NSQF ALIGNED CURRICULUM FOR

THREE YEAR (SIX SEMESTER)

DIPLOMA COURSE IN

LEATHER TECHNOLOGY FOOTWEAR (CASD)

Effective from Session -2022-23

Prepared by:

Curriculum Development Cell

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CORRECTED AND APPROVED BY BOARD OF TECHNICAL EDUCATION U.P., LUCKNOW IN CDC MEETING HELD ON 11.08.2023

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PREFACE

An important issue generally debated amongst the planners and educators world over is how technical education can contribute to sustainable development of the societies struggling hard to come in the same bracket as that of the developed nations. The rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In India, a shift has taken place from the forgettable years of closed economy to knowledge based and open economy in the last few decades. In order to cope with the challenges of handling new technologies, materials and methods, we have to develop human resources having appropriate professional knowledge, skills and attitude. Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Now it is time to consolidate and infuse quality aspect through developing human resources, in the delivery system. Polytechnics play an important role in meeting the requirements of trained technical manpower for industries and field organizations

In order to meet the requirements of future technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of diploma programmes. The curricula for diploma programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of diploma programme.

The real success of the diploma programme depends upon its effective implementation. However best the curriculum document is designed, if that is not implemented properly, the output will not be as expected. In addition to acquisition of appropriate physical resources, the availability of motivated, competent and qualified faculty is essential for effective implementation of the curricula.

It is expected of the polytechnics to carry out job market research on a continuous basis to identify the new skill requirements, reduce or remove outdated and redundant courses, develop innovative methods of course offering and thereby infuse the much needed dynamism in the system.

ACKNOWLEDGEMENTS

We gratefully acknowledge the guidance and contribution received from the following persons:

i) Principal Secretary, Technical Education & Vocational Education, Govt. of UP for his exemplary vision and approach.

ii) Special Secretary, Technical Education Department, Govt. of UP for his support and motivation.

iii) Director, Technical Education, UP and Director, I.R.D.T., Kanpur for continuously motivating, guiding and taking keen interest in the review of this curriculum.

iv) Secretary, Board of Technical Education, UP for his support in this project of review curriculum.

v) All the participants from industry/field organizations, engineering colleges, polytechnics and other technical institutions for their professional inputs during curriculum workshops.

vi) Faculty/Subject Experts from different departments of U.P. Government polytechnics for content updating.

vii) CDC Officer and other Concerning Staff of IRDT Kanpur for their support and assistance in the conduct of Curriculum workshops at different places.

1. SALIENT FEATURES OF DIPLOMA PROGRAMME IN LEATHER TECHNOLOGY, FOOTWEAR (CASD)

1)	Name of the Programme	:	Diploma in Leather Technology ,Footwear (CASD)
2)	Duration of the Programme	:	Three years (Six Semesters)
3)	Entry Qualification	:	Matriculation or equivalent NSQF Level as Prescribed by State Board of Technical Education, UP
4)	Intake	:	60 (or as prescribed by the Board)
5)	Pattern of the Programme	:	Semester Pattern
6)	NSQF Level	:	Level - 5
7)	Ratio between theory and	:	45 : 55 (Approx.)

Practice

8) Industrial Training:

Four weeks of industrial training is included after IV semester during summer vacation. Total marks allotted to industrial training will be 50.

9) Ecology and Environment :

As per Govt. of India directives, a subject on Environmental Studies has been incorporated in the curriculum.

10) Energy Conservation:

A subject on Energy Conservation has been incorporated in the curriculum.

11) Entrepreneurship Development

A full subject on Industrial Management and Entrepreneurship Development has been incorporated in the curriculum.

12) Student Centred Activities:

A provision of 3-6 hrs per week has been made for organizing Student Centred Activities for overall personality development of students. Such activities will comprise of co–curricular activities such as expert lectures, self study, games, hobby classes like photography, painting, singing etc. seminars, declamation contests, educational field visits, NCC, NSS and other cultural activities, disaster management and safety etc.

13) Project work

A project work has been included in the curriculum to enable the student get familiarize with the practices and procedures being followed in the industries and

provide an opportunity to work on some live projects in the industry.

2. EMPLOYMENT OPPORTUNITIES

- **JOB POTENTIAL / JOB OPPORTUNITIES**

The following are the job opportunities for diploma holders in leather technology.

1. As a leather technologist to manufacture various types of heavy and light leathers, sports goods leathers, garment leather etc.
2. As supervisor/production manager in the tanneries/leather and allied industries in the following sections:

   Liming Department, Tanning Department, Dyeing Department, Curing Department, Finishing Department, Testing and Quality control.
3. As research assistant for developing tanning processes for manufacture of various types of leathers.
4. As technical officer/sales officer in chemicals and auxiliary manufacturing companies.
5. As supervisor in quality control and purchases (Finished leather)
6. As an analyst in tanneries.
7. As supervisor or manager in raw hide curing, preservation and flaying centre.
8. As a field officer for procurement of new materials in shoe industry/Tannery
9. As a marketing officer in tanneries and allied industries.
10. As a laboratory assistant in leather test laboratories.
11. 11.As assistant/ Deputy Director leather in Govt. departments.
12. 12.As a design/planning supervisor in leather goods manufacturing and allied industries.
13. As a maintenance supervisor in leather industry

