5 Explain the manufacture, properties, and uses of flexible chrome retanned sole leather.

RECOMMENDED REFERENCE BOOKS

1. Kazi, S. H. (2016). *Principles of leather manufacturing*.
2. Hashmi, A. S., & Rafique, Z. (n.d.). *A short view of leather chemistry*.
3. Sarkar, K. T. (1981). *Theory and practice of leather manufacture*. Ajoy Sorcar.
4. Ogiwara, C. (n.d.). *Practical guidelines to light leather processing*.
5. Briggs, P. S. (n.d.). *Gloving, clothing and special leather*. Tropical Products Institute (TPI). (With J. C. Barrett).
6. Ogilvie, E. (n.d.). *Leather finishing*. Nene College, Northampton, England.
7. Covington, A. D. (n.d.). *Tanning chemistry: The science of leather*. RSC Publishing.
8. Watt, A. (n.d.). *Leather manufacture*. William Clowes and Sons Ltd., London.

List of Practical

192 Hrs

1. Evaluate Raw Materials

- 1.1 Physical Appearance
- 1.2 Softness, Flexibility
- 1.3 Hair slip, Puncture Strength
- 1.4 Area Substance & Weight

2. Apply Curing Process

- 2.1 Wet salting
- 2.2 Dry curing on frame
- 2.3 Dry salting

3. Perform Soaking Process

- 3.1 Soaking of Wet Salted, Dry Cured & Dry Salted Raw Material
- 3.2 Softness, Flexibility after Soaking
- 3.3 Hair slip, Putrefaction & Puncture Strength after Soaking
- 3.4 Soak Weight

4. Apply Depilation & Liming Process

- 4.1 Sodium Sulfide
- 4.2 Breaking of Drum
- 4.3 Dissolving
- 4.4 Lime
- 4.5 Slaking
 - 4.6 Sieving
 - 4.7 Dissolving to make Slurry
 - 4.8 Painting
- 4.9 Preparation of Paint
- 4.10 Application of Paint
- 4.11 Liming
- 4.12 Plumping
- 4.13 Pelt Weight
- 4.14 New Lime & its Effect

5. Perform De Liming Process

- 5.1 Use of different De liming Material
- 5.2 Pelt Condition (Degree of Swelling)
- 5.3 Grain Clearance & Physical Appearance
- 5.4 Degree of Deliming
- 5.5 Deliming pH

6. Conduct Bating Process

- 6.1 Use of Enzymatic Bate
- 6.2 Observe Physical Effects of Bating
- 6.3 Degree & Test of Bating
- 6.4 Cross-section pH

7. Carry Out Pickling Process

- 7.1 Use of different Pickling Agents
- 7.2 Acid Swelling
- 7.3 Negative Swelling

8. Perform Tanning Process

- 8.1 Vegetable Tanning

- 8.2 With Babool Bark
- 8.3 With Mimosa Extract
- 8.4 With Babool & Mimosa Extracts
- 8.5 Chrome Pre-tannage
- 8.6 Chrome Tanning
- 8.7 Tanning with Basic Chromium Sulfate
- 8.8 Boil Test
- 8.9 Neutralization & Fat-liquoring
- 8.10 Wet Blue Stock
- 8.11 Substance
- 8.12 Area
- 8.13 Physical Appearance

LT-133 Tannery Machinery Practice

Total Contact Hours

Theory	64	T	P	C
Practical	96	2	3	3

Learning Outcomes:

The students will be able to:

1. Identify, classify, and explain the working principles, advantages, and applications of wooden, stainless steel, and polypropylene tannery drums used in leather processing.
2. Gain knowledge of fleshing and unhairing equipment, including machine-based and hand-operated tools, and will understand their role in effective removal of flesh and hair from raw hides and skins.
3. Students will be able to describe the functions and operational principles of samming, splitting, and shaving machines and evaluate their importance in thickness control and moisture reduction.
4. Learners will understand various drying methods (vacuum, tunnel, conveyor, toggle, hang drying) and post-drying processes such as conditioning, staking, buffing, and dedusting to improve leather softness and surface quality.
5. Students will be able to explain finishing machinery (spray systems, roller coating, glazing, embossing, rotto press) and accurately describe leather trimming, area measuring methods, and packing procedures used in commercial tanneries

1. Tannery Drums

9 Hrs

- 1.1 Introduction
- 1.2 Wooden Tannery Drums
- 1.3 Experimental Wooden and Stainless Steel Drums
- 1.4 Poly propylene Drums

2. Fleshing and Unhairing Equipments

9 Hrs

- 2.1 Introduction
- 2.2 Fleshing Machine
- 2.3 Un-hairing Machine
- 2.4 Hand Fleshing Equipment's

3. Mechanical operation after Wet Blue

10 Hrs

- 3.1 Introduction
- 3.2 Samming Machine
- 3.3 Splitting Machine
- 3.4 Shaving Machine

4. Mechanical operation after Crust

10 Hrs

- 4.1 Introduction
- 4.2 Samming and Setting out
- 4.3 Vacuum Dryer
- 4.4 Tunnel Dryer
- 4.5 Conveyor Dryer
- 4.6 Toggle Dryer
- 4.7 Hang Drying

5. Operation after Drying

10 Hrs

5.1 Introduction	
5.2 Conditioning	
5.3 Types of Staking	
5.4 Buffing Machines	
5.5 Dedusting	
6. Finishing Machinery	8 Hrs
6.1 Introduction	
6.2 Spray Gun	
6.3 Automatic Spray Plant	
6.4 Roller Coater	
6.5 Friction Glazing	
6.6 Embossing Machines	
6.7 Rotto Press	
7. Area Measuring	8 Hrs
7.1 Introduction	
7.2 Trimming	
7.3 Measuring by Hand	
7.4 Measuring by Machines	
7.5 Packing	

Instructional Objectives

1: Tannery Drums – Instructional Objectives

- 1.1 Understand the role and importance of tannery drums in leather processing.
- 1.2 Identify different types of tannery drums used in modern tanneries.
- 1.3 Explain the construction, working principle, and applications of wooden tannery drums.
- 1.4 Differentiate between experimental wooden drums and stainless-steel drums.
- 1.5 Describe the advantages, limitations, and uses of polypropylene drums.
- 1.6 Compare drum materials based on durability, chemical resistance, and processing efficiency.

2: Fleshing and Unhairing Equipment – Instructional Objectives

- 2.1 Understand the purpose of fleshing and unhairing in beamhouse operations.
- 2.2 Explain the construction and working principle of a fleshing machine.
- 2.3 Operate a fleshing machine safely and efficiently.
- 2.4 Describe the working mechanism of unhairing machines.
- 2.5 Identify common defects caused by improper fleshing and unhairing.
- 2.6 Recognize various hand fleshing tools and explain their uses.
- 2.7 Compare hand fleshing methods with mechanical fleshing operations.

3: Mechanical Operations after Wet Blue – Instructional Objectives

- 3.1 Understand the importance of post wet-blue mechanical operations.
- 3.2 Explain the working principle of a samming machine.
- 3.3 Describe the splitting process and its role in thickness control.
- 3.4 Explain the function and operation of splitting machines.
- 3.5 Understand shaving operations and explain the working of shaving machines.
- 3.6 Identify quality issues arising from improper samming, splitting, or shaving.

4: Mechanical Operations after Crust – Instructional Objectives

- 4.1 Understand the need for mechanical processing after crusting.
- 4.2 Explain the processes of samming and setting out after tanning.
- 4.3 Describe the working principle of vacuum dryers and their advantages.
- 4.4 Explain the function and operation of tunnel dryers.
- 4.5 Describe conveyor dryers and their industrial applications.
- 4.6 Explain the working of toggle dryers and hang drying systems.
- 4.7 Compare different drying methods in terms of efficiency, leather quality, and energy use.

5: Operations after Drying – Instructional Objectives

- 5.1 Understand the objectives of post-drying operations in leather manufacture.
- 5.2 Explain the conditioning process and its importance for leather softness.
- 5.3 Identify different types of staking machines and their applications.
- 5.4 Describe the working principle of buffing machines.
- 5.5 Understand the purpose of dedusting in finishing operations.
- 5.6 Identify defects caused by improper conditioning, staking, or buffing.

6: Finishing Machinery – Instructional Objectives

- 6.1 Understand the role of finishing machinery in leather appearance and performance.
- 6.2 Explain the construction and working of spray guns.
- 6.3 Describe automatic spray plants and their advantages over manual spraying.

- 6.4 Explain the working principle of roller coaters.
- 6.5 Understand friction glazing and its effect on leather gloss.
- 6.6 Describe embossing machines and their use in pattern creation.
- 6.7 Explain the function of Rotto Press in leather finishing operations.

7: Area Measuring – Instructional Objectives

- 7.1 Understand the importance of area measurement in leather trade.
- 7.2 Explain trimming operations prior to measurement.
- 7.3 Measure leather area accurately using manual methods.
- 7.4 Explain the working principles of leather measuring machines.
- 7.5 Compare manual and machine measuring methods.
- 7.6 Understand packing procedures after area measurement for dispatch and storage.

RECOMMENDED REFERENCE BOOKS

- 1. Kazi, S. H. (2016). *Principles of leather manufacturing*.
- 2. Hashmi, A. S., & Rafique, Z. (n.d.). *A short view of leather chemistry*.
- 3. Sarkar, K. T. (1981). *Theory and practice of leather manufacture*. Ajoy Sorcar.
- 4. Ogiwara, C. (n.d.). *Practical guidelines to light leather processing*.
- 5. Briggs, P. S. (n.d.). *Gloving, clothing and special leather*. Tropical Products Institute (TPI). (With J. C. Barrett).
- 6. Ogilvie, E. (n.d.). *Leather finishing*. Nene College, Northampton, England.
- 7. Covington, A. D. (n.d.). *Tanning chemistry: The science of leather*. RSC Publishing.
- 8. Watt, A. (n.d.). *Leather manufacture*. William Clowes and Sons Ltd., London.

List of Practicals

96 Hrs

Operate and maintain following machines with safety measures:-

1. Fleshing Machine
2. Tanning & other Drums
3. Splitting Machine
4. Shaving Machine
5. Sammying Machine
6. Setting Out Machine
7. Vacuum Dryer
8. Toggle Dryer.
9. Vibration Staker
10. Buffing Machine
11. De-dusting Machine
12. Automatic Spraying
13. Friction Glazing
14. Embossing Press
15. Ironing
16. Area Measuring

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کل وقت 20 گھنٹے:

اسلامیات مطالعہ پاکستان

نصاب سال دوم

حصہ اول اسلامیات

حصہ دوم مطالعہ پاکستان

موضوعات:

1- سورۃ المؤمنون ایک تا گیارہ آیات کا ترجمہ مع تشریح

2- دس منتخب احادیث مع ترجمہ و تشریح

() خیر کم من تعلم القرآن و علمہ

() لا ایمان لمن لا امانتہ لہ ولا دین لا من لا اعہد لہ

() و یا کم و الظن ان الظن اکرب الحدیث

() من احدث فی امرنا هذا ما لیس منہ فہو رد

() من حمل علینا السلاح فلیس منا

() انا و کافل الیتیم فی الجنۃ

() لا ضرور ولا ضرار فی السلام

() کلکم راع و کلکم مسول عن رعیتہ

3- سیرۃ طیبہ

() مکی زندگی۔ ولادت۔ بعثت۔ ہجرت

() مدنی زندگی۔ مواخات۔ میثاق مدینہ۔ فتح مکہ (سبب و نتائج)

4- حضور ﷺ بحیثیت

() خطبہ حجۃ الوداع۔ انسانی حقوق کا اعلامیہ حقوق انسانی پالیسی 2018

() معلم کامل۔ سربراہ خاندان

5- اسلامی معاشرہ

نظام تعلیم اور اس کے مقاصد۔ عدل و انصاف۔ امر بالمعروف۔ نہی عن المنکر۔ انسانی حقوق کا معاشرتی اور معاشی ترقی میں کردار

جہاد۔ کسب حلال۔ مسجد (اہمیت و فضیلت)

6- اسلامی ریاست کی تعریف۔ اسلامی ریاست کی خصوصیات۔ اسلامی حکومت کے فرائض۔ اسلامی طرز حکومت۔

() حضور ﷺ کی بطور سربراہ بیان کر سکے
حضور ﷺ بحیثیت

() خطبہ حجۃ الوداع - انسانی حقوق کا اعلامیہ حقوق انسانی پالیسی 2018 کے بارے جان سکے
اسلامی معاشرہ:

عمومی مقاصد: اسلامی معاشرہ کی خصوصیات سے آگاہی حاصل کر سکے
خصوصی مقاصد:

- () اسلامی معاشرہ کا معنی و مفہوم کر سکے
- () اسلامی معاشرہ کی امتیازی خصوصیات بیان کر سکے
- () اسلامی معاشرہ میں عدل و احسان کی اہمیت بیان کر سکے
- () تبلیغ کے لغوی معنی بیان کر سکے
- () تبلیغ کی اہمیت اور ضرورت بیان کر سکے
- () جہاد کے لفظی و اصطلاحی معنی بیان کر سکے
- () جہاد کی اہمیت بیان کر سکے
- () جہاد اور قتل میں فرق بیان کر سکے
- () جہاد کی مختلف اقسام بیان کر سکے
- () لفظ مسجد کی تعریف بیان کر سکے
- () مسجد کی سابقہ حیثیت کو بحال کرنے کے بارے میں اقدامات کو مان سکے
- () انسانی حقوق کی معاشی اور معاشرتی ترقی میں اہمیت اور کردار بیان کر سکے

اسلامی ریاست:

عمومی مقاصد:

- () اسلامی ریاست کی خصوصیات بیان کر سکے
- خصوصی مقاصد:

- () ریاست کی تعریف بیان کر سکے
- () اسلامی ریاست میں طرز حکومت سے آگاہی حاصل کر سکے
- () اسلامی ریاست کی خصوصیات بیان کر سکے

- () اسلامی ریاست کے اغراض و مقاصد بیان کر سکے
- () اسلامی ریاست کے قیام کی لیے جدوجہد کر سکے
- () حقوق آگاہی و معلومات تک رسائی کا قانون جان سکے
- () ملازمت پیشہ خواتین کے حقوق کا تحفظ جان سکے اور
- () معاشرے میں خواتین کے حقوق کا تحفظ یقینی بنائے

نصاب مطالعہ پاکستان

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کل وقت 12 گھنٹے		

سال دوم

حصہ دوم

موضوعات:

- () دو قومی نظریہ
- () تحریک پاکستان
- () انڈین کانگریس
- () مسلم لیگ
- () تقسیم بنگال
- () میثاق لکھنؤ
- () تحریک خلافت
- () سندھو تحریک
- () تجاویز دہلی
- () نہرو رپورٹ
- () قائد اعظم کے چودہ نکات
- () خطبہ آلہ آباد
- () انتخابات 1938 اور انتقال اقتدار
- () قرارداد پاکستان

حصہ دوم
مطالعہ پاکستان

تدریس مقاصد:

تحریک پاکستان:

عمومی مقاصد:

() قیام پاکستان کے اسباب و تحریک کو بیان کر سکے

خصوصی مقاصد:

() قومیت کے مفہوم کو بیان کر سکے

() دو قومی نظریہ کی تعریف و توضیح کر سکے

() دو قومی نظریہ کی اہمیت بیان کر سکے

() ہندوستانی مسلمانوں کی محرومیوں کو بیان کر سکے

() قومی تشخص کو بحال رکھنے کے لیے مسلمانان ہند کی مساعی بیان کر سکے

() آزادی ہند اور قیام پاکستان علامہ اقبال اور قائد اعظم کی مسابہام کریں

() قیام پاکستان سے مستقبل اسلامی مملکت کے قیام کے لیے مسلم عوام کی کوششوں کو بیان کر سکے

() مسلم لیگ کے قیام پاکستان کے لیے جدو جہد بیان کر سکے

(غیر مسلم طلباء کے لیے)

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کل وقت 20 گھنٹے

نصاب اخلاقیات

سال دوم

موضوعات:

معاشرتی اقدار بلحاظ ہمسایہ۔ قوم۔ قومی سطح۔ شہری سطح۔ صنعتی اداروں کی سطح۔ ضروریات۔ ورثہ

() حقوق و فرائض

() قوت برداشت

() قوت ارادی

() لگن و جذبہ

() وسیع النظری

() بے غرضی

() انسانی دوستی

() حفاظتی شعور

() پاس آزادی

() کامل آگاہی

() تغیرات کو قبول کرنا

() خود شناسی

() انسانی حقوق کا اعلامیہ / حقوق انسانی پالیسی 2018

() انسانی حقوق کا معاشرتی اور معاشی ترقی میں کردار

() حقوق آگاہی / معلومات تک رسائی۔ ملازم پیشہ خواتین کا تحفظ

نصاب اخلاقیات

سال دوم

تدریس مقاصد:

طالب علم اخلاقیات کی اہمیت و ضرورت سے آگاہ ہو سکے اور بیان کر سکے

خصوصی مقاصد: طالب علم اس قابل ہو کہ

- () موضوعات کا مطلب بیان کر سکے
- () عملی زندگی سے مثالوں کی نشاندہی کر سکے
- () اپنی شخصیت اور معاشرے پر موضوعات کے مطابق اثرات پیدا کرنے کے طریقے بیان کر سکے
- () اعلیٰ اخلاقی اقدار میں سے قوت برداشت - قوت ارادی - لگن و جذبہ - وسیع النظری - بے غرض - انسانی دوستی شعور - پاس آزادی - کامل آگاہی اور خود شناسی کی اہمیت
- () اخلاقیات سے متصف ہو کر قومی خدمت بہتر طور پر انجام دے سکے
- () انسانی حقوق کا اعلامیہ / حقوق انسانی کی پالیسی 2018 کے بارے میں جان سکے
- () انسانی حقوق کا معاشرتی اور معاشی ترقی میں اہمیت اور کردار بیان کر سکے
- () حقوق آگاہی / معلومات تک رسائی کے قانون کو جان سکے
- () ملازم پیشہ خواتین کا تحفظ کو اخلاقیات کا حصہ تصور کرے