3. LEARNING OUTCOMES OF DIPLOMA PROGRAMME IN LEATHER TECHNOLGY , FOOTWEAR (CASD)

Sr.	Learning Outcomes
After undergoing this programme, students will be able to:	
1	Prepare and interpret drawings of engineering components and plants
2	Knowledge of Various Manufacturing Steps that are involve in Manufacturing of Footwear
3	Apply concepts of mechanics to solve chemical engineering problems
4	Apply basic principles of mathematics, science and engineering to solve chemical engineering problems
5	Knowledge of Footwear Design Such as Anatomy of Human Foot ,Muscular System , Skin Type , etc.
6	Knowledge of Footwear Design Such as, Footwear Diseases and abnormalities , footwear Structure etc
7	Knowledge of Footwear Technology Steps and its Purpose
8	Knowledge of Footwear Technology Steps and its Purpose Such as Closing , Skiving, edge Treatment etc.
9	Recognize the need for and have the ability to engage in life long learning
10	Conduct experiments, analyze, interpret data and synthesize valid conclusions
11	Operate conventional machine for machining of components as per Specifications as an aid to function effectively in the process industry.
12	Use electrical and electronic instruments to measure various engineering parameters
13	Knowledge & Skill of Leather Goods Machinery
14	Knowledge of Difference type of leather, fittings , cost, and durability etc.
15	Knowledge row heights , skin structure defects , curing etc

16	Knowledge about of the leather which are used for manufacturing different type of garments..
17	Knowledge of set standards and processors for maintaining the quality..
18	Knowledge of special type of Leathers.
19	Use various software tools for automation and process development.
20	Interpret factory acts, laws and taxes
21	Develop communication and interpersonal skills for effective functioning in The world of work.
22	Communicate effectively in English and local language in oral and written form with others
23	Manage resources effectively at work place
24	Plan and execute given task/project as a team member or leader
25	Prepare detailed project proposal and report.
26	Use computer and IT tools for creating documents, making spread sheet and making presentation
27	Solve real life problems by application of acquired knowledge and skills
28	Use energy conservation methods to manage energy efficiency
29	Use appropriate practices for conservation and prevention of environment Pollution and safety in process industries.
30	Knowledge of various manufacturing steps such as pricing, final product etc .
31	Knowledge of estimating & costing of Leather product and Industry..

4. CURRICULUM AREAS FROM LEARNING OUTCOMES OF THE PROGRAMME

The following curriculum area subjects have been derived from learning outcomes:

Sr. No.	Learning Outcomes	Curriculum Areas/Subjects
1.	Prepare and interpret drawings of engineering components and plants	-Engineering Drawing-I
2.	Knowledge of Various clicking methods.	-Footwear Technology -I (Clicking)
3.	Apply concepts of mechanics to solve chemical engineering problems	- Applied Mechanics
4.	Apply basic principles of mathematics, science and engineering to solve chemical engineering problems	- Applied Mathematics - Applied Physics - Applied Chemistry - Basics of Mechanical and Civil Engineering
5.	Knowledge of Anatomy of Human Foot	-ANATOMY OF HUMAN FOOT.
6.	Knowledge of Size System	- Footwear Design
7-	Knowledge of Upper Closing	- Footwear Technology –II (Closing)
8.	Develop communication and interpersonal skills for effective functioning in the world of work.	- Communication Skills
9.	Prepare detailed project proposal and report.	- Project Work
10.	Use of computer and IT tools for creating documents, making spread sheet and making presentation	- Basics of Information Technology
11.	Use energy conservation methods to manage energy efficiency	- Energy Conservation

12.	Use appropriate practices for conservation and prevention of environment pollution and safety in process industries.	- Environmental Studies -Pollution Control and Industrial Safety

13.	Knowledge of various manufacturing steps such as pricing , final product etc .	- Footwear Technology -III (construction)
14.	Knowledge of estimating & costing of Leather product and Industry.	- Financial Costing and Accounting

ABSTRACT OF CURRICULUM AREAS

a) General Studies

Communication Skills

Environmental Studies

Energy Conservation

Industrial Management and Entrepreneurship Development
Pollution Control and Industrial Safety
Universal Human Values

b) Applied Sciences

Applied Mathematics

Applied Physics

Applied Chemistry

c) Basic Courses in Engineering/Technology

Engineering Drawing

General Workshop Practice

Basics of Mechanical and Civil Engineering

Basics of Information Technology
Financial Cost and Management accounting

Basics of Electrical and Electronics Engineering

d) Applied Courses in Engineering/Technology Measuring

Footwear Technology -I
Footwear Technology -II
Footwear Technology -III
Footwear Design –I
Footwear Design –II
Material for Footwear manufacture
Footwear Engineering
Leather Goods and garment manufacturing
Elements of Leather Technology
Renewable Energy Sources
CAD/CAM for Footwear

Testing Quality Control

Industrial Training

Project Work

5. HORIZONTAL AND VERTICAL ORGANISATION OF THE SUBJECTS

Sr. No.	Subjects	Distribution in Periods per week in Various Semesters					
		I	II	III	IV	V	VI
1.	Communication Skills	5	-	-	6	-	-
2.	Applied Mathematics	5	5	5	-	-	-
3.	Applied Physics	7	7	-	-	-	-
4.	Applied Chemistry	7	-	-	-	-	-
5.	Engineering Drawing	8	-	-	-	-	-
6.	Footwear Technology –I (Clicking)	-	12				
7.	General Workshop Practice	8	8	-	-	-	-
8	Measuring Instrument & Measurement	6					
9.	Applied Mechanics	-	7	-	-	-	-
10.	Anatomy of Human foot	-	-	12	-	-	-
11.	Footwear Design	-	-	12	-	-	-
12.	Environmental Studies	-	-	5	-	-	-
13.	Basic of Mechanical & Civil Engineering	-	7	-	-	-	-
14.	Material for Footwear Manufacturing	-	-	6			
15.	Basics of Electrical and Electronics Engg	-	-	-	10	-	-
16.	Basics of Information Technology	-	-	6	-	-	-
17.	Footwear Machinery	-	-	-	8		
18.	Footwear Technology –II (Closing)	-	-	-	12		
19.	Elementary Leather Technology	-	-	-	10		
20	Leather Goods & Garment Manufacturing	-	-	-	-	12	
21.	Energy Conservation	-	-	-	-	-	5
22.	Industrial Management and Entrepreneurship Development	-	-	-	-	-	5
23.	Financial Costing & Accounting	-	-	-	-	5	
24.	Pollution Control and Industrial Safety	-	-	-	-	11	-
25.	Renewable Energy Sources					4	
26.	Universal Human Values	-	-	-	-	3	-
27.	Footwear Technology –III (Construction)						11
28.	CD/CAM for footwear.	-	-	-		-	7

29.	Testing & Quality Control	-	-	-	-	11	
30.	Project Work	-	-	-	-	-	6
31.	Student Centred Activities	2	2	2	2	2	2
	Total	**48**	**48**	**48**	**48**	**48**	**48**

7- **STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN LEATHER TECHNOLOGY FOOTWEAR (CASD)**

FIRST SEMESTER:

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
1.1	*Communication Skills-I	3	-	2	5	20	10	30	50	2.5	20	3	70	100
1.2	*Applied Mathematics-1	5	-	-	5	20	-	20	50	2.5	-	-	50	70
1.3	*Applied Physics-1	5	-	2	5	20	10	30	50	2.5	20	3	70	100
1.4	*Applied Chemistry	5	-	2	5	20	10	30	50	2.5	20	3	70	100
1.5	*Engineering Drawing-I	-	-	8	3	-	40	40	60	3	-	-	60	100
1.6	Measuring Instruments & Measurements	4	-	2	4	20	10	30	50	2.5	20	3	70	100
1.7	General Workshop Practice-I	-	-	8	2	-	40	40	-	-	60	4	60	100
#Student Centred Activities		-	-	2	1	-	30	30	-	-	-	-	-	30
Total		22	-	26	30	100	150	250	310	-	140	-	450	700

* Common with other diploma programmes

\# Student Centred Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

SECOND SEMESTER:

Sr. No.	SUBJECTS	STUDY SCHEME Periods/ Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
2.1	*Applied Mathematics-II	5	-	-	5	20	-	20	50	2.5	-	-	50	70
2.2	*Applied Physics-II	5	-	2	5	20	10	30	50	2.5	20	3	70	100
2.3	+Applied Mechanics	5	-	2	5	20	10	30	50	2.5	20	3	70	100
2.4	**Basics of Mechanical & Civil Engg.	5	-	2	5	20	10	30	50	2.5	20	3	70	100
2.5	Footwear Technology-I (Clicking)	6	-	6	7	20	30	50	50	2.5	50	3	100	150
2.6	General Workshop Practice II	-	-	8	2	-	40	40	-	-	60	4	60	100
#Student Centered Activities		-		2	1	-	30	30	-	-	-	-	-	30
Total		26	-	22	30	100	130	230	250	-	170	-	420	650

* Common with other diploma programmes

** Common with diploma in Electrical Engg.

\+ Common with diploma in Mechanical Engineering and Civil Engg.

\# Student Centered Activities will comprise of co-curricular activities like extension Lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

THIRD SEMESTER:

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
3.1	*Environmental Studies	3	-	2	3	20	10	30	50	2.5	20	3	70	100
3.2	*Applied Mathematics-III	5	-	-	4	20	-	20	50	2.5	-	-	50	70
3.3	Anatomy of human foot	6	-	6	7	20	30	50	50	2.5	50	3	100	150
3.4	Footwear Design	6	-	6	7	20	30	50	50	2.5	50	3 -	100	150
3.5	Material for Footwear Manufacture	6	-	-	5	20	-	20	50	2.5	-	-	50	70
3.6	*Basics of Information Technology	-	-	6	3	-	20	20	-	-	50	3	50	70
#Student Centered Activities		-	-	2	1	-	30	30	-	-	-	-	-	30
Total		26	-	22	30	100	120	220	250	-	170	-	420	640

*** Common with other diploma Programmes**

\# Student Centered Activities will comprise of co-curricular activities like extension Lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

FOURTH SEMESTER:

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
4.1	*Communication Skills-II	4	-	2	4	20	10	30	50	2.5	20	3	70	100
4.2	Footwear Machinery	6	-	2	6	20	10	30	50	2.5	20	3	70	100
4.3	Footwear Technology-II (CLOSING)	6	-	6	7	20	30	50	50	2.5	50	3	100	150
4.4	Elementary Leather Technology	6	-	4	6	20	30	50	50	2.5	50	3	100	150
4.5	**Basic of Electrical and Electronics Engineering	6	-	4	6	20	30	50	50	2.5	50	3	100	150
#Student Centered Activities		-		2	1	-	30	30	-	-	-	-	-	30
Total		28	-	20	30	100	140	240	250	-	190	-	440	680

Note: Industrial Training for 4 weeks after fourth semester during summer vacation.

* Common with other diploma Programmes

** Common with diploma in Computer Science and Engineering

Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self-study etc.

FIFTH SEMESTER:

Sr. No.	SUBJECTS	STUDY SCHEME Periods/ Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
-	Industrial Training	-	-	-	2	-	-	-	-	-	50	3	50	50
5.1	Leather Goods & Garment Manufacturing	6	-	6	6	20	30	50	50	2.5	50	-	100	150
5.2	Testing & Quality Control	5	-	6	6	20	30	50	50	2.5	50	-	100	150
5.3	Pollution Control and Industrial Safety	5	-	6	6	20	30	50	50	2.5	50	3	100	150
5.4	Financial Costing and Accounting	5	-	-	6	20	-	20	50	2.5	-	-	50	70
5.5	Renewable Energy Sources	4	-	-	2	20	-	20	50	2.5	-	-	50	70
5.6	*Universal Human Values	2	-	1	1	-	20	20	-	-	30	3	50	50
#Student Centered Activities		-	-	2	1	-	30	30	-	-	-	-	-	30
Total		27	-	21	30	100	140	240	250	-	230	-	500	720

Student Centered Activities will comprise of co-curricular activities like extension Lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

SIXTH SEMESTER:

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
6.1	Footwear Technology-III (Construction)	6	-	6	6	20	30	50	50	2.5	50	3	100	150
6.2	CAD/CAM for Footwear	6	-	4	6	20	30	50	50	2.5	50	3	100	150
6.3	*Energy Conservation	3	-	2	4	20	10	30	50	2.5	20	3	70	100
6.4	Leather and Products Merchandising	6	-	-	4	20	-	20	50	2.5	-	-	50	70
6.5	*Industrial Management and Entrepreneurship Development	5	-	-	4	20	-	20	50	2.5	-	-	50	70
6.6	Project Work	-	-	8	5	-	50	50	-	-	100	3	100	150
#Student Centered Activities		-	-	2	1	-	30	30	-	-	-	-	-	30
Total		26		22	30	100	150	250	250	-	220	-	470	720

*** Common with other diploma Programmes**

\# Student Centered Activities will comprise of co-curricular activities like extension Lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests,

Educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

8. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 30 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

i. 10 Marks for general behavior and discipline

(by HODs in consultation with all the teachers of the department)

ii. 5 Marks for attendance as per following:

(by HODs in consultation with all the teachers of the department)

a)	75 - 80%	2 Marks
b)	80 - 85%	4 Marks
c)	Above 85%	5 Marks

iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/ NSS activities as per following:

(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)

a)	15	-	State/National Level participation
b)	10	-	Participation in two of above activities
c)	5	-	Inter-Polytechnic level participation

Note: There should be no marks for attendance in the internal sessional of different subjects.

1.1 COMMUNICATION SKILLS – I

L	T	P
4	-	2

RATIONALE

Knowledge of English Language plays an important role in career development. This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills as parts of Communication Skill.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

.

- Understand the importance of effective communication
- Describe the process of communication
- Communicate effectively in different contexts
- Identify parts of speech
- Write correct sentences using appropriate vocabulary
- Reproduce and match words and sentences in a paragraph
- Write various types of paragraphs, notices for different purposes and composition on picture with appropriate format
- Read unseen texts with comprehension

.

DETAILED CONTENTS

1 Basics of Communication (13 periods)

Definition and process of communication

Types of communication - formal and informal, oral and written, verbal and non-verbal

Communications barriers and how to overcome them

Barriers to Communication, Tools of Communication

2	Application of Grammar		(18 periods)
	2.1	Parts of Speech (Noun, verb, adjective, adverb) and modals	
	2.2	Sentences and its types	
	2.3	Tenses	
	2.4	Active and Passive Voice	
	2.5	Punctuation	
	2.6	Direct and Indirect Speech	

3 Reading Skill (10 periods)

Unseen passage for comprehension (one word substitution, prefixes, suffixes, antonyms, synonyms etc. based upon the passage to be covered under this topic)

4 Writing Skill (15 periods)

Picture composition
Writing paragraph
Notice writing

LIST OF PRACTICALS

Note: Teaching Learning Process should be focused on the use of the language in writing reports and making presentations.

Topics such as Effective listening, effective note taking, group discussions and regular presentations by the students need to be taught in a project oriented manner where the learning happens as a byproduct.