Tarjumat-ul-Quran / Civics-II

TTQ-211 / Civic-211;

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Total Contact Hours:

Theory: 32

Practical: 0

Note: Syllabi for this subject would be as per BISEs/General education, developed by Punjab Curriculum TextBook Board (PCTB)

LT - 204 Principles of Leather Manufacturing - II

Total Contact Hours

Theory	64	T	P	C
Practical	192	2	6	4

Learning Outcomes:

The students will be able:

1. To understand and explain pre-dyeing operations of leather, including preservation of tanned stock, ageing effect, selection and sorting, sammying, setting, splitting, and shaving, and their influence on final leather quality.
2. To study the principles and practice of neutralization, its objectives, degree of neutralization, neutralizing agents, and procedures for chrome- and vegetable-tanned leathers.
3. To develop knowledge of retanning processes, including types of vegetable retanning materials, syntans, rechroming, zirconium retanning, and their effects on leather properties.
4. To understand the theory and application of leather dyeing, covering dye types, dye chemistry, dye–leather interactions, drum dyeing methods, and special dyeing techniques for chrome and vegetable tanned leathers.
5. To explain fat-liquoring and drying processes, including types of fat-liquors, factors affecting fat-liquoring, drying mechanisms, and various industrial drying methods.
6. To gain practical and theoretical understanding of post-drying operations, such as softening, staking, water repellency, and waterproofing techniques for chrome and vegetable tanned leathers

1. Pre-dyeing operations

9 Hrs

- 1.1 Preservation of Tanned Stock
- 1.2 Ageing Effect
- 1.3 Selection & Sorting
- 1.4 Sammying & Setting
- 1.5 Splitting
- 1.6 Shaving

2. Neutralization

7 Hrs

- 2.1 Introduction
- 2.2 Objectives & Function of Neutralization
- 2.3 Degree of Neutralization
- 2.4 Neutralizing Agents
- 2.5 Neutralization Procedure for Chrome & Vegetable Tanned Leather

3. Retanning

8 Hrs

- 3.1 Introduction
- 3.2 Types of Veg. Retanning Materials
 - 3.2.1 Objectives & Methods
 - 3.2.2 Vegetable Retanning Agents

3.3 Syntans	
3.3.1 Classification	
3.3.2 Properties	
3.4 Rechroming	
3.5 Retanning with Zirconium	
3.6 Methods	
4. Dyeing of leather	8 Hrs
4.1 Introduction	
4.2 Dyes & their Kinds	
4.3 Anionic Dyes	
4.3.1 Acid Dyes	
4.3.2 Acid selected Dyes	
4.3.3 Pre-metalized Dyes	
4.3.4 Direct Dyes	
4.3.5 Dye Woods	
4.3.6 Comparison of Light Fastness & Penetration of various types of Anionic Dyes	
4.4 Acid Dyes	
4.4.1 Structure of Acid Dye Molecule	
4.4.2 Effect of Temperature & Concentration	
4.4.3 Effect of Tannage & pH	
4.4.4 Properties of Common Yellow, Red & Blue Acid Dyes	
4.5 Cationic dyes	
4.5.1 Structure of Cationic Dye Molecule	
4.5.2 Application of Cationic Dyes in Leather Dyeing	
4.6 Drum Dyeing of Chrome Tanned Leather	
4.6.1 Factors Effecting Drum Dyeing	
4.6.2 Dyeing of Full Chrome Leather	
4.6.3 Dyeing of Chrome Retanned Leather	
4.6.4 Dyeing of Chrome Crust Stock	
4.6.5 No Float Dyeing	
4.6.5 Sandwich Dyeing	
4.7 Brush Staining Method	
4.8 Spray & Curtain Coating Techniques of Dyeing	
4.9 Dyeing of Vegetable Tanned Leather	
5. Fat-liquoring of leather	9 Hrs
5.1 Types of Fat-liquors	
5.1.1 Non-ionic	
5.1.2 Cationic and Anionic	
5.1.3 Multi-charge Fat-liquors	
5.2 Factors Effecting Fat-liquoring of Chrome Leather	
5.3 Fat-liquoring Methods & Techniques	
6. Drying of leather	7 Hrs
6.1 Mechanism of Drying & Rate of Drying	
6.2 Drying Methods	
6.2.1 Hanging	
6.2.2 Toggle Drying	

6.2.3 Paste Drying	
6.2.4 Vacuum Drying	
6.2.5 Micro Wave Drier & High Frequency Drying	
6.2.6 Freeze Drying of Raw Hides & Skins	
7. Softening processes	8 Hrs
7.1 Staking	
7.1.1 Hand Staking & Perching	
7.1.2 Slocomb Staking Machine	
7.1.3 Rotary Staking Machine	
7.1.4 Vertical Frame Staker	
7.1.5 Schlageter & Molissa System	
7.2 Dry drumming	
7.3 Boarding	
8. Water repellency & water proofing	8 Hrs
8.1 Introduction	
8.1.1 Methods for Water Repellency	
8.1.2 Materials for Water Repellency	
8.2 Water Proofing of Chrome Tanned Leather	
8.3 Water Proofing of Vegetable Tanned Leather	

Instructional Objectives

1. Pre-dyeing operations

- 1.1 Explain the importance of preservation of tanned stock before wet finishing.
- 1.2 Describe the ageing effect on tanned leather and its influence on dyeing results.
- 1.3 Perform proper selection and sorting of leather according to quality and end use.
- 1.4 Explain the purpose and working principles of sammying and setting operations.
- 1.5 Describe the splitting process and its effect on thickness uniformity.
- 1.6 Explain the shaving operation and its role in achieving accurate substance.

2. Neutralization

- 2.1 Define neutralization and explain its necessity in leather processing.
- 2.2 Describe the objectives and functions of neutralization in wet finishing.
- 2.3 Explain the concept and control of degree of neutralization.
- 2.4 Identify different neutralizing agents and their characteristics.
- 2.5 Explain step-by-step neutralization procedures for chrome-tanned and vegetable-tanned leather.

3. Retanning

- 3.1 Explain the objectives and methods of retanning.
- 3.2 Explain the objectives and methods of retanning.
- 3.3 Identify vegetable retanning agents and describe their applications.
- 3.4 Define syntans and explain their classification and properties.
- 3.5 Explain the process and purpose of rechroming.
- 3.6 Describe retanning with zirconium and its advantages.
- 3.7 Explain different methods of retanning used in leather manufacture.

4. Dyeing of leather

- 4.1 Explain the chemistry, structure, and properties of acid dyes used in leather dyeing.
- 4.2 Describe cationic dyes, their structure, and their application in leather dyeing.
- 4.3 Explain the drum dyeing process of chrome-tanned leather and its influencing factors.
- 4.4 Describe brush staining, spray, and curtain coating dyeing techniques.
- 4.5 Explain dyeing methods for vegetable-tanned leather and compare them with chrome leather dyeing.
- 4.6 Evaluate light fastness, penetration, and performance of different dye classes.

5. Fat-liquoring of leather

- 5.1 Classify fat-liquors into non-ionic, cationic, anionic, and multi-charge types.
- 5.2 Explain the factors affecting fat-liquoring of chrome leather.
- 5.3 Describe different fat-liquoring methods and techniques and their impact on softness and durability.

6. Drying of leather

- 6.1 Explain the mechanism and rate of drying of leather.
- 6.2 Describe various drying methods including hanging, toggle, paste, vacuum, microwave, high-frequency, and freeze drying.
- 6.3 Compare different drying techniques in terms of efficiency, leather quality, and applications.

7. Softening processes

- 7.1 Explain the purpose of staking and its effect on leather softness.
- 7.2 Describe hand staking, perching, and various mechanical staking machines.
- 7.3 Explain dry drumming and boarding processes used for softening leather.

8. Water repellency & water proofing

- 8.1 Explain the principles of water repellency in leather.
- 8.2 Describe different methods and materials used for water repellency.
- 8.3 Explain water proofing techniques for chrome-tanned leather.
- 8.4 Explain water proofing techniques for vegetable-tanned leather and compare both systems.

RECOMMENDED REFERENCE BOOKS

- 1. Kazi, S. H. (2016). *Principles of leather manufacturing*.
- 2. Hashmi, A. S., & Rafique, Z. (n.d.). *A short view of leather chemistry*.
- 3. Sarkar, K. T. (1981). *Theory and practice of leather manufacture*. Ajoy Sorcar.
- 4. Ogiwara, C. (n.d.). *Practical guidelines to light leather processing*.
- 5. Briggs, P. S. (n.d.). *Gloving, clothing and special leather*. Tropical Products Institute (TPI). (With J. C. Barrett).
- 6. Ogilvie, E. (n.d.). *Leather finishing*. Nene College, Northampton, England.
- 7. Covington, A. D. (n.d.). *Tanning chemistry: The science of leather*. RSC Publishing.
- 8. Watt, A. (n.d.). *Leather manufacture*. William Clowes and Sons Ltd., London.

List of Practical

192 Hrs

Carryout chrome and vegetable crust manufacturing from following materials:-

1. Buff Calf

- 1.1 Soaking
- 1.2 Liming and depilation
- 1.3 Deliming and bating
- 1.4 Degreasing
- 1.5 Pickling
- 1.6 Tanning
- 1.7 Samming, splitting, shaving
- 1.8 Retanning, dying, fat liquoring
- 1.9 Machine operations

2. Cow Calf

1. Soaking
2. Liming and depilation
3. Deliming and bating
4. Degreasing
5. Pickling
6. Tanning
7. Samming, splitting, shaving
8. Retanning, dying, fat liquoring
9. Machine operations

3. Goat

1. Soaking
2. Liming and depilation
3. Deliming and bating
4. Degreasing
5. Pickling
6. Tanning
7. Samming, splitting, shaving
8. Retanning, dying, fat liquoring
9. Machine operations

4. Sheep

1. Soaking
2. Liming and depilation
3. Deliming and bating
4. Degreasing
5. Pickling
6. Tanning
7. Samming, splitting, shaving
8. Retanning, dying, fat liquoring
9. Machine operations

LT - 223 Crusting of Upper & Soft Leather

Total Contact Hours

Theory	64	T	P	C
Practical	96	2	3	3

Learning Outcomes:

The students will be able to:

1. Understand types and manufacturing of calf, cow, buffalo, and goat upper leathers.
2. Identify raw materials and different tannage systems used for light and upper leathers.
3. Evaluate physical and performance properties of garment and gloving leathers.
4. Explain manufacturing methods of specialized and sports leathers.
5. Relate leather types to their appropriate end uses in footwear, garments, gloves, and sports goods.

1. Manufacture of calf & cow side upper leather 8 Hrs

- 1.1 Full Grain Leather
 - 1.1.1 Full Chrome
 - 1.1.2 Chrome Retanned
 - 1.1.3 Chrome Free
- 1.2 Corrected Grain Leather
- 1.3 Suede from Calf
- 1.4 Softie Upper Leather

2. Buff calf leather 8 Hrs

- 2.1 Leathers from small Buffalo Calves
- 2.2 Semi-chrome Leather
- 2.3 Buffalo side Leather
 - 2.3.1 Full Grain Buff side
 - 2.3.2 Corrected Grain Leather
 - 2.3.3 Cow Calf Suede
- 2.4 Full Veg. tanned

3. Manufacture of goat skin upper leather 7 Hrs

- 3.1 Glazed Kid
- 3.2 Softie Nappa
- 3.3 Goat Skin Suede

4. Manufacture of specialized upper leathers 8 Hrs

- 4.1 White Finished Leather
- 4.2 Nubuck
- 4.3 Shrunk Grain Upper Leather
- 4.4 Zug grain Leather
- 4.5 Water Proof Leather
- 4.6 Washable Leather
- 4.7 Chrome Tanned Lining
- 4.8 Vegetable Tanned Lining

5. Type & uses of light leathers 9 Hrs

- 5.1 Raw Materials, Type of Tannage & Uses for following Kinds of Light Leather
- 5.2 Glove Leather
- 5.3 Clothing Leather
- 5.4 Wool Sheep Skin
- 5.5 Chamois Leather

6. Properties of garment & gloving leather

9 Hrs

- 6.1 Required Physical Properties
- 6.2 Pattern & Cutting Area
- 6.3 Artistic Merits & Uniformity
- 6.4 Weight & Color
- 6.5 Stitch Tear Strength
- 6.6 Tensile Strength & Elongation at Break
- 6.7 Dye-Fastness & Resistance to Water Spotting
- 6.8 Water Repellency
- 6.9 Rub Fastness & Perspiration Resistance
- 6.10 Dry Cleanability & Resistance to Pressing
- 6.11 Requirements of Gloving Leather
- 6.12 Men's & Ladies Gloves
- 6.13 Sports Gloves, Working Gloves
- 6.14 Non-elastic Stretch
- 6.15 Required Tannage for Gloving & Garment Leather
- 6.16 From Cow Hides
- 6.17 From Sheep Skins
- 6.18 From Goat Skins

7. Manufacture of garment & gloving leather

7 Hrs

- 7.1 From Sheep & Goat Skins
- 7.2 From Buff Calf & Cow Calf
- 7.3 From Deer Skins
- 7.4 From Kangaroo Skins
- 7.5 Work Gloves Leather from Splits

8. Football and specialized leather

8 Hrs

- 8.1 Hand Ball Leathers from Cow Bends
- 8.2 Foot Bait Feathers from Cow
- 8.3 Finishing of Football Leather
- 8.4 Leather for Sports Gloves
- 8.5 Chamois
- 8.6 Wool Sheep Skins
- 8.7 Cow & Cow Calf Fur Leather
- 8.8 Goat Skin Fur Leather

Instructional Objectives

1. Manufacture of Calf & Cow Side Upper Leather

- 1.1 Understand the concept and classification of upper leathers.
- 1.2 Differentiate between full grain, corrected grain, suede, and softie upper leathers.
- 1.3 Explain the manufacturing process of full chrome, chrome retanned, and chrome-free leathers.
- 1.4 Compare properties and applications of calf and cow side upper leathers.
- 1.5 Identify suitable tannages for various types of upper leather.

2. Buff Calf Leather

- 2.1 Identify characteristics of small buffalo calf and buff side leathers.
- 2.2 Explain the manufacture of semi-chrome and full vegetable tanned buff leather.
- 2.3 Distinguish between full grain and corrected grain buff side leathers.
- 2.4 Understand suede production from cow calf and buffalo hides.
- 2.5 Evaluate end uses of buff calf and buffalo side leathers.

3. Manufacture of Goat Skin Upper Leather

- 3.1 Describe the structural characteristics of goat skins.
- 3.2 Explain the manufacturing process of glazed kid leather.
- 3.3 Understand production of softie nappa and goat skin suede.
- 3.4 Compare physical properties of goat skin upper leathers.
- 3.5 Identify appropriate applications of goat upper leathers.

4. Manufacture of Specialized Upper Leathers

- 4.1 Define specialized upper leathers and their importance.
- 4.2 Explain manufacturing methods of white finished, nubuck, and shrunken grain leathers.
- 4.3 Understand zug grain leather and its special features.
- 4.4 Describe the processes involved in waterproof and washable leather manufacture.
- 4.5 Differentiate between chrome tanned and vegetable tanned lining leathers.

5. Type & Uses of Light Leathers

- 5.1 Classify different types of light leathers.
- 5.2 Identify raw materials and tannages used for light leather manufacture.
- 5.3 Explain production and uses of glove and clothing leathers.
- 5.4 Describe wool sheep skin and chamois leather.
- 5.5 Correlate leather properties with their end uses.

6. Properties of Garment & Gloving Leather

- 6.1 Identify required physical and aesthetic properties of garment and gloving leather.
- 6.2 Explain importance of pattern cutting area and uniformity.
- 6.3 Evaluate strength properties such as tensile, tear, and elongation.
- 6.4 Understand color fastness, rub fastness, and perspiration resistance.
- 6.5 Describe requirements of different types of gloves.
- 6.6 Compare garment and gloving leathers from cow, sheep, and goat skins.

7. Manufacture of Garment & Gloving Leather

- 7.1 Explain manufacturing processes of garment and glove leather from various skins.
- 7.2 Compare leather production from sheep, goat, buff calf, and cow calf skins.

- 7.3 Understand special leather manufacture from deer and kangaroo skins.
- 7.4 Describe work glove leather production from splits.
- 7.5 Select appropriate processing methods for different end uses.

8. Football and Specialized Leather

- 8.1 Identify leather requirements for footballs and sports goods.
- 8.2 Explain manufacture of hand ball leather from cow bends.
- 8.3 Describe feathering and finishing of football leather.
- 8.4 Understand leather selection for sports gloves.
- 8.5 Explain chamois, wool sheep skin, and fur leather production.
- 8.6 Identify uses of cow, cow calf, and goat skin fur leathers.