Listening and Speaking Exercises

1. Self and peer introduction
2. Newspaper reading
3. Just a minute session-Extempore
4. Greeting and starting a conversation
5. Leave taking
6. Thanking
7. Wishing well
8. Talking about likes and dislikes
9. Group Discussion
10. Listening Exercises.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centred activities in class room and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

RECOMMENDED BOOKS

1. Communicating Effectively in English, Book-I by RevathiSrinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; DhanpatRai Publications, New Delhi.
3. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
4. Excellent General English-R.B.Varshnay, R.K. Bansal, Mittal Book Depot, Malhotra
5. The Functional aspects of Communication Skills – Dr. P. Prsad, S.K. Katria & Sons, New Delhi
6. Q. Skills for success – Level & Margaret Books, Oxford University Press.
7. E-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR.

Websites for Reference:

1. http://www.mindtools.com/ page 8.html – 99k
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	13	24
2	18	32
3	10	16
4	15	28
Total	**56**	**100**

1.2 APPLIED MATHEMATICS - I

L	T	P
5	-	-

RATIONALE

Contents of this course provide fundamental base for understanding elementary mathematics and their uses in solving engineering problems. Contents of this course will enable students to use basic mathematical function like logarithms, partial fractions, matrices and basic 2D, curves in solving various engineering problems of all fields.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Apply Binomial theorem to solve engineering problems
- Apply determinants properties and Crammer's rule to solve engineering problems
- Apply dot & cross product of vectors to find the solution of engineering problems
- Use complex numbers in various engineering problems
- Apply differential calculus and higher order to solve engineering problems
- Find velocity, acceleration, errors and approximation in engineering problems with application of derivatives.

DETAILED CONTENTS

1. Algebra -I (12 Periods)

   1.1 Series : AP and GP; Sum, nth term, Mean

   1.2 Binomial theorem for positive, negative and fractional index (without proof). Application of Binomial theorem.

   1.3 Determinants : Elementary properties of determinant of order 2 and 3, Multiplication system of algebraic equation, Consistency of equation, Crammer's rule

2. Algebra- II (12 Periods)

   Vector algebra : Dot and Cross product, Scaler and vector triple product.

   Complex number.

   Complex numbers, Representation, Modulus and amplitude Demoivre theorem, its application in solving algebraic equations, Mod. function and its properties..

3. Trigonometry (10 Periods)

3.1 Relation between sides and angles of a triangle : Statement of various formulae showing relationship between sides and angle of a triangle.

3.2 Inverse circular functions: Simple case only

4. Differential Calculus - I (18 Periods)

4.1 Functions, limits, continuity, - functions and their graphs, range and domain, elementary methods of finding limits (right and left), elementary test for continuity and differentiability.

4.2 Methods of finding derivative, Trigonometric functions, exponential function, Function of a function, Logaritimic differentiation, Differentiation of Inverse trigonometric function, Differentiation of implicit functions.

5. Differential Calculus - II (18 Periods)

5.1 Higher order derivatives, Leibnitz theorem (without proof). Simple applications.

5.2 Application - Finding Tangents, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration, Errors and approximation.

INSTRUCTONAL STRATEGY

The basic instructional strategy to teach basic mathematics, Binomial theorem, trigonometry, differential equations etc. should be conceptual with real world applications of relevant branch. More numerical and theory examples can be used for clear understanding of the content**.**

MEANS OF ASSESSMENT

- Assignments and Quiz/Class Tests
- Mid-term and End-term Written Tests
- Model/Prototype Making

RECOMMENDED BOOKS

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi

2. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,

3Applied Mathematics-I by Chauhan and Chauhan, Krishna Publications, Meerut**.**

4. Applied Mathematics-I (A) by Kailash Sinha and Varun Kumar; Aarti Publication, Meerut

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1.	12	20
2.	12	20
3.	10	12
4	18	24
5	18	24
Total	**70**	**100**

1.3 APPLIED PHYSICS – I

L	T	P
5	-	2

RATIONALE

Applied physics includes the study of a diversified topics related to the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects behave. Concrete knowledge of physical laws, analysis and applications in various fields of engineering and technology are given prominence in this course content.

Note: Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to learn and appreciate these concepts and principles. In all contents, SI units should be followed.

LEARNING OUTCOMES

After undergoing this course, the students must be able to:

- Identify the use of S.I. system of measurement with accuracy and how it is used in engineering
- Represent physical quantities as scalars and vectors, applying the physical laws and concepts of linear and circular motion in everyday life.
- Solve difficult problems (walking of man, horse and cart problem, flying of bird/ aircraft, etc.)
- Analyse and design banking of roads/railway tracks and apply conservation of momentum principle to Explain rocket propulsion, recoil of gun etc.
- Derive work, power and energy relationship and solve problems about work and power.
- Define work, energy and power and their units.
- Describe conservation of energy and its applications
- Understand the concept of rotational motion of a rigid body and its applications
- Apply the physical laws and concepts of gravity, its variation with longitude and latitude and its uses in space satellite etc. .
- Understand the concept of elasticity, surface tension, pressure and the laws governing movement of fluids.
- Express physical work in term of heat and temperature; Measure temperature in various processes on different scales (Celsius, Kelvin, Fahrenheit etc.)
- Distinguish between conduction, convection and radiation, identify the different methods for reducing heat losses
- Understand the laws of thermodynamics, Carnot cycle and their applications.

DETAILED CONTENTS

1. Units and Dimensions (10 Periods)

Need of Measurement in engineering and science, unit of a physical quantities - fundamental and derived units, systems of units (FPS, CGS and SI units)

Dimensions and dimensional formulae of physical quantities.

Principle of homogeneity of dimensions

Dimensional equations and their applications, conversion of numerical values of physical quantities from one system of units into another, checking the correctness of physical equations and deriving relations among various physical quantities

Limitations of dimensional analysis

Error in measurement, accuracy and precision of instruments, random and systematic errors, absolute error, relative error, and percentage error, Estimation of probable errors in the results of measurement (combination of errors in addition, subtraction, multiplication, division and powers), rules for representing significant figures in calculation.

Application of units and dimensions in measuring length, diameter, circumference, volume, surface area etc. of metallic and non metallic blocks, wires, pipes etc (at least two each).

2. Force and Motion (10 periods)

Scalar and vector quantities – examples, representation of vector, types of vectors

Addition and Subtraction of Vectors, Triangle and Parallelogram law (Statement only), Scalar and Vector Product.

Resolution of Vectors and its application to lawn roller.

Force, Momentum, Statement and Derivation of Conservation of linear momentum, its applications such as recoil of gun.

Impulse and its Applications

Circular motion (Uniform and Non-uniform), definition of angular displacement, angular velocity, angular acceleration, frequency, time period.

Relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical)

Central force, Expression and Applications of Centripetal and centrifugal forces with examples such as banking of roads and bending of cyclist, Principle of centrifuge.

Application of various forces in lifts, cranes, large steam engines and turbines

3. Work, Power and Energy (10 periods)

Work: and its units, examples of zero work, positive work and negative work, conservative and non-conservative force,

Friction: modern concept, types, laws of limiting friction, Coefficient of friction and its Engineering Applications.

Work done in moving an object on horizontal and inclined plane for rough andplane surfaces with its applications

Energy and its units: Kinetic energy and potential energy with examples andtheir derivation, work energy theorem.

Principle of conservation of mechanical energy for freely falling bodies,examples of transformation of energy.

Power and its units, calculation of power in numerical problems

Application of Friction in brake system of moving vehicles, bicycle, scooter,car trains etc.

4 Rotational Motion (10 periods)

Concept of translatory and rotatory motions with examples

Definition of torque with examples

Angular momentum, Conservation of angular momentum (quantitative) and its examples

Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and perpendicular axes (statements only), Moment of inertia of rod, disc, ring and sphere (hollow and solid) (Formulae only). Concept of Fly wheel.

Rotational kinetic energy, Rolling of sphere on the slant plane

Comparison of linear motion and rotational motion.

Application of rotational motions in transport vehicles, and machines.

5 Motion of planets and satellites (08 periods)

Gravitational force, Kepler's law of planetary motion

Acceleration due gravity and its variation

Gravitational Potential and Gravitational potential energy

Motion of satellite, orbital velocity and time period of satellite, Total energy and Binding energy of a satellite, Escape energy and escape velocity

Types of satellites, Geo-stationary satellite, semi-synchronous, polar satellite (concept only) and their uses in science and technology

Concept of Black Holes

6. Properties of Matter (12 periods)

Elasticity: definition of stress and strain, different types of modulii of elasticity, Hooke's law, significance of stress strain curve

Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications

Surface tension: concept, its units, angle of contact, Capillary action and determination of surface tension from capillary rise method, applications of surface tension, effect of temperature and impurity on surface tension

Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature on viscosity, application in hydraulic systems.

Concept of fluid motion, stream line and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem and their applications.

7. Heat and Thermodynamics (10 periods)

` 7.1 Difference between heat and temperature

7.2 Modes of transfer of heat (Conduction, convection and radiation with examples)

7.3 Different scales of temperature and their relationship

7.4 Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them

7.5 Heat conduction in a metal rod, Temperature gradient, Concept of Co-efficient of thermal conductivity, Uses and effects of Heat conduction in Daily life.

7.6 Isothermal and Adibatic process

7.7 Zeroth, First and second law of thermodynamics, Heat engine (concept Only), Carnot cycle.

7.8 Application of various systems of thermometry in refrigeration and air-conditioning etc.

LIST OF PRACTICALS

1 To find radius of wire and its volume and the maximum permissible error in these quantities by using both vernier calipers and screw gauge.

2 To find the value of acceleration due to gravity on the surface of earth by using a simple pendulum.

3 To determine the Radius of curvature of (i) convex mirror, (ii) concave mirror by spherometer

4 To verify parallelogram law of forces

5 To study conservation of energy of a ball or cylinder rolling down an inclined plane.

6 To find the Moment of Inertia of a flywheel about its axis of rotation

7 To determine the atmospheric pressure at a place using Fortin's Barometer

8 To determine the viscosity of glycerin by Stoke's method

9 To determine the coefficient of linear expansion of a metal rod

10 To determine force constant of spring using Hooks law

INSTRUCTIONAL STATREGY

Teacher may use various teaching aids like live models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. The teacher should explain about field applications before teaching the basics to develop proper understanding of the physical phenomenon. Use of demonstration and animations can make the subject interesting and may develop scientific temper in the students. Teacher must plan a tour of Science Park/planetarium available in nearby areas in order to enhance the interest in this course.