RECOMMENDED REFERENCE BOOKS

- 1. Kazi, S. H. (2016). *Principles of leather manufacturing*.
- 2. Hashmi, A. S., & Rafique, Z. (n.d.). *A short view of leather chemistry*.
- 3. Sarkar, K. T. (1981). *Theory and practice of leather manufacture*. Ajoy Sorcar.
- 4. Ogiwara, C. (n.d.). *Practical guidelines to light leather processing*.
- 5. Briggs, P. S. (n.d.). *Gloving, clothing and special leather*. Tropical Products Institute (TPI). (With J. C. Barrett).
- 6. Ogilvie, E. (n.d.). *Leather finishing*. Nene College, Northampton, England.
- 7. Covington, A. D. (n.d.). *Tanning chemistry: The science of leather*. RSC Publishing.
- 8. Watt, A. (n.d.). *Leather manufacture*. William Clowes and Sons Ltd., London.

List of Practical

96 Hrs

Prepare Belting Leather

1. Soaking
2. Liming and depilation
3. Deliming and bating
4. Pickling
5. Vegetable tanning
6. Bleaching
7. Neutralization
8. Retanning, dying, fat liquoring
9. Manufacturing of Belting, Saddlery & Harness Leather from Vegetable Crust

Develop Upholstery Leather

1. Soaking
2. Liming and depilation
3. Deliming and bating
4. Pickling
5. Vegetable tanning
6. Bleaching
7. Neutralization
8. Retanning, dying, fat liquoring
9. Manufacture of Vegetable Upholstery Leather

Prepare Sole Leather

1. Soaking
2. Liming and depilation
3. Deliming and bating
4. Pickling
5. Pre-tanning
6. Vegetable tanning
7. Machine operations
8. Chrome Retanned Sole Leather
9. Water Proof Sole Leather

Prepare fur leather from following:-

1. Sheep
2. Goat
3. Cow & Cow Calf

LT - 254 Principles of Shoe Manufacturing

Total Contact Hours

Theory	64	T	P	C
Practical	192	2	6	4

Learning Outcomes:

The students will be able:

1. Students will be able to identify different parts of shoes and explain various leather styles, edge treatments, and decorations.
2. Students will understand the shape of the foot, pressure distribution during walking, and methods of taking footprints.
3. Students will be able to explain and use different sizing systems such as French (Paris point), English, and Mondo-point.
4. Students will recognize different upper, lining, insole, and soling materials used in shoe manufacturing.
5. Students will be able to understand modeling and pattern engineering methods and create basic shoe upper designs

1. Introduction to boots and shoes 8 Hrs

- 1.1 Parts of a shoe
- 1.2 Distinguish factor of different Leather styles
- 1.3 Edge treatment techniques
- 1.4 Decorations

2. Foot and foot measurements 8 Hrs

- 2.1 Shape of the foot
- 2.2 Pressure distribution under the foot during walking
- 2.3 Foot prints

3. Shoe sizes and sizing system 6 Hrs

- 3.1 Principles of size and fit
- 3.2 French size system (Paris points)
- 3.3 English size system
- 3.4 Mondo-point system

4. Upper and lining materials 8 Hrs

- 4.1 Shoe upper leather
- 4.2 Woven and knitted fabrics
- 4.3 Synthetic upper material
- 4.4 Lining leather
- 4.5 Lining fabrics
- 4.6 Lining coated fabrics
- 4.7 Miscellaneous insole materials

5. Insole materials 6 Hrs

- 5.1 Insole leather
- 5.2 Leather board
- 5.3 Cellulose board

5.4 Non-Woven materials	
6. Soling materials	10 Hrs
6.1 Sole leather	
6.2 Rubber Soling materials	
6.3 Polyvinylchloride (PVC)	
6.4 Thermo-plastic rubber (T.P.R)	
6.5 Polyurethane soling materials	
6.6 Microcellular rubber	
6.7 Ethylene vinyl acetate (EVA)	
6.8 Miscellaneous soling materials	
7. Miscellaneous soling material used in shoe manufacturing	10 Hrs
7.1 Toe puffs and stiffeners	
7.2 Shanks	
7.3 Heels	
7.4 Sewing threads	
7.5 Adhesives	
7.6 Other materials	
8. Modeling & pattern engineering of shoe uppers	8 Hrs
8.1 Form cutting (Copying last)	
8.2 Paper method	
8.3 Tape method	
8.4 Folding copies	
8.5 Standard design light boots for men	
8.6 Standard design oxford boots for men	
8.7 Standard design Gibson boot for men	
8.8 Standard design of insole by plain foot method	
8.9 Standard design of insole by Dr. Shady.	

Instructional Objectives

1. Introduction to Boots and Shoes

- 1.1 Identify and describe the different parts of a shoe.
- 1.2 Differentiate between various leather styles based on their characteristics.
- 1.3 Explain various edge treatment techniques used in shoe manufacturing.
- 1.4 Recognize and describe different types of shoe decorations and their purposes.

2. Foot and Foot Measurements

- 3.1 Explain the structure and shape of the human foot.
- 3.2 Analyze the pressure distribution under the foot during walking.
- 3.3 Interpret footprints and relate them to foot structure and gait.

4. Shoe Sizes and Sizing System

- 4.1 Explain the principles of proper shoe size and fit.
- 4.2 Compare different shoe sizing systems (French, English, Mondopoint).
- 4.3 Convert shoe sizes between different international systems.
- 4.4 Evaluate the importance of correct sizing for comfort and performance.

5. Upper and Lining Materials

- 5.1 Identify different types of upper materials used in footwear.
- 5.2 Compare woven, knitted, and synthetic materials for shoe uppers.
- 5.3 Explain the properties and uses of lining leather and fabrics.
- 5.4 Evaluate the suitability of different materials for specific shoe types.

6. Insole Materials

- 6.1 Describe different types of insole materials and their properties.
- 6.2 Differentiate between leather, cellulose board, and non-woven materials.
- 6.3 Assess the importance of insoles in comfort and durability of shoes.

7. Soling Materials

- 7.1 Identify various soling materials used in footwear manufacturing.
- 7.2 Compare properties of materials such as rubber, PVC, TPR, PU, EVA.
- 7.3 Analyze the advantages and disadvantages of each soling material.
- 7.4 Select appropriate soling material based on function and usage.

8. Miscellaneous Materials Used in Shoe Manufacturing

- 8.1 Identify and describe the function of toe puffs, stiffeners, shanks, and heels.
- 8.2 Explain the role of threads and adhesives in shoe construction.
- 8.3 Recognize other supporting materials used in footwear production.

9. Modeling & Pattern Engineering of Shoe Uppers

- 9.1 Explain different pattern making techniques (form cutting, paper, tape method).
- 9.2 Demonstrate the process of developing shoe upper patterns.
- 9.3 Analyze standard designs such as Oxford, Gibson, and light boots.
- 9.4 Design insoles using plain foot method and Dr. Shady method.
- 9.5 Apply pattern engineering concepts in practical shoe design.

Recommended Books

- 1. Ogilvie, E. (n.d.). *Leather Finishing*. Northampton, England: Nene College.
- 2. Covington, A. D. (2009). *Tanning Chemistry: The Science of Leather*. Cambridge: RSC Publishing.
- 3. Watt, A. (n.d.). *Leather Manufacture*. London: William Clowes and Sons Ltd.

4. Luijten, J. A. J., & Velden, P. W. J. (n.d.). *Principles of Shoe Designing* (Vols. 1–2). Netherlands: TNO Leather & Shoe Research Institute.
5. Luijten, J. A. J., & Velden, P. W. J. (n.d.). *Design, Pattern Engineering and Grading of Footwear* (Vols. 1–2). Netherlands: TNO Leather & Shoe Research Institute

List of Practicals

192 Hrs

1. Prepare mean form cutting (Copying last)
2. Create mean form by using paper method
3. Create mean form by using tape method
4. Create mean form by using folding copies
5. Practice to attach toe puffs and stiffeners
6. Practice to attach shanks
7. Practice to attach heel
8. Practice to adjust sewing threads in machines
9. Apply different adhesives
10. Create a standard design light boots for men
11. Create a standard design oxford boots for men
12. Create a standard design Gibson boot for men
13. Create a standard design of insole by plain foot method
14. Create a standard design of insole by Dr Shady.
15. Perform French size system (Paris points)
16. Perform English size system
17. Perform mondo-point system
18. Create a shape of the foot by using plain foot method
19. Create foot prints with sketching the human foot
20. Create following styles of fashion shoes:-
 - 20.1 Gents shoe
 - 20.2 Ladies shoe
 - 20.3 Chappal
 - 20.4 Sandal

LT - 264 Applied Chemistry - II

Total Contact Hours

Theory	64	T	P	C
Practical	96	2	3	3

Learning Outcomes:

The students will be able to:

1. Understand periodic classification of elements, periodic trends, different blocks (s, p, d), and the properties and reactions of hydrogen.
2. Explain the chemistry, properties, and industrial applications of sodium and calcium compounds, especially their uses in the leather industry.
3. Describe the preparation, properties, and uses of alum and ammonium compounds relevant to industrial processes.
4. Apply modern theories of covalent bonding, including VSEPR theory, molecular orbital theory, hybridization, and molecular shapes of common compounds.
5. Discuss the preparation, properties, and industrial uses of oxygen and sulfur compounds, particularly hydrogen peroxide, sulfur dioxide, and sulfuric acid.
6. Develop understanding of chromium chemistry, solution chemistry, and hydrocarbons, including concentration units, buffer solutions, and reactions of alkanes, alkenes, and alkynes.

1. The chemistry of periodic table

7 Hrs

- 1.1 Periodic classification of elements / periodicity
- 1.2 Different Blocks of Periodic Table (s, p & d)
- 1.3 Hydrogen
 - 1.3.1 Physical Properties
 - 1.3.2 Reaction with Halogens
 - 1.3.3 Reaction with Oxygen
 - 1.3.4 Oxidation & Reduction

2. Compounds of sodium & calcium

8 Hrs

- 2.1 Availability, Properties, Impurities & Uses in Leather Industry of
 - 2.1.1 Chloride Carbonate & Bicarbonate of Sodium
 - 2.1.2 Oxide & Hydroxide of Calcium
 - 2.1.3 Sulfite of Sodium
 - 2.1.4 Sodium Sulfate & Sodium Hydroxide

3. Alum and ammonium compounds

8 Hrs

- 3.1 ALUM (Preparation, Properties & Use in Leather Industry)
- 3.2 AMMONIUM COMPOUNDS
- 3.3 Availability, Properties & Use in Leather Industry: Ammonium Chloride, Sulfate & Hydroxide

4. Modern theories of covalent bonding

8 Hrs

- 4.1 Valence Shell Electron Pair Repulsion Theory (VSEPR Concept)
- 4.2 Types of Molecules in VSEPR Theory (AB_2 Type, AB_3 Type)
- 4.3 Molecular Orbital Theory (MOT)

4.4 Diatomic Molecules	
4.5 Hybridization	
4.6 sp^3 (Methane & Ethane)	
4.7 sp^2 (Ethene)	
4.8 sp (Ethyne)	
5. Oxygen and sulfur compounds	7 Hrs
5.1 Preparation, Properties & Use in Leather Industry of:	
5.1.1 Hydrogen Peroxide	
5.1.2 Sulfur Dioxide	
5.1.3 Sulfuric Acid	
6. Chromium & its compounds	8 Hrs
6.1 Fundamental Chemistry of Chromium	
6.2 Dichromate of Sodium and Potassium	
6.3 Chrome Tanning Salt	
7. Chemistry of solutions	8 Hrs
7.1 Solution, its Components & Types	
7.2 Concentration of Solution & its Units	
7.3 Molarity (M), Molality (m), Mole Fraction (X) & Parts Per Million (P.P.m)	
7.4 Solubility & Factors affecting solubility	
7.5 Buffer solution	
8. Hydro carbons	10 Hrs
8.1 Alkanes	
8.1.1 Nomenclature	
8.1.2 Homologous Series	
8.1.3 Methane & Ethane	
8.1.4 Chemical Reactions of Alkanes	
8.2 Alkenes	
8.2.1 Nomenclature	
8.2.2 Ethene	
8.2.3 General Reactions of Alkenes	
8.3 Alkynes	
8.3.1 Nomenclature	
8.3.2 Acetylene	

Instructional Objectives

1. The Chemistry of Periodic Table

- 1.1 Explain the concept of periodic classification and periodicity of elements.
- 1.2 Differentiate between s-block, p-block, and d-block elements.
- 1.3 Describe the physical properties of hydrogen.
- 1.4 Explain the reactions of hydrogen with halogens and oxygen.
- 1.5 Understand oxidation and reduction behavior of hydrogen.

2. Compounds of Sodium & Calcium

- 2.1 Identify the availability and properties of sodium and calcium compounds.
- 2.2 Explain impurities and industrial preparation of sodium salts.
- 2.3 Describe the properties and uses of sodium chloride, carbonate, bicarbonate, sulfite, sulfate, and hydroxide.
- 2.4 Explain the properties of calcium oxide and calcium hydroxide.
- 2.5 Discuss the applications of these compounds in the leather industry.

3. Alum and Ammonium Compounds

- 3.1 Describe the preparation and properties of alum.
- 3.2 Explain the uses of alum in leather processing.
- 3.3 Identify important ammonium compounds and their availability.
- 3.4 Explain the properties and uses of ammonium chloride, ammonium sulfate, and ammonium hydroxide.

4. Modern Theories of Covalent Bonding

- 4.1 Explain the VSEPR theory and predict molecular shapes.
- 4.2 Classify molecules according to AB_2 and AB_3 types.
- 4.3 Describe the basic concepts of molecular orbital theory.
- 4.4 Explain bonding in diatomic molecules.
- 4.5 Understand hybridization concepts (sp^3 , sp^2 , sp) with examples such as methane, ethene, and ethyne.

5. Oxygen and Sulfur Compounds

- 5.1 Describe the preparation and properties of hydrogen peroxide.
- 5.2 Explain the properties and uses of sulfur dioxide.
- 5.3 Discuss the preparation and industrial importance of sulfuric acid.
- 5.4 Identify applications of these compounds in the leather industry.

6. Chromium and Its Compounds

- 6.1 Explain the fundamental chemistry of chromium.
- 6.2 Describe the properties of sodium and potassium dichromates.
- 6.3 Understand the composition and uses of chrome tanning salts.
- 6.4 Discuss the role of chromium compounds in leather tanning.

7. Chemistry of Solutions

- 7.1 Define solutions and classify their types.
- 7.2 Explain concentration units such as molarity, molality, mole fraction, and ppm.
- 7.3 Discuss solubility and factors affecting solubility.
- 7.4 Describe buffer solutions and their importance in chemical processes.

8. Hydrocarbons

- 8.1 Classify hydrocarbons into alkanes, alkenes, and alkynes.
- 8.2 Apply nomenclature rules for hydrocarbons.
- 8.3 Explain homologous series and general properties.
- 8.4 Describe the properties and reactions of methane, ethane, ethene, and acetylene.
- 8.5 Understand general chemical reactions of alkanes and alkenes.

RECOMMENDED REFERENCE BOOKS

- 1. Kazi, S. H. (2016). *Principles of leather manufacturing*.
- 2. Hashmi, A. S., & Rafique, Z. (n.d.). *A short view of leather chemistry*.
- 3. Sarkar, K. T. (1981). *Theory and practice of leather manufacture*. Ajoy Sorcar.
- 4. Ogiwara, C. (n.d.). *Practical guidelines to light leather processing*.
- 5. Briggs, P. S. (n.d.). *Gloving, clothing and special leather*. Tropical Products Institute (TPI). (With J. C. Barrett).
- 6. Ogilvie, E. (n.d.). *Leather finishing*. Nene College, Northampton, England.
- 7. Covington, A. D. (n.d.). *Tanning chemistry: The science of leather*. RSC Publishing.
- 8. Watt, A. (n.d.). *Leather manufacture*. William Clowes and Sons Ltd., London.

List of Practicals

96 Hrs

1. Separate a mixture of coloured dyes (mixture of inks) by paper chromatography
2. Separation of Cd^{+2} and Pb^{+2} cations by paper chromatography
3. Detection of Elements (C,H,N,S and Halogens)
4. To determine the percentage impurity of NaOH in the given solution volumetrically.
5. To determine the percentage composition of the mixture of HCl and NaCl volumetrically
6. To determine the (a) percentage of NaOH in a mixture of NaOH and NaCl (b) % composition.
7. To determine the percentage purity of the Na_2CO_3 in washing soda by volumetric method
8. To determine the impurity of NaHCO_3 in the given sample of baking soda
9. To determine the percentage composition of Oxalic acid and sodium oxalate in given sample volumetrically
10. To determine the percentage composition of mixture of H_2SO_4 and Na_2SO_4 volumetrically
11. To determine the amount of acetic acid in a given sample of vinegar
12. To determine the amount of free alkali in a provided sample of soap
13. To determine the number of water molecules in the given sample of hydrated oxalic acid volumetrically
14. To determine the solubility of oxalic acid at room temperature volumetrically
15. To determine the solubility of Mohr's salt at room temperature volumetrically.
16. To determine the percentage purity of Mohr's salt volumetrically.
17. Determine the PH of given solutions.
18. Purity given sample of impure sodium chloride by passing HCl gas (Common ion Effect)

LT-272 Safety Practice and Procedure

Total Contact Hours

	T	P	C
Theory 64 Hours	2	0	2

Learning Outcomes

The students will be able to:

1. Explain basic concepts of industrial safety, hazards, and risk analysis.
2. Identify and use personal protective equipment (PPE) and plant safety systems.
3. Understand employee training importance and permit-to-work procedures.
4. Describe accident investigation methods and major industrial incidents.
5. Apply process safety, environmental safety, and fire prevention principles

COURSE CONTENTS

1. Introduction to safety and its place in industry	6 Hrs
1.2 Safety in chemical industry	
1.3 Philosophy of accidents.	
1.4 Define Work Permit	
1.5 Introduction to Process Safety	
1.6 Hazards Identification and Risk Analysis	
2. Personal protection equipments	12 Hrs
2.1. What is PPE	
2.2. Types of PPEs	
2.3. Description and detail of PPEs usage	
2.4. Safety Equipment at Plant Site	
2.5. Safety Suit Purpose & Usage	
2.6. Fire Suppression System	
3. Employees training	12 Hrs
3.1. Training of employees and its importance.	
3.2. Importance of training.	
3.3. Introduction of international safety courses.	
3.4. What is Permit to work?	
4. Accident investigation record and report	12 Hrs
4.1. Accident Investigation terminology and maintain record of reports.	
4.2. Sample of Incident Report	
4.3. Six Significant Disasters	
5. Industrial noise and control	4 Hrs
5.1 Industrial noise and control.	
6. Process and environment safety	12 Hrs
6.1 Basic requirement for safe handling and storage of waste	

- 6.2 What is Equipment Safety
- 6.4 Hand over and Documentation of process equipment's
- 6.5 What is Process Safety Management System and briefly explain its elements
- 6.6 What are Safety Critical Switches on Process Safety Equipment's
- 6.7 What is a Fire Station & How it Works?
- 6.8 What is an Emergency Response Plan (ERP) in Process Industries?
- 6.9 What is technical safety and Loss prevention?

7. Fire prevention hazards

6 Hrs

- 7.1 Fire hazards and prevention.
- 7.2 Enlist types
- 7.3 Firefighting equipment's

BOOKS RECOMMENDED.

1. Heinrich, H. W. (2007). *Industrial accident prevention: A scientific approach*. New York, NY: McGraw-Hill.
2. Heinrich, H. W. (1980). *Industrial accident prevention: A safety management approach*. New York, NY: McGraw-Hill.

Instructional Objectives:

1. Introduction to Safety and Its Place in Industry

1. Explain the concept and importance of safety in industrial environments.
2. Describe the role of safety in the chemical industry.
3. Discuss the philosophy and causes of industrial accidents.
4. Define the term **Work Permit** and explain its purpose.
5. Explain the fundamentals of **Process Safety**.
6. Identify hazards and perform basic **Risk Analysis** in industrial settings.

2. Personal Protection Equipments (PPE)

1. Define Personal Protective Equipment (PPE).
2. Classify different types of PPE used in industries.
3. Explain the correct usage, purpose, and maintenance of PPE.
4. Identify safety equipment available at plant sites.
5. Describe the purpose and application of safety suits.
6. Explain the working principles of fire suppression systems.

3. Employees Training

1. Explain the importance of employee safety training in industries.
2. Describe different types of training programs for workers.
3. Identify international safety courses and certifications.
4. Explain the concept and procedures of **Permit to Work (PTW)** systems.

4. Accident Investigation Record and Report

1. Explain accident investigation terminology and procedures.
2. Maintain proper accident and incident records.
3. Prepare a standard incident report format.
4. Discuss major industrial disasters and their lessons learned.

5. Industrial Noise and Control

1. Explain the sources and effects of industrial noise.
2. Describe methods and techniques for controlling industrial noise.

6. Process and Environment Safety

1. Explain safe handling and storage methods for industrial waste.
2. Describe equipment safety requirements and precautions.
3. Explain documentation and handover procedures of process equipment.
4. Describe the Process Safety Management (PSM) system and its elements.
5. Identify safety-critical switches in process equipment.
6. Explain the function of an industrial fire station.
7. Describe the Emergency Response Plan (ERP) in process industries.
8. Explain the concepts of technical safety and loss prevention.

7. Fire Prevention Hazards

1. Explain fire hazards and preventive measures in industries.
2. Classify different types of fires.
3. Identify firefighting equipment and explain their uses

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کل وقت 20 گھنٹے

نصاب سال سوئم

حصہ اول اسلامیات

حصہ دوم مطالعہ پاکستان

موضوعات:

1- قرآن مجید:

سورۃ الفاتحہ، آیت الکرسی، سورۃ البقرہ کی آخری آیات از امن الرسول ﷺ تا آخر سورۃ اخلاق مع ترجمہ و تشریح

2- دس منتخب احادیث کا ترجمہ (تشریح)

() بنی الاسلام علی خمس شہادت انا لا اله الا الله لا لمراقلم الصلوٰۃ و ایتا الزکوٰۃ و حج البيت و صوم

رمضان

() الدین النصیحتہ

() المنشاء موتمن

() للمومن علی المومن سنت خصال يعود ماذا مرض و تڑھدہ اذا مات و یحبہ اذا دعا

() لیسلم علیہ اذا لقیہ و لیثمتہ اذا عطس و فصیحلہ اذا غاب او شہد

() لا تخن من خانک

() لا یدخل الجنة قاتع

() ان الله حرم علیکم عقوق المہات و اضاعتہ المال

() لیسر او لا تعسر او لا تنفر

() ذاق طعم الايمان من مرضی باللہ و با الا سلام دینا بمجمد نبیا

() افضل الذکر لا اله الا الله

3- حقوق و فرائض:

حصول تعلیم بطور فرض، والدین اور اولاد کے حقوق و فرائض، ہمسایہ کے حقوق، بچوں کے حقوق، عورتوں کے حقوق، بزرگ

شہریوں کے حقوق، محنت افراد کے حقوق۔

4- اسلام کی اخلاقی اقدار:

صبر و استقلال، عفو و درگزر، ایقانے عہد، اخوت، ایثار و قربانی۔

سال سوئم

حصہ اول اسلامیات

تدریس مقاصد

قرآن حکیم:

عمومی مقاصد: منتخب سورتوں اور آیات کی روشنی میں اسلام کے بنیادی مقاصد اور عبادات جان سکے
خصوصی مقاصد: طالب علم اس قابل ہو جائے گا کہ۔

سورۃ الفاتحہ، آیت لکری، سورۃ بقرہ کی آخری آیات ازمن الرسول سے اور سورۃ اخلاق کا ترجمہ و تشریح کر سکے
طالب علم درج ذیل کا مفہوم بیان کر سکے

() رب العالمین صرف اللہ تعالیٰ ہے

() اللہ رحم کرنے والا ہے

() قیامت کے دن بادشاہی اللہ کی ہوگی

() عبادات اور استعانت کا حقدار صرف اللہ ہے

() طالب علم درج ذیل کا مفہوم بیان کر سکے

() اللہ پاک ہر عیب سے پاک ہے

() اللہ کے اسمائے حسنہ حق اور قیوم ہیں

() تمام انبیاء پر ایمان لانا ضروری ہے

() رسول، ملائکہ، کتب، سماویہ، پر ایمان لانا فرض ہے

() اطاعت حقیقی صرف اللہ کے لیے ہے

() اسلامی احکامات پر عمل کرنا انسانی بساط میں ہے

() کفر کو اللہ کی مدد کے بغیر شکست نہیں دی جاسکتی

() اللہ ایک ہے

() اللہ کسی کا محتاج نہیں نہ اس کا کوئی شریک ہے

منتخب احادیث:

عمومی مقصد: احادیث کی روشنی میں اسلامی تعلیمات پر عمل پیرا ہو سکے

خصوصی مقاصد:

- () احادیث کا ترجمہ بیان کر سکے
 - () احادیث کی تشریح کر سکے
 - () معاشرتی اور انفرادی زندگی میں احادیث سے رہنمائی حاصل کر سکے
- حقوق و فرائض:

عمومی مقاصد:

- () اسلامی معاشرے کا ایک اچھا فرد بن سکے

خصوصی مقاصد:

- () والدین کے حقوق و فرائض بیان کر سکے
- () بمسائیوں کے حقوق بیان کر سکے
- () بچوں کے حقوق بیان کر سکے
- () عورتوں کے حقوق کی پاسداری کر سکے
- () بزرگ شہریوں کے حقوق کا خیال رکھ سکے
- () محنت حضرات کے حقوق جان سکے اور ان کے حقوق کی پاسداری کر کے انہیں معاشرے کا ایک مفید فرد بنایا جاسکے
- () اسلام میں حقوق و فرائض کی آگاہی کی صورت میں اپنے اندر خدمت خلق کا جذبہ پیدا کر سکے

اسلامی اقدار:

عمومی مقاصد:

- () طالب علم جان سکے گا کہ تعلیم کا مقصد حسن اخلاق سے متصف ہونا ہے

خصوصی مقاصد:

- () اخلاق کے معنی و مفہوم کو بیان کر سکے
- () اسلام میں حسن و اخلاق کی اہمیت بیان کر سکے
- () قرآن و سنت کی روشنی میں صبر و استقلال کی اہمیت بیان کر سکے
- () ایفاء عہد کی اہمیت بیان کر سکے
- () اخوت کے معنی و مفہوم بیان کر سکے
- () اخوت اسلامی کی اہمیت بیان کر سکے

() اسلام کی اعلیٰ اقدار کو اپنا کر مثالی معاشرہ پیدا کر سکے

نصاب (سال سوئم)

GEN 301

ٹی پی سی
1 0 1
کل وقت 12 گھنٹے

مطالعہ پاکستان

حصہ دوئم

موضوعات:

- () قیام پاکستان
- () باؤنڈری کمیشن
- () ریڈ کلف ایوارڈ
- () تقسیم بنگال
- () تقسیم پنجاب
- () مسئلہ مہاجرین
- () ریاست کا الحاق
- () ریاست جموں کشمیر
- () نہری پانی کا تنازعہ
- () قرارداد پاکستان
- () علماء کے بائیس نکات
- () 1956-1962 اور 1973 کے دساتیر کی اسلامی انسانی حقوق کی دفعات (8 تا 28)۔
- () اقلیتوں کے حقوق۔ دیگر محروم طبقات کے حقوق
- () پاکستان کا محل وقوع اور اسکی جغرافیائی اہمیت۔ GSP+ کا تعارف اور عملی طریقہ کار
- () قدرتی وسائل (تیل، گیس، کوئلہ)

مطالعہ پاکستان (حصہ دوم)
قیام پاکستان

تدریس مقاصد:

عمومی مقاصد:

() قیام پاکستان کے بعد درپیش مسائل سے آگاہی حاصل کرے اور بیان کرے

خصوصی مقاصد:

() باؤنڈری کمیشن تشکیل اور اس کے فرائض بیان کر سکے

() ریڈ کلف اور اس کے ایوارڈ کے بارے میں بیان کر سکے

() بنگال اور کلکتہ کی تقسیم کی وجوہات بیان کر سکے

() پنجاب کی تقسیم کی تفصیل بیان کر سکے

() مہاجرین کی آمد سے جو مسائل پیدا ہوئے انہیں بیان کر سکے

() ریاستوں کے الحاق کے بارے میں تفصیل بیان کر سکے

() ریاست جموں کشمیر کے بارے میں بیان کر سکے

() نہری پانی کے تنازعہ کو بیان کر سکے

() قرارداد مقاصد کی تفصیلات بیان کر سکے

() 22 علماء کے متفقہ اسلامی نکات بیان کر سکے

() 1973 کے آئین میں انسانی حقوق کی دفعات (28-8)۔ اقلیتوں کے حقوق اور دیگر محروم طبقات کے حقوق کے بارے میں

جان سکے

() قیام پاکستان کے بعد نفاذ اسلام کی کوششوں کو بیان کر سکے

() پاکستان کے محل وقوع اور اس کی جغرافیائی اہمیت بیان کر سکے اور GSP+ کے تعارف اور عملی طریقہ کار بیان کر سکے

() پاکستان میں قدرتی وسائل (تیل، گیس، کوئلہ) کے بارے میں بیان کر سکے

خصوصی مقاصد:

- () احادیث کا ترجمہ بیان کر سکے
 - () احادیث کی تشریح کر سکے
 - () معاشرتی اور انفرادی زندگی میں احادیث سے رہنمائی حاصل کر سکے
- حقوق و فرائض:

عمومی مقاصد:

- () اسلامی معاشرے کا ایک اچھا فرد بن سکے

خصوصی مقاصد:

- () والدین کے حقوق و فرائض بیان کر سکے
- () بمائیوں کے حقوق بیان کر سکے
- () بچوں کے حقوق بیان کر سکے
- () عورتوں کے حقوق کی پاسداری کر سکے
- () بزرگ شہریوں کے حقوق کا خیال رکھ سکے
- () محنت حضرات کے حقوق جان سکے اور ان کے حقوق کی پاسداری کر کے انہیں معاشرے کا ایک مفید فرد بنایا جاسکے
- () اسلام میں حقوق و فرائض کی آگاہی کی صورت میں اپنے اندر خدمت خلق کا جذبہ پیدا کر سکے

اسلامی اقدار:

عمومی مقاصد:

- () طالب علم جان سکے گا کہ تعلیم کا مقصد حسن اخلاق سے متصف ہونا ہے

خصوصی مقاصد:

- () اخلاق کے معنی و مفہوم کو بیان کر سکے
- () اسلام میں حسن و اخلاق کی اہمیت بیان کر سکے
- () قرآن و سنت کی روشنی میں صبر و استقلال کی اہمیت بیان کر سکے
- () ایقائے عہد کی اہمیت بیان کر سکے
- () اخوت کے معنی و مفہوم بیان کر سکے
- () اخوت اسلامی کی اہمیت بیان کر سکے

() اسلام کی اعلیٰ اقدار کو اپنا کر مثالی معاشرہ پیدا کر سکے

نصاب (سال سوئم)

GEN 301

ٹی پی سی
1 0 1
کل وقت 12 گھنٹے

مطالعہ پاکستان

حصہ دوم

موضوعات:

- () قیام پاکستان
- () باؤنڈری کمیشن
- () ریڈ کلف ایوارڈ
- () تقسیم بنگال
- () تقسیم پنجاب
- () مسئلہ مہاجرین
- () ریاست کا الحاق
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- () نہری پانی کا تنازعہ
- () قرارداد پاکستان
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- () 1956-1962 اور 1973 کے دساتیر کی اسلامی انسانی حقوق کی دفعات (8 تا 28)۔
- () اقلیتوں کے حقوق۔ دیگر محروم طبقات کے حقوق
- () پاکستان کا محل وقوع اور اسکی جغرافیائی اہمیت۔ GSP+ کا تعارف اور عملی طریقہ کار
- () قدرتی وسائل (تیل، گیس، کوئلہ)

غیر مسلم طلباء کے لیے
نصاب اخلاقیات (سال سوئم)

تذریس مقاصد:

عمومی مقاصد:

- () ملکی ترقی کے لیے اعلیٰ اوصاف کے ساتھ بہتر طور پر ملک و ملت کی خدمت کر سکے
- خصوصی مقاصد: طالب علم اس قابل ہو سکے کہ
- () موضوعات کا مطلب بیان کر سکے
- () عملی زندگی سے مثالوں کی نشاندہی کر سکے
- () موضوعات کی اہمیت بیان کر سکے
- () اپنی شخصیت اور معاشرے پر موضوعات کے مطابق اثرات پیدا کرنے کے طریقے بیان کر سکے
- () مثبت ذہن کے ساتھ کام کر سکے
- () عدل و انصاف سے ادارہ میں، دفتر میں بہتر ماحول پیدا کر سکے
- () ماحول کو اخلاقی طور پر پاکیزہ بنائے
- () کارکنوں کی بہتر طور پر دل جوئی کر سکے
- () کارکردگی میں اضافہ کر سکے
- () باہمی احترام کی برکات سے استفادہ کر سکے
- () بچوں کے حقوق بیان کر سکے
- () عورتوں کے حقوق کی پاسداری کر سکے
- () بزرگ شہریوں کے حقوق کا خیال رکھ سکے
- () محنت حضرات کے حقوق جان سکے اور ان کے حقوق کی پاسداری کر کے انہیں معاشرے کا ایک مفید فرد بنایا جاسکے

LT – 304 Principles of Leather Manufacturing – III

Total Contact Hours

Theory	64	T	P	C
Practical	192	2	6	4

Learning Outcomes:

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

1. Explain the objectives, need, and types of leather finishing and required finish properties.
2. Identify and describe the composition of leather finishes including pigments, binders, resins, lacquers, and auxiliaries.
3. Formulate and apply basic and specific leather finishes using appropriate techniques.
4. Perform mechanical finishing operations used in leather finishing.
5. Identify defects and problems in leather finishing and suggest causes and remedies.
6. Evaluate finished leather quality and recommend corrective measures.