MEANS OF ASSEMENTS

- Assignment & Quiz,
- Mid-Term and End-Term written test, −

Model Making,

- Actual Lab & Practical Work, −
VivaVoice

RECOMMENDED BOOKS

1 Text Book of Physics for Class XI (Part-I, Part-II); N.C.E.R.T., Delhi

2 Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi

3 Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi

4 B.Sc.Practical Physics by C L Arora, S. Chand Publication..

5 Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi

6 Engineering Physics by DK Bhhatacharya & Poonam Tandan; Oxford University Press,

7 Modern Engineering Physics by SL Gupta, Sanjeev Gupta, Dhanpat Rai Publications

8 V. Rajendran,physics-I, Tata McGraw-Hill raw Hill publication, New Delhi

9 Arthur Beiser, Applied Physics, Tata McGraw-Hill raw Hill publication, New Delhi

10 Physics Volume 1, 5th edition, Haliday Resnick and Krane, Wiley publication

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	15
2	10	15
3	10	15
4	10	15
5	8	10
6	12	16
7	10	14
Total	**70**	**100**

1.4 APPLIED CHEMISTRY

L T P
5 - 2

RATIONALE

The use of various chemicals and chemical products in diverse technical and engineering fields have repeatedly proved the importance of Applied Chemistry, which enhances its role to a new peak. On the other hand, ever increasing use of such materials will compel engineers, technocrats to acquire essential applied chemistry knowledge in order to select engineering materials, which not only suit them but also provide more environmental compatibility. This situation demands principles of Applied Chemistry in diploma-engineering courses. Principles of Applied Chemistry will enable budding engineers and technocrats to develop scientific temper and appreciate physical, chemical and engineering properties of materials. Hence the subject of Applied Chemistry.

LEARNING OUTCOMES

After undergoing this subject, the student will be able to:

- Classify various substances based on state of aggregation
- Substantiate the laws and principles on which structure of atom is established.
- Explain and predict properties of substances.
- Explain sources of water and various characteristics of water (quantitatively).
- Explain cause and factors which can adversely affecting natural water quality and remedial measures available for water purification
- Think critically, develop and adapt water conservation techniques.
- Explain corrosion of metal and their preventive measures.
- explain chemical nature and causes of corrosion
- apply correct and efficient methods of corrosion prevention.
- explain chemistry of fuels and their relative advantages.
- select most efficient fuel for the engine and engineering applications.
- suggest how to subside air pollution caused by the use of fossil fuels
- explain the chemistry of various polymers and plastics
- verify suitability and select polymer/rubber/plastic materials for engineering applications.

DETAILED CONTENTS

1. Atomic Structure, Periodic Table and Chemical Bonding (14 periods)

    1.1 Fundamental particles- mass and charges of electrons, protons and neutrons with names of the scientists who discovered these fundamental particles.

    1.2 Bohr's model of atom and successes and limitations of atomic theory

(qualitative treatment only).

1.3 Atomic number, atomic mass number isotopes and isobars.

1.4 Definition of orbit and orbitals, shapes of s and p orbitals only, quantum

numbers and their significance,

1.5 Aufbau's principle, Pauli's exclusion principle and Hund's rule electronic configuration of elements with atomic number (Z) = 30 only. (Electronic configurations of elements with atomic number greater than 30 are excluded).

1.6 Modern periodic law and periodic table, groups and periods, classification of elements into s, p, d and f blocks (periodicity in properties - excluded)

1.7 Chemical bonding and cause of bonding and types such as ionic bond in NaCl sigma (σ) and pi (π) covalent bonds in H_2, HCl, Cl_2, elementary idea of hybridization in $BeCl_2$, BF_3, CH_4, NH_3 and H_2O, VSEPR, Molecular orbital Theory

1.8 States of Matter: Solid, Liquid & Gas, Metallic bonding- explanation with the help of electron gas (sea) model.

2. Fuelsand Lubricants (18 periods)

2.1 Definition of fuel, classification of fuels, characteristics of good fuel, relative merits of gaseous, liquid and solid fuels

2.2 Calorific value-higher calorific value, lower calorific value, determination of calorific value of solid or liquid fuel using Bomb calorimeter and numerical examples.

2.3 Coal - types of coal and proximate analysis of coal

2.4 Fuel rating – Octane number and Cetane number, fuel-structural influence on Octane and Cetane numbers

2.5 Gaseous fuels – chemical composition, calorific value and applications of natural gas (CNG), LPG, producer gas, water gas and biogas.

2.6 Elementary ideal on – hydrogen as future fuels, nuclear fuels.

Lubricants: Definition and properties, mechanism, industrial application and its function in bearings.

Synthetic lubricants and cutting fluids.

3. Water (14 periods)

Demonstration of water resources on Earth using pie chart.

Classification of water – soft water and hard water, action of soap on hard water, types of hardness, causes of hardness, units of hardness – mg per liter (mgL^{-1}) and part per million (ppm) and simple numerical, pH and buffer solutions and their applications.