1. Leather finishing objectives 9 Hrs

- 1.1 Need of Finishing of Leather
- 1.2 Properties Required from Leather Finishes
- 1.3 Various Types of Leather Finishes

2. Composition of leather finishes 10 Hrs

- 2.1 Coloring Material
 - 2.1.1 Definition & Types of Pigments
 - 2.1.2 Source of White, Black, Yellow, Red & Blue Pigments
 - 2.1.3 Pigment Dispersion
- 2.2 Film Forming Materials
 - 2.2.1 Protein Binders
 - 2.2.2 Acrylic Resins, General Properties & Types
 - 2.2.3 Diene Resins & Co-polymers
 - 2.2.4 Poly Urethane
 - 2.2.5 Lacquers Solvents & Diluent
 - 2.2.6 Nitro-cellulose Lacquers
 - 2.2.7 Solvents for Lacquers
 - 2.2.8 Plasticisers for Cellulose Lacquers
 - 2.2.9 Auxiliaries
 - 2.2.10 Plasticisers & Fixing Agents for Protein Binders
 - 2.2.11 Wetting Agents, Dispersing Agents
 - 2.2.12 Waxes, Fillers & Plate Releasing Agents
 - 2.2.13 Thickeners
 - 2.2.14 Mating Agents or Duller
 - 2.2.15 Silicones, Modifiers & Slip Agents

3. Formulation & application of leather finishes 9 Hrs

- 3.1 Basic Film Formulations

3.1.1	Impregnation Mixtures	
3.1.2	Staining	
3.1.3	Sealer Coat	
3.1.4	Base Coats	
3.1.5	Seasons & Top Coats	
3.2	Specific Finish Formulation	
3.2.1	Plain Finish	
3.2.2	Glaze Finishes	
3.2.3	Resin Finishes	
3.2.4	Patent & Wet Look Finish	
3.2.5	Oil Finishes	
3.3	Application of Leather Finishes	
3.3.1	Spraying	- Manual, Auto, Airless
3.3.2	Padding	- Manual, Machine
3.3.3	Roller Coating	- Forwards, Reverse
3.3.4	Curtain Coating.	
4.	Mechanical operations in finishing	7 Hrs
4.1	Buffing & De dusting	
4.2	Polishing	
4.3	Boarding	
4.4	Ironing & Smooth Plating	
4.5	Embossing	
4.6	Glazing	
4.7	Milling	
5.	Causes & remedies for defects in finish mixture	9 Hrs
5.1	Putrefaction	
5.2	Settling of Pigments	
5.3	Coagulation of Finishes	
5.4	Change in Color	
5.5	Flocculation of Pigments	
6.	Problems in leather finishing	11 Hrs
6.1	Impregnation Defects – Causes & Remedies	
6.2	Insufficient Rate or Depth of Penetration	
6.3	Inadequate Break Improvement	
6.4	Firming of Leather	
6.5	Difficulties in Re-wetting	
6.6	Difficulties in Rebuffing	
6.7	Finish Application Defects – Causes & Remedies	
6.8	Streaking of Pad Coat	
6.9	Balling-up of Pad Coats	
6.10	Poor Wetting-out of Pad Coats	
6.11	Poor Wetting-out of Spray Coats	
6.12	Blushing of Lacquers & Lacquer Emulsions	
6.13	Mechanical & Handling difficulties during Finishing	
6.14	Sticking & Air Marking during Smooth Plating	
6.15	Embossing Problems	

6.16	Sticking of Leather in Piles	
7.	Causes & remedies for finished leather defects	9 Hrs
7.1	Poor Break of Grain	
7.2	Poor Wet Rub Resistance	
7.3	Poor Dry Rub & Abrasion Resistance	
7.4	Poor Flexibility, Elasticity & Adhesion of Finish	
7.5	Inadequate Heat Resistance	
7.6	Lack of Uniformity	
7.7	Insufficient Coverage	
7.8	Poor Light Fastness	
7.9	Spewing	

Instructional Objectives

1. Leather Finishing Objectives

1. Explain the need for leather finishing in terms of protection, aesthetics, and performance.
2. Describe the objectives of leather finishing for functional and decorative purposes.
3. Identify properties required from leather finishes, including durability, flexibility, gloss, and resistance.
4. Classify various types of leather finishes such as matt, gloss, semi-gloss, and specialty finishes.
5. Differentiate between engineering-oriented and pure IT leather finishes.
6. Correlate finish properties with end-use applications, e.g., shoes, upholstery, garments.
7. Discuss the importance of finish in improving leather marketability and quality perception.

2. Composition of Leather Finishes

1. Identify and describe coloring materials used in leather finishes.
2. Define types of pigments (organic and inorganic) and their characteristics.
3. Identify the source of white, black, yellow, red, and blue pigments used in leather finishing.
4. Explain pigment dispersion techniques for uniformity and stability.
5. Describe film-forming materials including protein binders, acrylic resins, diene resins, co-polymers, and polyurethanes.
6. Explain properties, advantages, and limitations of each type of film-forming material.
7. Identify and describe lacquers, solvents, and diluents, including nitrocellulose lacquers.
8. Explain the role of plasticisers in cellulose and protein-based finishes.
9. Identify auxiliaries including wetting agents, dispersing agents, waxes, fillers, plate releasing agents, thickeners, dullers, silicones, modifiers, and slip agents.
10. Select appropriate composition materials for specific finish formulations to achieve desired properties.

3. Formulation & Application of Leather Finishes

1. Prepare basic film formulations including impregnation mixtures, staining, sealer coats, base coats, and top coats.
2. Formulate specific finishes such as plain, glaze, resin, patent, wet-look, and oil finishes.
3. Apply finishes using spraying techniques (manual, automatic, airless).
4. Apply finishes using padding techniques (manual and machine).
5. Apply finishes using roller coating techniques (forward and reverse).
6. Apply finishes using curtain coating techniques.
7. Understand layer sequencing and its effect on finish quality.
8. Evaluate uniformity, penetration, and appearance of applied finishes.
9. Troubleshoot common application errors and apply corrective measures.
10. Maintain safety, cleanliness, and process documentation during application.

4. Mechanical Operations in Finishing

1. Perform buffing and de-dusting operations to remove surface imperfections.
2. Carry out polishing to improve gloss and surface smoothness.

3. Execute boarding, ironing, and smooth plating to flatten and shape leather.
4. Demonstrate embossing to create decorative or patterned finishes.
5. Perform glazing to achieve glossy or semi-gloss finishes.
6. Conduct milling operations to soften leather and enhance grain.
7. Explain the purpose, effect, and mechanism of each mechanical operation.
8. Apply safety and maintenance procedures during finishing operations.

5. Causes & Remedies for Defects in Finish Mixture

1. Identify common defects in finish mixtures such as putrefaction and coagulation.
2. Explain causes of pigment settling, flocculation, and color changes in finishes.
3. Suggest preventive and corrective measures for defective mixtures.
4. Analyze the effect of mixture defects on leather appearance and durability.
5. Apply quality control techniques during preparation of finish mixtures.
6. Maintain stability and consistency of finishes during storage and use.
7. Troubleshoot problems during mixing and application of finishes.

6. Problems in Leather Finishing

1. Diagnose impregnation defects, including insufficient penetration and inadequate break improvement.
2. Identify finish application defects, including streaking, balling-up, poor wetting, and blushing.
3. Recognize mechanical and handling difficulties such as sticking, air marking, and embossing problems.
4. Suggest corrective measures for re-buffing, re-wetting, and embossing problems.
5. Solve problems related to lacquer and lacquer emulsion application.
6. Apply process adjustments to maintain uniformity and quality of finishes.
7. Evaluate overall finishing efficiency and leather performance.
8. Implement preventive measures to minimize defects during finishing.
9. Document quality control actions and maintain standards.

7. Causes & Remedies for Finished Leather Defects

1. Identify finished leather defects such as poor break, poor wet rub, poor dry rub, and abrasion resistance.
2. Explain causes of poor flexibility, elasticity, and adhesion of finishes.
3. Identify heat resistance, coverage, and uniformity problems in finished leather.
4. Detect poor light fastness and spewing issues.
5. Suggest remedial actions to correct defects in finished leather.
6. Evaluate finished leather quality against industry standards.
7. Recommend preventive measures for future production.
8. Relate defect analysis to selection of finish materials and application techniques.
9. Apply inspection and quality control methods for finished leather.

RECOMMENDED REFERENCE BOOKS

1. Kazi, S. H. (2016). *Principles of leather manufacturing*.
2. Hashmi, A. S., & Rafique, Z. (n.d.). *A short view of leather chemistry*.
3. Sarkar, K. T. (1981). *Theory and practice of leather manufacture*. Ajoy Sorcar.
4. Ogiwara, C. (n.d.). *Practical guidelines to light leather processing*.
5. Briggs, P. S. (n.d.). *Gloving, clothing and special leather*. Tropical Products Institute (TPI). (With J. C. Barrett).
6. Ogilvie, E. (n.d.). *Leather finishing*. Nene College, Northampton, England.
7. Covington, A. D. (n.d.). *Tanning chemistry: The science of leather*. RSC Publishing.
8. Watt, A. (n.d.). *Leather manufacture*. William Clowes and Sons Ltd., London.

List of Practical

192 Hrs

- 1. Manufacture of Leather from cow & cow calf**
 - 1.1 Upper from Light Cow & Cow Calf
 - 1.2 Side Upper Leather, Resin & Glaze Finishing
 - 1.3 Shrunk Grain Leather
 - 1.4 Upper Leather for Sports Shoes
- 2 Manufacture of Leather from buffalo & buffalo calf**
 - 2.1 Glazed Finish Upper Leather from Small Buffalo Calf
 - 2.2 Resin Finish Upper Leather from Small Buffalo Calf
 - 2.3 Shrunk Grain Leather
 - 2.4 Chrome Tanned Upholstery Leathery
 - 2.5 Full Grain Side Upper Leather
- 3 Manufacture of Leather from sheep & goat skins**
 - 3.1 Garment with Specialized Finishes & Effects
 - 3.2 Suede from Goat Skins
 - 3.3 Wool Sheep Skins
- 4 Prepare chrome splits**
 - 4.1 For Hunting Suede
 - 4.2 Pigment Finished, Plain, Embossed
- 5 Manufacture of special leather**
 - 5.1 Nubuck (Dyed)
 - 5.2 Nubuck (White Crust) Leather

LT – 313 Upper, Light and Specialized Leather

Total Contact Hours

Theory	64	T	P	C
Practical	96	2	3	3

Learning Outcomes

After completing this course, students will be able to:

1. Explain the importance, quality requirements, and types of leather finishing.
2. Identify and describe materials used in leather finishing, including colours, binders, lacquers, and auxiliary chemicals.
3. Operate and understand finishing machinery, such as spray guns, auto spray plants, curtain coaters, and roller coaters.
4. Perform mechanical operations after finishing, including ironing (Finiflex), glazing, roto press, and embossing.
5. Apply suitable finishing techniques for different leather types, including shoe upper, gloves, garments, upholstery, nubuck, patent, and split leather.
6. Demonstrate practical skills in finishing various leathers, from raw to crust (dyed and natural) for cow, buffalo, sheep, and goat skins

Course Contents

1. Importance of Leather Finishing	8 Hrs
1.1 Introduction	
1.2 Quality of Leather Finishing	
1.3 Properties related to Finished Leather	
1.4 Types of Finishes	
2. Materials used in Leather Finish	7 Hrs
2.1 Introduction	
2.2 Finishing Colours	
2.3 Binders	
2.4 Lacquers	
2.5 Helping Chemicals	
3. Machinery Used in Leather Finishing	9 Hrs
3.1 Introduction	
3.2 Spray Gun	
3.3 Auto Spray Plant	
3.4 Curtain Coater	
3.5 Roller Coater	
4. Mechanical operation after Finishing	6 Hrs
4.1 Introduction	
4.2 Finiflex (Ironing)	
4.3 Glazing	
4.4 Roto Press	
4.5 Embossing Press	
5. Operations before Specialized Finishing	6 Hrs

5.1 Introduction	
5.2 Shoe upper Leather Crust (Dyed and Natural)	
5.3 Glove Leather Crust (Dyed and Natural)	
5.4 Garment Leather Crust (Dyed and Natural)	
5.5 Specialized Leather Crust (Dyed and Natural)	
6. Shoe Upper Leather Finish	8 Hrs
6.1 Introduction	
6.2 Aniline	
6.3 Pigmented	
6.4 Glazed	
6.5 Embossed Finish	
7. Gloves Leather Finish	6 Hrs
7.1 Introduction	
7.2 Finishing of Gloves	
7.3 Working Gloves Finishing	
7.4 Motor Bike Gloves	
7.5 Fashion Gloves	
7.6 Sports Gloves	
8. Garment Leather Finish	7 Hrs
8.1 Introduction	
8.2 Men's Garments Finish	
8.3 Ladies Garments Finish	
8.4 Children Garments Finish	
9. Specialized Leather Finish	7 Hrs
9.1 Introduction	
9.2 Upholstery Finish	
9.3 Nubuck Finish	
9.4 Patent Finish	
9.5 Split Finish	

Instructional Objectives

1. Importance of Leather Finishing

1. Explain the concept and purpose of leather finishing.
2. Describe the importance of finishing in leather manufacturing.
3. Identify the quality requirements of finished leather.
4. Explain the physical and chemical properties related to finished leather.
5. Differentiate between various types of leather finishes.

2. Materials Used in Leather Finish

1. Describe the role of materials used in leather finishing.
2. Identify different types of finishing colours and their uses.
3. Explain the function of binders in finishing formulations.
4. Discuss the purpose and types of lacquers.
5. Describe the importance of helping chemicals in finishing.

3. Machinery Used in Leather Finishing

1. Identify various machines used in leather finishing.
2. Explain the working principle of a spray gun.
3. Describe the operation of an auto spray plant.
4. Explain the working of a curtain coater.
5. Discuss the function of a roller coater.

4. Mechanical Operations after Finishing

1. Explain the importance of post-finishing mechanical operations.
2. Describe the Finiflex (ironing) process.
3. Explain the glazing process and its effects.
4. Discuss the working and purpose of the roto press.
5. Explain the function of the embossing press.

5. Operations before Specialized Finishing

1. Explain the importance of preparatory operations before specialized finishing.
2. Describe the characteristics of shoe upper leather crust (dyed and natural).
3. Explain the properties of glove leather crust (dyed and natural).
4. Describe garment leather crust (dyed and natural).
5. Identify specialized leather crust types (dyed and natural).

6. Shoe Upper Leather Finish

1. Explain the objectives of shoe upper finishing.
2. Describe aniline finishing and its characteristics.
3. Explain pigmented finishing and its applications.
4. Describe glazed finish.
5. Explain embossed finish and its uses.

7. Gloves Leather Finish

1. Explain the purpose of glove leather finishing.
2. Describe general finishing methods for gloves.

3. Explain finishing techniques for working gloves.
4. Discuss finishing requirements for motor bike gloves.
5. Describe fashion gloves finishing methods.
6. Explain finishing of sports gloves.

8. Garment Leather Finish

1. Explain the objectives of garment leather finishing.
2. Describe finishing techniques for men's garments.
3. Explain finishing methods for ladies' garments.
4. Discuss finishing requirements for children's garments.

9. Specialized Leather Finish

1. Explain the concept of specialized leather finishes.
2. Describe upholstery finishing and its requirements.
3. Explain nubuck finishing process.
4. Discuss patent finishing and its characteristics.
5. Describe split leather finishing techniques.

RECOMMENDED REFERENCE BOOKS

1. Kazi, S. H. (2016). *Principles of leather manufacturing*.
2. Hashmi, A. S., & Rafique, Z. (n.d.). *A short view of leather chemistry*.
3. Sarkar, K. T. (1981). *Theory and practice of leather manufacture*. Ajoy Sorcar.
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6. Ogilvie, E. (n.d.). *Leather finishing*. Nene College, Northampton, England.
7. Covington, A. D. (n.d.). *Tanning chemistry: The science of leather*. RSC Publishing.
8. Watt, A. (n.d.). *Leather manufacture*. William Clowes and Sons Ltd., London.

List of Practical

96 Hrs

1) Perform Raw to Crust procedure (Dyed and Natural) from different types of Leather

1.1 Cow and Cow Calf

1.2 Buff and Buff Calf

1.3 Sheep Skin

1.4 Goat Skin

2) Apply Finishing Process

2.1 Shoe upper Finish

2.2 Glove Finishing

2.3 Garment Finishing

2.4 Upholstery Finish

2.5 Proteineous Finish

2.6 Finishing of Different Splits

LT – 323 Applied Chemistry – III

Total Contact Hours

Theory	64	T	P	C
Practical	96	2	3	3

Learning Outcomes

After completing this course, students will be able to:

1. Explain the structure, preparation, properties, and reactions of alkyl halides, alcohols, carbonyl compounds, nitrogen compounds, benzene, and phenols.
2. Differentiate between important organic compounds such as SN1 & SN2 reactions, primary/secondary/tertiary alcohols, aldehydes and ketones, and various aromatic derivatives.
3. Describe the preparation, properties, and industrial uses of important chemicals like methyl chloride, acetone, aniline, ethylene glycol, glycerol, and phenol derivatives.
4. Understand reaction mechanisms and naming (nomenclature) of organic compounds including aliphatic and aromatic compounds.
5. Explain major chemical industrial processes such as urea manufacture, Solvay process, caustic soda production, and sodium metal preparation.
6. Identify environmental issues related to chemistry including air and water pollution, acid rain, photochemical smog, and solid waste management

Course Contents

1. Alkyl halides & their derivatives

9 Hrs

- 1.1 General Chemical Reactions of Monohalo Alkanes
- 1.2 Preparation & Properties of Methyl Chloride
- 1.3 Preparation & Properties of Dichloromethane & Trichloromethane
- 1.4 Preparation & Properties of Carbon Tetra Chloride
- 1.5 Organo-Metallic Compounds (Grignard Reagent)
- 1.6 SN1 & SN2 Mechanism

2. Alcohols

8 Hrs

- 2.1 General Reactions of Alcohols
- 2.2 Preparation & Properties & Uses of Specific Alcohols
- 2.3 Tests for distinction between primary, secondary & tertiary alcohols
- 2.4 Methyl & Ethyl Alcohols
- 2.5 Iso Propyl Alcohols
- 2.6 Di hydric & tri Hydric Alcohol, Preparation, Properties & Uses of Ethylene Glycol & Glycerol
- 2.7 Unsaturated Alcohols
- 2.8 Allyl Alcohols

3. Carbonyl compounds (aldehydes & ketone)

8 Hrs

- 1.1 Nomenclature
- 1.2 General Chemical Reactions
- 1.3 Aldol Condensation & Cannizarro's Reaction
- 1.4 Preparation & Properties & Uses of:
- 1.5 Formaldehyde
- 1.6 Acetaldehyde
- 1.7 Acetone

1.8 Ethyl Methyl Ketones	
2. Aliphatic nitrogen compounds	7 Hrs
2.1 Cyanide & Vinyl Cyanide	
2.2 Nomenclature	
2.3 General Reaction	
2.4 Nitro Alkanes	
2.5 Nomenclature	
2.6 General Reactions, Preparation & Properties	
2.7 Amines	
2.8 Amino Acids	
3. Benzene & its derivatives	9 Hrs
3.1 Nomenclature	
3.2 Sources	
3.3 Benzene & its Homologous	
3.4 Chemical Reactions	
3.5 Nitro Benzene	
3.6 Amino Compounds Aniline, its Preparation & Properties	
3.7 Diamines	
3.8 Di-azonium Salts	
3.9 Di-azotization	
3.10 Benzene Di-azonium Chloride	
3.11 Benzoic Acid	
3.12 Phthalic Acid & its derivatives	
3.13 Benzene Sulphonic Acid	
3.14 Sulphanilic Acid	
4. Phenols (hydroxy compounds)	8 Hrs
4.1 Monohydric Phenols	
4.2 Phenols & Cresoles	
4.3 Amino Phenols	
4.4 Nitro Phenols	
4.5 Di-hydric Phenols	
4.6 Catechol & Resorcinols	
4.7 Tri-hydric Phenols	
4.8 Pyro Gallol	
5. Chemical industries	7 Hrs
5.1 Urea Manufacture	
5.2 Solvay's process for Sodium Carbonate manufacture	
5.3 Caustic Soda manufacture	
5.4 Preparation of Sodium metal	
6. Environmental chemistry	8 Hrs
6.1 Components of Environment	
6.2 Pollution & its Types	
6.3 Air Pollution	
6.4 Water Pollution	
6.5 Acid Rain	
6.6 Photochemical Smog	
6.7 Factors affecting the Quality of Water	
6.8 Solid Waste Management	

Recommended Books

1. Punjab Textbook Board. (Year). *Textbook of intermediate chemistry (Parts I & II)*. Lahore, Pakistan: Punjab Textbook Board.
2. Muhammad, A. (Year). *Ilmi applied science*. Lahore, Pakistan: Ilmi Kitab Khana.
3. Reedy, J. N. (Year). *Polytechnic chemistry*. New Delhi, India: Tata McGraw-Hill.
4. Jain, P. C. (Year). *Chemistry for engineers*. New Delhi, India: Tata McGraw-Hill

Instructional Objectives

1. Alkyl Halides & Their Derivatives

1. Explain the general chemical reactions of monohalo alkanes.
2. Describe the preparation and properties of methyl chloride, dichloromethane, trichloromethane, and carbon tetrachloride.
3. Explain the formation and importance of Grignard reagent.
4. Differentiate between SN1 and SN2 reaction mechanisms.

2. Alcohols

1. Describe the general reactions of alcohols.
2. Explain preparation, properties, and uses of important alcohols (methyl, ethyl, isopropyl).
3. Distinguish between primary, secondary, and tertiary alcohols by chemical tests.
4. Describe dihydric and trihydric alcohols including ethylene glycol and glycerol.
5. Explain unsaturated and allyl alcohols.

3. Carbonyl Compounds (Aldehydes & Ketones)

1. Apply correct nomenclature of aldehydes and ketones.
2. Describe general reactions of carbonyl compounds.
3. Explain Aldol condensation and Cannizzaro reaction.
4. Describe preparation, properties, and uses of formaldehyde, acetaldehyde, acetone, and ethyl methyl ketone.

4. Aliphatic Nitrogen Compounds

1. Explain nomenclature and general reactions of cyanides and nitro alkanes.
2. Describe preparation and properties of nitro compounds.
3. Explain the structure and reactions of amines.
4. Describe the structure and importance of amino acids.

5. Benzene & Its Derivatives

1. Apply nomenclature rules for benzene and its derivatives.
2. Describe sources and chemical reactions of benzene and its homologues.
3. Explain preparation and properties of nitrobenzene, aniline, benzoic acid, and benzene sulphonic acid.
4. Describe diazotization and formation of benzene diazonium chloride.
5. Explain important derivatives like phthalic acid and sulphanilic acid.

6. Phenols (Hydroxy Compounds)

1. Describe monohydric, dihydric, and trihydric phenols.
2. Explain properties of phenol, cresols, catechol, resorcinol, and pyrogallol.
3. Describe amino phenols and nitro phenols.

7. Chemical Industries

1. Explain the manufacture of urea.
2. Describe the Solvay process for sodium carbonate production.
3. Explain the manufacture of caustic soda.
4. Describe the preparation of sodium metal.

8. Environmental Chemistry

1. Identify components of the environment.
2. Explain different types of pollution.
3. Describe causes and effects of air pollution, water pollution, acid rain, and photochemical smog.
4. Explain factors affecting water quality.
5. Describe methods of solid waste management.

List of Practical

96 Hrs

1. Prepare 2,4,6 – Tribromophenol
2. Perform Crystallization of Benzoic Acid from Water
3. Classify following Functional Groups:-
 - 3.1 NaHCO_3
 - 3.2 Neutral FeCl_3
 - 3.3 Bromine water Test
4. Model Analysis for Carboxylic Acid (Benzoic Acid)
5. Model Analysis for Carboxylic Acid (Salicylic acid)
6. Model Analysis for Carboxylic Acid (Oxalic acid)
7. Model Analysis for Phenol (Resorcinol)
8. Model Analysis for Ketones (Benzophenone)
9. Separate mixture of coloured pigments (mixture of ink) by paper chromatography
10. Separation of Cd^{+2} and Pb^{+2} cations by paper chromatography
11. Determine the molecular mass of the given acid by volumetric method.
12. Determination of Phenol in the given sample.
13. Determination of acetone in the given sample.

LT – 363 Quality Control & Leather Testing

Total Contact Hours

Theory	64	T	P	C
Practical	96	2	3	3

Learning Outcomes

After completing this course, students will be able to:

1. Understand the importance of quality control in tannery and the need for quality standards in leather production.
2. Explain international quality standards such as International Organization for Standardization (ISO), REACH, and Leather Working Group (LWG), and their registration processes.
3. Apply quality improvement methods in raw hides and skins, including curing, storage, and defect control.
4. Perform stage-wise quality control during leather manufacturing and conduct chemical and physical testing according to standard methods.
5. Understand tannery chemicals and effluent treatment, including safe handling of chemicals and management of wastewater treatment systems

Course Contents

- | | |
|--|---------------|
| 1. Introduction to quality control in tannery | 8 Hrs |
| 1.1 Purpose & Importance of Quality Control in Tannery | |
| 1.2 Need for Quality Standards | |
| 1.3 General Quality Concentration in a Tannery | |
| 2. International Quality Standardization | 11 Hrs |
| 2.1 Introduction | |
| 2.2 Objectives of International Organization for Standardization (ISO) | |
| 2.3 Common ISO standards in Leather Industry | |
| 2.3.1 Registration Process of ISO | |
| 2.4 Introduction & Objectives of | |
| 2.4.1 Registration | |
| 2.4.2 Evaluation | |
| 2.4.3 Authorization | |
| 2.5 Restriction of Chemicals (REACH) | |
| 2.5.1 Registration process of REACH | |
| 2.5.2 Introduction & Objectives of LWG | |
| 2.6 Registration Process of LWG | |
| 3. Quality improvement in raw hide & skins | 8 Hrs |
| 3.1 Controlling Defects in Living Animals | |
| 3.2 Method to Improve Slaughtering | |
| 3.3 Quality Control during Curing | |
| 3.4 Storage of Raw Stock | |
| 4. Stage wise quality control in leather manufacture | 9 Hrs |

4.1 Beam House	
4.2 Pickled Pelts	
4.3 Tan Yard Processes	
4.4 Dye House Operations & Processes	
4.5 Vegetable Crust	
4.6 Finishing	
4.7 Storage of Finished Leather	
5. Quality standards for leather	7 Hrs
5.1 Standards for Upper Leather	
5.2 Standards for Garment Leather	
5.3 Requirements for Glove Leather	
5.4 Methods of Chemical Analysis (IUC)	
5.5 Methods of Physical Testing (IUP)	
5.6 Methods of Fastness Testing (IUF)	
5.7 Sampling for Chemical & Physical Leather Testing	
6. Practical tests for quality control in tannery	6 Hrs
6.1 Cured Hides	
6.2 Beam House	
6.3 Wet Blue	
6.4 Dye House Materials & Processes	
6.5 Crust Leather	
7. Chemicals in tannery	8 Hrs
7.1 Beam House Chemicals	
7.1.1 Source & Availability	
7.1.1 Storage & Handling	
7.2 Tan Yard Chemicals	
7.2.1 Application & Handling of Acids	
7.2.1 Origin, Source of Tanning Materials	
7.3 Dyestuff, Fat-liquors, Retanning & Pasting Materials	
7.3.1 Chemical Nature	
7.3.2 Storage	
8. Effluent treatment	7 Hrs
8.1 Nature of Tannery Effluent	
8.1.1 Beam House	
8.1.2 Chrome Tanning	
8.1.3 Vegetable Tanning	
8.1.4 Dyeing	
8.2 Volume of Waste Water	
8.3 Effluent (Waste Water) Treatment System	

Instructional Objectives

- 1. Introduction to Quality Control in Tannery**
 1. Understand the purpose and importance of quality control in tannery.
 2. Explain the need for quality standards in leather production.
 3. Identify general quality concerns in a tannery.
- 2. International Quality Standardization**
 1. Understand the objectives of International Organization for Standardization (ISO).
 2. Explain common ISO standards used in the leather industry.
 3. Understand the concepts of REACH and Leather Working Group (LWG).
 4. Describe the registration and evaluation processes of ISO, REACH, and LWG.
- 3. Quality Improvement in Raw Hide & Skins**
 1. Identify common defects in raw hides and skins.
 2. Explain methods to improve slaughtering and curing.
 3. Understand proper storage of raw stock.
- 4. Stage-wise Quality Control in Leather Manufacture**
 1. Understand quality control in beam house, tan yard, and dye house processes.
 2. Explain quality requirements at crust and finishing stages.
 3. Describe proper storage of finished leather.
- 5. Quality Standards for Leather**
 1. Understand standards for upper, garment, and glove leather.
 2. Explain methods of chemical, physical, and fastness testing.
 3. Understand proper sampling methods for leather testing.
- 6. Practical Tests for Quality Control in Tannery**
 1. Perform practical tests on cured hides, wet blue, crust, and finished leather.
 2. Evaluate quality at different stages of leather production.
- 7. Chemicals in Tannery**
 1. Identify beam house and tan yard chemicals.
 2. Understand the source, storage, and safe handling of chemicals.
 3. Explain the use of dyestuffs, fat liquors, and retanning materials.
- 8. Effluent Treatment**
 7. Understand the nature of tannery effluent.
 8. Explain wastewater generation in different processes.
 9. Describe the effluent treatment system in a tannery

RECOMMENDED REFERENCE BOOKS

1. Kazi, S. H. (2016). *Principles of leather manufacturing*.
2. Hashmi, A. S., & Rafique, Z. (n.d.). *A short view of leather chemistry*.
3. Sarkar, K. T. (1981). *Theory and practice of leather manufacture*. Ajoy Sorcar.
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7. Covington, A. D. (n.d.). *Tanning chemistry: The science of leather*. RSC Publishing.
8. Watt, A. (n.d.). *Leather manufacture*. William Clowes and Sons Ltd., London.

List of Practical

96 Hrs

- 1. Evaluate Quality standards for following leather:-**
 - 1.1 Standards for Upper Leather
 - 1.2 Standards for Garment Leather
 - 1.3 Requirements for Glove Leather
- 2. Apply International methods for following leather testing:-**
 - 2.1 Methods of Chemical Analysis (IUC)
 - 2.2 Methods of Physical Testing (IUP)
 - 2.3 Sampling for Chemical & Physical Leather Testing
- 3. Perform tests for quality control in tannery**
 - 3.1 Cured Hides
 - 3.2 Beam House
 - 3.3 Wet Blue
 - 3.4 Dye House Materials & Processes
 - 3.5 Crust Leather

LT – 373 Evaluation of Chemical Materials and Procedures

Total Contact Hours

Theory	32	T	P	C
Practical	96	1	3	2

Learning Outcomes

After completing this course, students will be able to:

1. Understand the sources, quality, structure, and availability of hides and skins used as raw materials in leather manufacturing.
2. Explain the histology, chemical composition, and physiological functions of skin components and the chemistry of hide proteins.
3. Perform and interpret moisture, ash, lipid, and pH analysis of hides, skins, and leather during different tannery processes.
4. Identify the effects of processing operations on leather composition, including moisture content, fats, and chemical balance.
5. Evaluate physical and chemical properties of leather and recognize common testing methods used for quality assessment

Course Contents

1. Background of raw material source, quality & availability 5 Hrs

- 1.1 Introduction
- 1.2 Quality of hides & skins
- 1.3 Structural properties of hides and skins.
- 1.4 Availability of raw material

2. Hides & skins-histology & structure 5 Hrs

- 2.1 Introduction
- 2.2 Basic Layers of Skin
- 2.3 Chemical composition
- 2.4 Physiological function of skins components
- 2.5 Chemistry of hide-protein

3. Moisture analysis of skin/hide and leather 3 Hrs

- 3.1 Introduction
- 3.2 Purpose of moisture analysis
- 3.3 Forms of water present in leather
- 3.4 Effect on moisture content at different stages of tannery operation

4. Ash analysis 5 Hrs

- 4.1 Introduction
- 4.2 Definition and objectives
- 4.3 Types of Ash in leather
- 4.4 Ash content in vegetable and chrome tanned leather

5. Lipids extraction and characterization 5 Hrs

- 5.1 Introduction and objectives
- 5.2 Lipid in Native hides
- 5.3 Effects of processes on natives lipids
- 5.4 Lipids in leather
- 5.5 Lipids Added to leather
- 5.6 Determination of fats in leather / fat liquors

6. pH MEASUREMENT AND BUFFERS**3 Hrs**

- 6.1 Introduction and objectives
- 6.2 Method to determine the pH at different stages
- 6.3 Buffer solution
- 6.4 Common ion Effect

7. Concept of Physical and chemical Evaluation**6 Hrs**

- 7.1 Introduction of properties
- 7.2 Physical properties of leather
- 7.3 Chemical properties
- 7.4 Name of Physical Testing
- 7.5 Name of Chemical Testing

Instructional Objectives

1. Background of Raw Material Source, Quality & Availability

1. Define raw materials used in leather industry.
2. Explain the quality factors of hides and skins.
3. Describe the structural properties of hides and skins.
4. Identify factors affecting availability of raw materials.

2. Hides & Skins – Histology & Structure

1. Explain the basic layers of skin.
2. Describe the histological structure of hides and skins.
3. Explain the chemical composition of skin.
4. Discuss the physiological functions of skin components.
5. Understand the chemistry of hide proteins.

3. Moisture Analysis of Skin/Hide and Leather

1. Define moisture analysis and its importance.
2. Explain the purpose of moisture determination.
3. Identify different forms of water in leather.
4. Describe the effect of moisture at different tannery stages.

4. Ash Analysis

1. Define ash and its objectives in leather testing.
2. Explain types of ash in leather.
3. Compare ash content in vegetable and chrome tanned leather.
4. Understand the significance of ash determination.

5. Lipids Extraction and Characterization

1. Define lipids and explain their objectives in leather study.
2. Describe lipids present in native hides.
3. Explain the effect of processing on native lipids.
4. Identify lipids added during leather processing.
5. Determine fat content in leather and fat liquors.

6. pH Measurement and Buffers

1. Define pH and its importance in leather processing.
2. Explain methods to determine pH at different stages.
3. Describe buffer solutions and their role.
4. Explain the common ion effect in simple terms.

7. Concept of Physical and Chemical Evaluation

1. Define physical and chemical properties of leather.
2. Identify major physical properties of leather.
3. Identify important chemical properties.
4. Name common physical testing methods.
5. Name common chemical testing methods

RECOMMENDED REFERENCE BOOKS

1. Kazi, S. H. (2016). *Principles of leather manufacturing*.
2. Hashmi, A. S., & Rafique, Z. (n.d.). *A short view of leather chemistry*.
3. Sarkar, K. T. (1981). *Theory and practice of leather manufacture*. Ajoy Sorcar.
4. Ogiwara, C. (n.d.). *Practical guidelines to light leather processing*.
5. Briggs, P. S. (n.d.). *Gloving, clothing and special leather*. Tropical Products Institute (TPI). (With J. C. Barrett).
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8. Watt, A. (n.d.). *Leather manufacture*. William Clowes and Sons Ltd., London.

List of Practical

96 Hrs

1. Determine moisture content as per required standard
2. Determine Ash content as per required standard
3. Determine Fat content (leather and Fat liquor)
4. Measure pH (leather and liquors) as per procedure
5. Prepare buffer solutions of different pH levels.
6. Determine the purity of sulphuric acid & formic acid.
7. Determine chromium oxide content as per procedure
8. Determine solid contents of substances
9. Determine Iodine and acid value of fat liquors and oils
10. Determine hardness of water
11. Prepare indicator BCG, BCP and phenolphthalein.

FTW-353 Leather Goods Pattern Making & Manufacturing

Total Contact Hours

Theory	64	T	P	C
Practical	96	2	3	3

Learning Outcome

The students will be able to:

1. Apply fundamental and advanced knowledge of pattern making for leather goods such as bags, wallets, belts, and accessories.
2. Develop the ability to transform design concepts into functional, feasible leather products.
3. Execute hands-on skills in crafting, assembling, and finishing leather goods using appropriate tools and techniques.
4. Apply creativity, precision, and industrial awareness in leather goods production.

Course Contents

- 1. Principle of Leather Goods** **4Hrs**
 - 1.1. Introduction to crafts / Leather goods
 - 1.2. General requirements of crafts
 - 1.3. Miscellaneous materials used in crafts making
 - 1.4. Machinery and tools required for crafts making
- 2. Pattern Engineering of Leather Goods** **24Hrs**
 - 2.1 Drafting of different types of Leather goods especially in (Wallet, Key Chain, Belt, Mobile Cover, File Cover, Glasses Cover, Gloves)
 - 2.2 Modeling and pattern engineering of different crafts components
 - 2.3 Sizing of different leather goods
- 3. Principles of leather goods cutting and stitching** **24Hrs**
 - 3.1 Principle of cutting
 - 3.2 Different cutting tools and methods
 - 3.3 Principles of goods stitching
 - 3.4 Types and requirements of stitching
 - 3.5 Make cutting patterns (Box Board, X-Ray sheet & tin template)
 - 3.6 Essential operations before packing
- 4. Introduction to Costing** **12Hrs**
 - 4.1 Introduction to Costing
 - 4.2 Implementation of Graph paper
 - 4.3 Direct tracing on material
 - 4.4 Material consumption

Recommended Books

1. By Dick Anzeic - Practical Pattern Making, (STP) SHOE TRADERAS PUBLI.
2. H.J.PATRIC, F.B.S.I - Modern Pattern Cutting and Design, (STP) SHOE TRADERAS PUBLI.
3. R.G.Miller- Manual of Shoe Making, Clarks Limited.

Instructional Objectives

1. Principles of Leather Goods

- 1.1 Explain the concept and importance of leather crafts and goods.
- 1.2 Explain the general requirements for leather craft production.
- 1.3 Explain the List various miscellaneous materials used in leather goods manufacturing.
- 1.4 Explain the Recognize and describe the machinery and tools necessary for making leather crafts.

2. Pattern Engineering of Leather Goods

- 2.1 Explain the standard patterns for various leather goods including wallets, key chains, belts, mobile covers, file covers, glasses covers, and gloves.
- 2.2 Explain the modeling and pattern engineering techniques to different craft components.
- 2.3 Explain the the correct sizes and scaling of various leather products.

3. Principles of Leather Goods Cutting and Stitching

- 3.2 Explain the basic principles and importance of accurate cutting in leather goods.
- 3.3 Explain the and use various cutting tools and techniques effectively.
- 3.4 Explain the different stitching principles used in leather goods.
- 3.5 Describe types of stitching and their functional requirements.
- 3.6 Explain the cutting patterns using box board, X-ray sheets, and tin templates.
- 3.7 Explain the essential finishing and pre-packing operations in leather goods production.

4. Introduction to Costing

- 4.2 Define costing and explain its role in leather goods production.
- 4.3 Define the Use graph paper for cost estimation and layout planning.
- 4.4 Define the direct tracing on leather and substitute materials for material planning.
- 4.5 Define the Calculate material consumption and estimate cost-effectiveness of leather goods.

List of Practical

96. Hours

1. Draw the sketch and developed standard of Wallet
2. Draw the sketch and developed standard of Key chain
3. Draw the sketch and developed standard of Belt
4. Draw the sketch and developed standard of Mobile Cover
5. Draw the sketch and developed standard of File Cover
6. Draw the Sketch and developed standard of Glasses Cover
7. Draw the Sketch and developed standard of Gloves
8. Make the Lining Pattern of all leather goods
9. Manufacture the Wallet
10. Manufacture the Key chain
11. Manufacture the Belt
12. Manufacture the Mobile Cover
13. Manufacture the File Cover
14. Manufacture the Glasses Cover
15. Manufacture the Gloves

FTW-373 Entrepreneurship & E-Commerce

Total Contact Hours

Theory	64	T	P	C
Practical	96	2	3	3

Learning Outcome

The students will be able to:

1. Understand basic concept of Entrepreneurship
2. Apply techniques for generating business idea and assessing opportunities
3. Understand market research and business models
4. Understand the basics of establishing a business
5. Create account on different online markets
6. Write proposal for clients in online markets

Course Contents

- 1. Introduction to Entrepreneurship** **08Hs**
 - 1.1. The concept of Entrepreneurship
 - 1.2. Key terminologies of Entrepreneurship
 - 1.3. Classification of business; difference between social and commercial business
 - 1.4. Reasons for Entrepreneurship
 - 1.5. Entrepreneurial motivation
 - 1.6. Risk Taking in Entrepreneurship
 - 1.7. Small enterprises
- 2. Innovation & Creativity** **07 Hrs**
 - 2.1. Concept of innovation and creativity
 - 2.2. Collective and Creative Thinking
 - 2.3. Entrepreneurial ideas
 - 2.4. Collective and Creative Thinking
 - 2.5. Assessment of entrepreneurial opportunities
- 3. Entrepreneurial Characteristics** **06Hrs**
 - 3.1. Concept of Entrepreneurial characteristics
 - 3.2. Entrepreneurial Leadership
 - 3.3. Self-discipline skills
 - 3.4. Decision making skills
 - 3.5. Principles of negotiation
- 4. Establishment of Enterprise** **07 Hrs**
 - 4.1. Concept of Market, market size, market demand and Competition
 - 4.2. Importance of Business location & selection of site
 - 4.3. Legal forms of business in Pakistan
 - 4.4. Product Strategies

- 4.5. Pricing Strategies
- 5. Management of an Enterprise** **12 Hrs**
 - 5.1. Concept of hiring and firing
 - 5.2. Different hiring techniques
 - 5.3. Managing Supply Chain
 - 5.4. techniques for selection of supplies
 - 5.5. Advertisement and its importance
 - 5.6. Different Advertisement techniques
 - 5.7. Product Life cycle of product
 - 5.8. Components and preparation of Business Plan
- 6. E-Commerce** **24 Hrs**
 - 6.1. Overview and Types of E-Commerce
 - 6.2. Impact of E-Commerce on businesses
 - 6.3. E-Commerce Platform
 - 6.4. Creation of account on different platforms
 - 6.5. Overview of product hunting and sourcing and their key considerations
 - 6.6. Product Selection
 - 6.7. Digital Marketing
 - 6.8. Logistics and Supply Chain
 - 6.9. Social Media Ethics

Recommended Books

- Knowing About Business (KAB), ILO
- Small Business and Entrepreneurship, Macmillan and Dewhurst.
- Drucker, P. and Maciariello, J, (2014). Innovation and entrepreneurship. Routledge.
- Introduction to E-Commerce, Martin Kutz
- E-Commerce Business. Technology. Society, Kenneth C. Laudon & Carol G Traver

Instructional Objectives

1. Introduction to Entrepreneurship

- 1.1. Define & explain the concept of Entrepreneurship and its various types
- 1.2. Identify and interpret the terms and elements involved in the concept of enterprise
- 1.3. Describe its importance in society & explanation of Social and Commercial business
- 1.4. Appreciate that the advancement of individual and society in general when entrepreneurship is adopted
- 1.5. Explain various motivational factors that entrepreneurs possess and utilize
- 1.6. Exhibit the skills needed to assess and evaluate a risk
- 1.7. Describe the outline of small enterprise elements, ideas, motivation, resources

2. Innovation & Creativity

- 2.1. Describe and differentiation innovation and creativity
- 2.2. Use a variety of strategies to promote unique ideas through group and creative thinking.
- 2.3. Explain the resources of business idea both internal and external
- 2.4. Explain Key aspects of an entrepreneurial assessment approach

3. Entrepreneurial Characteristics

- 3.1 Explain the various entrepreneurial characteristics
- 3.2 Define the leadership qualities which are essential to the success of entrepreneurs
- 3.3 Define the self- management skills and how they are important to be entrepreneurs
- 3.4 Explain the steps for decision making and rating of decision making skills
- 3.5 Define the rules of negotiation for resolving business issues

4. Establishment of Enterprise

- 4.1 Explain the procedure for assessing the market size and demand and different types of market
- 4.2 Explain the major factors to be considered when selecting a location for a business
- 4.3 Describe the basic types of business ownership and the limitation of each one
- 4.4 Describe the concept market & marketing, 5 “w’s” of market, and differentiate between sellers and buyers’ market
- 4.5 Define the advantages and disadvantages of using various sources of capital to start an enterprise and Explain the component of cost of product and pricing strategies

5. Management of an Enterprise

- 5.1 Describe the different hiring and firing methods
- 5.2 Explain the Job description and specification and importance of the term & conditions of services
- 5.3 Explain the concept of supply chain
- 5.4 Elaborate Characteristics of successful sales personals & Identify the various techniques of selecting a supplier
- 5.5 Describe the purpose and importance of advertisement
- 5.6 Explain the different advertisement techniques
- 5.7 Describe the purpose and importance of life cycle of product
- 5.8 Explain important components and parts included in preparation of Business Plan

6. E-Commerce

- 6.1. Explain E-commerce and its different types

- 6.2. Explain E-commerce's impact on today's business world
- 6.3. Explain time management tools & identify key factors of time management
- 6.4. Define the concept of "product hunting" and "sourcing" in e-commerce and their key considerations
- 6.5. Define appropriate product selection techniques for e-commerce
- 6.6. Describe the digital marketing
- 6.7. Define the social media ethics

1. Create and Manage Account / Store on different Platform (DARAZ, Shopify and Amazon etc.)
2. Upload and manage product images
3. Add, edit, and manage products in e-commerce platform
4. Integrate a payment gateway
5. Complete a test order to understand and checkout process
6. Update order status “Pending” to “Shipped”
7. Update product stock level
8. Create a blog on an e-commerce platform
9. Add social media links to an e-commerce site

LT – 381 Final Design Project

Total Contact Hours

Theory		T	P	C
Practical	96	0	3	1

Learning Outcomes

After completing this course, students will be able to:

1. Develop different leather articles like shoe upper, garments, gloving, upholstery, suede, and nubuck according to quality requirements.
2. Understand and manage tannery setup, including chrome recovery plant, effluent treatment plant, chemical store, and production areas.
3. Perform physical testing and analyze leather properties, including fat content and dye fixation.
4. Compare different leather processing methods (unhairing, bating, and fat liquors) to improve leather quality

List of Practicals

96 Hrs

As an essential part of DAE Leather Technology course, each student will have to complete a project including the following: -

1- Develop any one article from the following:-

- 1.1 Shoe upper leather
- 1.2 Garments leather
- 1.3 Gloving leather
- 1.4 Upholstery leather
- 1.5 Suede leather
- 1.6 Nubuck leather

2- Prepare a report on any one following:-

- 2.1 Chrome recovery plant
- 2.2 Effluent treatment plant
- 2.3 Management of chemical store
- 2.4 Management of production yard
- 2.5 Management of mechanical yard
- 2.6 Mass balance of sodium sulfide and lime
- 2.7 Mass balance of chrome
- 2.8 Comparison between different un-hairing methods
- 2.9 Comparison between different bating materials
- 2.10 Comparison between different fat liquors
- 2.11 Comparison between different Tanning

3-CP & DP Viva

List of Tools, Equipment & Machinery (for 50 students)
DAE Leather Technology, Revised 2026

List of labs.

1. Tanning lab
2. Physical Testing lab
3. Chemical Testing lab
4. Physics Lab
5. Chemistry Lab
6. Footwear/ Leather Goods Lab
7. Computer lab

• **Tanning Lab:**

Sr.no	Equipment's	Quantity
1.	Stool	50
2.	Hand cutting knife	15
3.	Indicator liming/deliming /neutralization each	03 small pack
4.	Measuring tape	05
5.	Beume meter	12
6.	Measuring cylinder	05
7.	Weighing balance	02
8.	Fleshing Knife	04
9.	Fleshing Machine	01
10.	Sammying Setting Machine	01
11.	Shaving Machine	01
12.	Splitting Machine	01
13.	Toggle Plant	01
14.	Staking Machine (Molissa)	01
15.	Wheel Staking Machine	01
16.	Vacuum Dryer	01
17.	Glazing Machine	01
18.	Buffing & Dedusting Machine	01
19.	Roto Press	01
20.	Hydraulic Press (Embossing)	01
21.	Spray Booth	02
22.	Spray Gun	04
23.	Staking Horse	04
24.	Working Table	01
25.	Air Compressor	02

26.	Experimental Drum	20
27.	Fire Extinguishers (DCP 6–8kg, CO2 8kg, Foam)	02 No each
28.	Fire Blanket	02 No's
29.	Safety goggles	10 No's
30.	Respiratory Gas Mask (Air Anti-Dust & Chemical fumes, double filter)	5 No's
31.	Safety Helmet	10 No's
32.	Safety shoes	50 No's
33.	Ear Muff	5 No's
34.	Sand Storage buckets for fire fighting	5 No's
35.	Water Storage buckets for fire fighting	5 No's

Consumable Materials (Tanning Lab)

1.	Sulphuric Acid	25 Kg
2.	Replacement syntan	25kg
3.	Binder	25 Kg
4.	Dyes (Different colours)	25 kg
5.	Hides	30 Nos
6.	Fat liquors	60 litre
7.	Skins	90 Nos
8.	Polymer Re tanning Agents	10 Kg
9.	Pigments	15 kg
10.	Sodium chloride	160 kg
11.	Sodium bi sulphite	10 kg
12.	Sodium sulphide	100 kg
13.	Sodium Format	10 Kg
14.	Dispersing agent	20 kg
15.	Resin Syntan	25 Kg
16.	Neutralizing agent	25kg
17.	Lime	160 kg
18.	Chrome Syntan	25 Kg
19.	Sodium Bi Carbonate	30 kg
20.	Formic acid	50 kg
21.	Mimosa	50 kg
22.	Chest nut	10 kg
23.	Chrome	125 kg
24.	Bactericide	05 kg
25.	Fungicide	05 kg
26.	Alum	03 kg

27.	Aldehyde	03kg
28.	Ammonia liquor	05 kg
29.	pH paper	02 packs
30.	Bate	10 kg
31.	Wetting agent	30 kg
32.	Ammonium chloride	10 kg
33.	Ammonium sulphate	25 kg
34.	Raw Neat Foot Oil	10 kg
35.	Auxiliaries	25 kg
36.	Oxalic acid	05 kg
37.	Nitrocellulose Lacquer	25 Kg
38.	Apron / Proper uniform	50 No's
39.	Dust Mask	50 No's
40.	Safety Gloves set (Leather, rubber & Cotton)	50 No's
41.	First Aid Box	1 No's

- **Physical Testing Lab:**

Sr.no	Equipment's	Quantity
1.	Stool	25
2.	Table	5
3.	Scissor	10
4.	Tensile/ Tear strength Machine	01
5.	Cutting dies	20
6.	Ball Brust test machine	01
7.	Thickness gauge	02
8.	Flex Resistance test M/C (For Sole)	01
9.	Adhesion Strength M/C	01
10.	Slip Resistance tester	01
11.	Sole flexing tester M/C	01
12.	Heel attachment strength tester M/C	01
13.	Water Pentro meter M/C	01
14.	Abrasion Resistance M/C	01
15.	Rub Fastness M/C	01
16.	Adhesion of Finish M/C	01
17.	Flexo Meter (For Upper)	01
18.	Light Fastness M/C	01
19.	Humidifier	01
20.	Thermograph	01
21.	AC 2 ton	02
22.	Desiccator	02
23.	Clicking press	01
24.	Glass Magnifier	06

Consumable Materials (Physical Testing Lab.)

1.	Leather hides	20
2.	Leather Skins	30
3.	Raxine	10 meter
4.	Steel Rule	10
5.	Soles	10
6.	Magic (Adhesive)	5
7.	Scotch Tape (1inch)	2
8.	Masking tape	12
9.	Cotton Felt white	1 Pack

10.	Cotton Felt Black	1 Pack
11.	Abrasion Paper	1 roll
12.	Hand knife cutter	12
13.	Cutting board	2
14.	Copper wire	2 meter
15.	Filter paper sheet	2
16.	Towel piece	5
17.	Silica gel	1 Kg
18.	Graph Paper	1 roll
19.	Acetone	2.5 Liter
20.	Mask	50
21.	Lab Coat	50
22.	Working Gloves	12
23.	Permanent Marker	1 Pack
24.	Sealing Agent	100 ml
25.	First Aid Box	1 No's

- **Chemical Testing Lab:**

Sr.no	Equipment's	Quantity
1.	Stool	25
2.	pH meter (analytical grade)	03
3.	Spectrophotometer	01
4.	Digital balance	02
5.	Soxhlet apparatus	01
6.	BOD cabinet	01
7.	Water distillation unit	01
8.	Drying oven	01
9.	Steam Distillation	01
10.	Leather Grinding Mill	01
11.	Rotary Shaker	01
12.	Microscope Monotype	02
13.	Muffle Furnace Mod	01
14.	Hot Plate Model	03
15.	Multi Hot Plate	02
16.	Microscope Stereotype	01
17.	Bench top pH meter with pH Electrode	02
18.	Fume Hood	01
19.	Watch Glass	50

Consumable Materials (Chemical Testing Lab)

1.	Leather hides	10
2.	Leather Skins	20
3.	Filter paper	100 sheets
4.	Sulphuric acid	2.5 Liter
5.	Hydrochloric acid	2.5 Liter
6.	Per chloric acid	2.5 Liter
7.	Formic Acid	2.5 Liter
8.	Nitric acid	2.5 Liter
9.	Sodium Chloride	1 Kg
10.	Ammonium Chloride	1 Kg

11.	Ethanol	2.5 Liter
12.	Diethyl ether	2.5 Liter
13.	Acetone	2.5 Liter
14.	Bromo cresol green Indicator	100 g
15.	Bromo cresol purple Indicator	100 g
16.	Methyl Orange indicator	100 g
17.	Methyl Red indicator	100 g
18.	Phenolphthalein indicator	100 g
19.	pH paper	12 Pack
20.	Test tubes	50
21.	Test tube holder	8
22.	Cylinder 50 ml	10
23.	Cylinder 100 ml	10
24.	Cylinder 250 ml	10
25.	Cylinder 500 ml	10
26.	Beaker 1000 ml	6
27.	Beaker 500 ml	10
28.	Beaker 250 ml	12
29.	Beaker 100 ml	12
30.	Beaker 50 ml	12
31.	Pipette graduate	10
32.	Pipette bulb	10
33.	Sucker	5
34.	Washing bottle	6
35.	Shaker bottle	12
36.	Masking Tape	12
37.	Funnel	12
38.	Flask	24
39.	Stirrer	6
40.	China dishes	12
41.	Thimble	50
42.	Cotton roll	3
43.	Permanent marker	10
44.	Brush	6
45.	Thermometer	12
46.	Iodine flask	12
47.	Tissue paper	2 pack
48.	Mask	50
49.	Gloves	6
50.	Goggles	3

51.	First Aid Box	1 No's
52.	Hand cutting knife	15

Footwear/Leather Goods Lab:

Sr.no	Equipment's	Quantity
1.	Chair/ Stool	50
2.	Working Table	10
3.	Scissor	50
4.	Hand cutting knife	50
5.	Cutting mat	50
6	Hammer	25
7.	Punch set	3
8.	Cutting board	5
9.	Clicking press	1
10.	Hydraulic press	1
11.	Laser cutting machine	1
12.	Splitting machine	1
13.	Skiving machine	2
14.	Numbering machine	1
15.	Screen printing apparatus	1
16.	Strap cutter	1
17.	Cabinet	5
18.	Zinc sheet	100KG
19.	Measuring tape	10
20.	Brush	10
21.	L-key set	2 Set
22.	Revolving punch	5
23.	Zig Zag Stitching M/C	1
24.	Single Needle Post bed M/C	5
25.	Single Needle Flatbed M/C	5
26.	Eyelet machine	1
27.	Pasting machine	1
28.	Single Needle Cylinder Arms	1
29.	Blocking machine	1
30.	Single Double Needle Post bed M/C	5
31.	Cutting Knives As per Model set	3
32.	Button Hole M/C	01
33.	Button attaching	01
34.	Electric Cutting M/C	01
35.	Safety Over Lock M/C	02
36.	Vacuum M/C (Shell Form)	01
37.	Punching & Eyeleting M/C	01
38.	Edge Upper Folding M/C	01
39.	Table Peg Stand	02
40.	Lasting plier	10
41.	Nail puller	10
42.	Electric heater	02

43.	Rubber hammer	10
44.	Shoe last (Pair)	35
45.	Toe lasting activator	01
46.	Toe lasting M/C	01
47.	Toe shaping M/C	01
48.	Outside sole lasting M/C	01
49.	Sole Attaching	01
50.	Heel lasting machine	01
51.	Sole press	01
52.	Shape farming	01
53.	Heat Setter	01
54.	Cold Chamber	01
55.	Sole Stitching M/C	01
56.	Ruffing M/C	01
57.	Buffing M/C	01
58.	Hand ruffing M/C	01
59.	Spray Booth with gun	01
60.	Wrinkle Chasing	01
61.	Auto Insole Back Part Terming M/C	01
62.	Eyeleting M/C For Insole Shank Steel	01
63.	Toe Forming M/C Hot& Cold	01
64.	Back Forming Hot &Cold	01
65.	Toe Activator/Steam Mulling M/C	01
66.	Embossing & Printing M/C 01	01
67.	Stroble M/C	01
68.	Upper Forming M/C For 4Pairs Mold 01	01
69.	Roughing M/C Total Bottom 01	01
70.	Sole Roughing Dual Head 01	01
71.	Inside Sole Stitching Inter Lock 01	01
72.	Side Sole Stitching M/C 01	01
73.	Sole & Upper Reactivation M/C 01 I	01
74.	Insole Forming M/C 01	01
75.	Auto Shank Board Reducing & Grooving 01	01
76.	De-Lasting	01

Consumable Materials (Footwear Lab/ Leather Goods Lab)

Sr. #	Material Name	Quantity
1.	Leather	150 sq.ft
2.	Raxine	20 Meter
3.	Sole	50Pairs
4.	Yellow Paste	25 KG
5.	Sole Attaching Adhesive	20 KG
6.	M.E.K	10 Litre
7.	Ethyle	10 KG
8.	Atolvine	3 KG
9.	Shank	3 Pckt
10.	Thread	20 Cone
11.	Eyelet	1 Pckt
12.	Zip	1 Role
13.	D. Ring	1 Pckt
14.	Laces	3 Dozen
15.	Box Board Sheet	10 Rim
16.	Lead Pencil	6 Pckt
17.	Drawing Kit	10
18.	Sharpener(Big Size)	10
19.	Steel Roller(12 Inches)	50 Pcs
20.	Jacket Lining	50 Mtr
21.	Tich Button	1 Pckt
22.	Needles (18,21)	10 Box
23.	Spring Cutter	50
24.	Spirt Lamp (Steel)	10
25.	First Aid Box	1 No's

Computer lab

Sr.no	Equipment's	Quantity
1.	Chair	50
2.	Computer Table	50
3.	Computer system	50
4.	Microsoft windows	50
5.	Microsoft office	50
6.	Color printer	01
7.	Medium duty printer	01
8.	Light duty scanner	01
9.	LED multimedia projector	01
10.	Backup ups	01
11.	USB	05
12.	External hard drive	01
13.	Air Conditioner	02

Consumable Materials (Computer Lab)

1.	Paper Rim	6 Pack
2.	First Aid Box	1 No's
3.	Toner	1 No's

- **Physics Lab**

S.No	Description	QTY
1.	Graph Paper	50
2.	Meter Rod	20
3.	Drawing Board	25
4.	Vernier Caliper 0 to 150mm (0.05)	10
5.	Solid cylinder	10
6.	Outside Micro meter 0 to 25mm (0.01)	10
7.	Wire of different diameter	35
8.	Fletcher trolley apparatus	08
9.	Tuning fork of different frequencies (5 each of different frequencies)	08
10.	Rubber pads	10
11.	Resonance apparatus	8
12.	Beaker	20
13.	Thermometer 0-100C,	20
14.	V shaped wooden blocks	20
15.	Solid spheres	50
16.	Card stand	20
17.	Drawing pins packets	01
18.	Protractor/D	50
19.	Slotted cork	50
20.	Glass slabs	20
21.	Common pins packets	01
22.	Lead Pencils in dozens	5
23.	Tables 4'X8'X 3' height	6
24.	Concave mirror	8
25.	Knitting needles in packets	1
26.	Upright needles with stand	50
27.	Converging lense	08
28.	Microscope with vernier scale	02
29.	Spectrometer with light source(Sodium lamp)	08
30.	index needle	50
31.	Convex lense of small focal length	08
32.	Convex lense of large focal length	08
33.	Pin hole camera Digital	08
34.	Tripod stand	50
35.	Bunsen burner	08

36.	Calorimeter alongwith wooden lid	08
37.	Stirrer	08
38.	Hangers	08
39.	Pulleys	20
40.	Weight Box,	08
41.	Drawing Board Half imperial size	08
42.	Mirrors strips 1"X6"	08
43.	Mirrors strips 4"X6"	08
44.	Cotton threads gola	01
45.	Universal stands/frame	08
46.	set square 30,60,45 degree midium size	08
47.	Toggle joint apparatus	08
48.	Spring balance 1-10Kg	08
49.	Spring balance 1-20Kg	08
50.	Steel yards/ steel meter rod	01
51.	wooden blocks	08
52.	Differential pulley block	4
53.	Simple harmonic motion apparatus	08
54.	Drawing sheets Imperial size (pack of 100 sheets)	1
55.	Hooks law apparatus (Helical spring type)	08
56.	Maxwell needle type magnetic apparatus for north and south pole determination	08
57.	Binoculars(doorbeen)	08
58.	Stop watch digital	08
59.	Common balance	08
60.	Knife edges wooden	08
61.	Wedges wooden	08
62.	Forces on a Suspension Bridge Apparatus	08
63.	Pulley & Block Apparatus	08
64.	Bell Crank Lever Apparatus	08
65.	Wire Suspension Apparatus	08
66.	Steam Generator	08
67.	Half Degree Thermometer	08
68.	Calori Meter	08
69.	Flannel	08
70.	Blotting Paper	35
71.	Galvanometer	08
72.	Batteries 12 Volt 6 Amp	08
73.	Connecting Wire 10 Meter	01
74.	Hypsometer	08
75.	Optical Bench	08
76.	Kundt's tube	08

77.	V Shape Block	15
78.	Lycopodium Powder	½ kg
79.	Sono Meter	08
80.	Searles apparatus	08
81.	Steel Wire (Pieces)	50

- **Chemistry Lab**

S.No	Description	QTY
1.	Beakers 100 ml	10
2.	Beakers 250ml	10
3.	Beakers 500ml	10
4.	Beakers 1000ml	10
5.	Funnel 3 inch or 75mm	10
6.	China dish 60cc	10
7.	Bunsen burner With stop cork	10
8.	Tripod stand 8 inches or 6 inches	10
9.	Thermometer 110c	10
10.	Capillary tubes Good quality	10
11.	Universal pH paper Range 1-14	05
12.	Watch glass 3"	10
13.	Glass tube local	03 Meters
14.	Ostwald's viscometer	10
15.	Pipet 10ml	10
16.	Specific gravity bottle 25ml	10
17.	Electronic balance 0.1gm -500gm	03
18.	Stalagmo meter	10
19.	Pinch cork	05
20.	Hoffman's volta meter	05
21.	Connecting wires	05 meters
22.	D.C Adapter 300mili ampere	03
23.	Distilled water plant 5liters/h	01
24.	Copper plates 5cmx3cm	04
25.	Aluminium plates 5cmx2cm	04
26.	Ammeter (Ampere meter) 0-3 ampere	03
27.	Test tubes 16x150mm	60
28.	Test tube stand Plastic or steel	06
29.	Test tube brush For washing test tubes	06
30.	Test tube holder Good quality	10
31.	Measuring flask 1 liter	10
32.	Measuring flask 500 ml	10
33.	Measuring flask 250ml	10
34.	Conical flask 250ml	10
35.	Kipps apparatus 250 ml	01
36.	Conical flask 100ml	10
37.	Reagent bottles Small and middle size	20

38.	Burette 50ml	10
39.	Iron stand with clamps or burette stand	10
40.	Wire guaze	10
41.	Wash bottle plastic	05
42.	Dropper Medium size	05
43.	Glass stirrer Medium size	10
44.	Tongs	05
45.	Delivery tube	05
46.	Graduated cylinder 100ml	05
47.	Match box/ lighter	05
48.	Sand paper	05
49.	Filer For cleaning iron apparatus	03
50.	<u>DC power supply 20 AMP</u>	02
51.	<u>DC power supply 60 AMP</u>	02
52.	<u>Tape for labeling</u>	02
53.	<u>Scissor</u>	01
54.	Ammonia	1 pound
55.	Acetone	2 liters
56.	Ammonium acetate	100 gm
57.	Acidic acid	1 pound
58.	Ammonium sulphate	100 gm
59.	Ammonium carbonate	100 gm
60.	Ammonium chloride	100 gm
61.	Ammonium hydroxide	100 gm
62.	Ammonium sulphide yellow	½ liters
63.	Antimonium sulphate	100 gm
64.	Aluminium sulphate	100 gm
65.	Benzene	1 liter
66.	Barium chloride	100 gm
67.	Barium nitrate	100 gm
68.	Borax	100 gm
69.	Bismuth chloride	100 gm
70.	Copper sulphate	300 gm
71.	Concentrated sulphuric acid	3 liters
72.	Calcium chloride	100 gm
73.	Cobalt nitrate	100 gm
74.	Calcium carbonate	100 gm
75.	Cadmium sulphate	100 gm
76.	Diphenylamine	100 gm
77.	Ethanol	1 liter
78.	Ether	1 liter
79.	Ferrous chloride	100 gm
80.	Ferrous sulphate	100 gm

81.	Ferric sulphate	100 gm
82.	Ferric chloride	100 gm
83.	Ferrous sulfide	100 gm
84.	Hydro chloric acid	3 liters
85.	Lead acetate	100 gm
86.	Lead nitrate	100 gm
87.	Litmus solution	½ liters
88.	Methyl orange	100 gm
89.	Magnesium sulphate	100 gm
90.	Methylated spirit	1 liters
91.	Mercuric chloride	100 gm
92.	Manganese sulphate	100 gm
93.	Mercuric chloride	100 gm
94.	Naphthalene	100 gm
95.	N –butanol	1 liter
96.	Nitric acid	2 liters
97.	Nikel sulphate	100 gm
98.	Potassium ferrocyanide	100 gm
99.	Potassium nitrate	100 gm
100.	Potassium permaganate	100 gm
101.	Potassium chromate	100 gm
102.	Potassium sulphate	100 gm
103.	Potassium iodide	200 gm
104.	Phosphoric acid	½ liters
105.	Potassium dichromate	100 gm
106.	Phenolphthalene	100 gm
107.	Potassium hydroxide	100 gm
108.	Plumbic chloride	100 gm
109.	Potassium ferricyanide	100 gm
110.	Sodium chloride	1 kg
111.	Sand	2 kg
112.	Sodium sulphate	100 gm
113.	Sodium phosphate	100 gm
114.	Sodium hydroxide	100 gm
115.	Sodium carbonate	100 gm
116.	Silver nitrate	100 gm
117.	Sodium thiosulphate	100 gm
118.	Stannous chloride	100 gm
119.	Sodium sulphide	100 gm
120.	Sodium bicarbonate	100 gm
121.	Sodium phosphste	100gm
122.	Sodium nitrite	100gm
123.	Zinc sulphate	100gm

124.	Zinc chloride	100gm
125.	Zinc nitrate	100gm

RELEVANT QUALIFICATION OF INSTRUCTORS / TEACHERS

For Technical Subjects

- BS Chemistry/ BS biotechnology/ BS Chemical / BS Leather with minimum of 2 year Industrial / Teaching experience in the related field.
- DAE Leather with minimum of 3-years Industrial / Teaching experience in the related field.

Lab. Technician

- DAE in Leather Technology with 1-years Industrial / Teaching experience in the related field
- Intermediate with 1 Year Leather Manufacturing Certificate 3-years Industrial / experience in the related field

For Subjects pertaining to Humanities / Related Studies /Management / IT

- BS / M.A (16 years or higher) degree in English, Islamiat / Pak Studies with 2 years of teaching experience
- BS / M.Sc. (16 years or higher) degree in IT / CS / SE or BS in Computer Engineering with 2-years of teaching experience
- BS / M.Sc. (16 years or higher) degree in Mathematics / Physics / Chemistry with 2-years of teaching experience
- BBA / MBA (16 years or higher) degree with 2-years of teaching experience

EMPLOYABILITY OF THE PASS-OUTS with Market designations and vertical progression

The students holding DAE qualifications in Leather Technology can seek employment in firms/companies / industry dealing in any of the following Areas / Sectors: -

- As Assistant Tanner in Tanneries
 - Shoe Technicians in all Production processes
 - Quality control in Leather, Footwear making
 - Incharge as a Physical and Chemical Testing both Leather & Footwear
 - Footwear materials marketing manager
 - Chemicals marketing manager
 - Merchandising Manager
 - Leather relevant tools and machinery marketing
 - Own Business in Leather, shoe or leather goods manufacturing
 - Trainer of Leather, Footwear and leather goods related trainees
- Moreover, they can be considered also for higher study in all Graduation programs in Pakistan and abroad.

Vertical mobility for Private Industry:

→ Assistant Tanner → Tanner → Chief Tanner → Production Manager
→ Production Line Supervisor → Production Supervisor → Assistant Production Manager
→ Production Manager → General Manager
→ Quality Inspector → Quality Supervisor → Assistant Quality Manager → Quality Manager
→ Assistant Merchandising Manager → Merchandising Manager
→ Assistant Marketing Manager → Marketing Manager

Vertical mobility for Government Sector:

Assistant Lab Technician → Lab Technician → Supervisor

Vertical mobility for TVET Sector:

Junior Instructor → Instructor → Senior Instructor → Leather Technologist → Chief Leather Technologist / Chemical Technologist → Project Director