Disadvantages caused by the use of hard water in domestic and boiler feed water. Primming and foaming and caustic embrittlement in boilers.

Removal of hardness -Permutit process and Ion-exchange process.

Physico-Chemical methods for Water Quality Testing

a) Determination of pH using pH meter, total dissolved solids (TDS)

b) Testing and Estimation of- alkalinity, indicator their types and application total hardness by EDTA method and O'Hener's Method. (chemical reaction of EDTA method are excluded).

c) Understanding of Indian Water Quality standards as per WHO

Natural water sterilization by chlorine and UV radiation and reverse osmosis.
Municipality waste water treatment. Definition of B.O.D and C.O.D.

4. Electrochemistry (4 periods)

Redox Reaction, Electrode Potential, Nernst equation, Electrochemical cell (Galvanic and Electrobytes); Nernst equation.

5. Corrosion and its Control (10 periods)

Definition of corrosion and factors affecting corrosion rate.
Theories of

a) Dry (chemical) corrosion- Pilling Bedworth rule

b) Wet corrosion in acidic atmosphere by hydrogen evolution mechanism

Definition of passivity and galvanic series
Corrosion control:

a) Metal coatings – Cathodic protection, Cementation on Base Metal Steel –Application of Metal Zn (Sheradizing),Cr (Chromozing) and Al (Calorizing), Sacrificial protection and impressed current voltage
b) Inorganic coatings – Anodizing and phosphating,
c) Organic coatings - use of paints varnishes and enamels
d) Internal corrosion preventive measures- alloying (with reference to passivating, neutralizing and inhibition) and heat treatment (quenching, annealing)

6. Organic compounds, Polymers and Plastics (10 periods)

Classification of organic compounds and IUPAC Nomenclature
Definition of polymer, monomer and degree of polymerization

Brief introduction to addition and condensation polymers with suitable examples (PE, PS, PVC, Teflon, Nylon -66 and Bakelite)

Definition of plastics, thermo plastics and thermo setting plastics with suitable examples, distinctions between thermo and thermo setting plastics

Applications of polymers in industry and daily life

LIST OF PRACTICALS

1. Estimation of total hardness of water using standard EDTA solution

Estimation of total alkalinity of given water sample by titrating it against standard sulphuric acid solution

3. Proximate analysis of solid fuel)
4. Estimation of temporary hardness of water sample by O' Hener's Method.
5. Determination of flash and fire point of given lubricating oil using Able's flash point

apparatus

INSTRUCTIONAL STRATEGY

Teachers may take help of various models and charts while imparting instructions to make the concept clear. More emphasis should be laid on discussing and explaining practical applications of various chemical process and reactions. In addition, students should be encouraged or motivated to study those processes in more details, which may find practical application in their future professional career.

MEANS OF ASSEMENTS

- Assignment & Quiz,
- Mid-Term and End-Term written test,
- Model Making,
- Actual Lab & Practical Work,
- VivaVoice

RECOMMENDED BOOKS

1. Chemistry in Engineering by J.C. Kuricose & J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Engineering Chemistry by P.C. Jain & Monika Jain, Dhanapat Rai Publishing Company, New Delhi.
3. Eagle's Applied Chemistry - I by S. C. Ahuja & G. H. Hugar, Eagle Prakashan, Jalandhar.
4. Engineering Chemistry – A Text Book by H. K. Chopra & A. Parmar, Narosa Publishing House, New Delhi.
5. Applied Chemistry - I by Dr. P. K Vij & Shiksha Vij, Lords Publications, Jalandhar.
6. Engineering Chemistry by Dr. Himanshu Pandey, Goel Publishing House, Meerut, India

SUGGESTED DISTRIBUTION OF MARKS

Topics	Time Allotted (hrs)	Marks Allotted (%)
1.	14	20
2.	18	24
3.	14	20
4.	4	6
5.	10	15
6.	10	15
Total	**70**	**100**

1.5 ENGINEERING DRAWING - I

L	T	P
-	-	8

RATIONALE

Drawing is the language of engineers and technicians. Reading and interpreting engineering drawing is their day to day responsibility. The subject is aimed at developing basic graphic skills in the students so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation. The emphasis, while imparting instructions, should be to develop conceptual skills in the students following BIS SP 46 – 1988.

Note:

i) First angle projection is to be followed

ii) Minimum of 18 sheets to be prepared and at least 2 sheets on AutoCAD

iii) Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Identify and use of different grades of pencils and other drafting instruments which are used in engineering field
- Draw free hand sketches of various kinds of objects.
- Utilize various types of lines used in engineering drawing.
- Read and apply different dimensioning methods on drawing of objects.
- Use different types of scales and their utilization in reading and reproducing drawings of objects and maps.
- Draw 2 - dimensional view of different objects viewed from different angles (orthographic views)
- Draw and interpret complete inner hidden details of an object which are otherwise not visible in normal view
- To make projections of Solid
- Generate isometric (3D) drawing from different 2D (orthographic) views/sketches
- Identify conventions for different engineering materials, symbols, sections of regular objects and general fittings used in Civil and Electrical household appliances
- Use basic commands of AutoCAD.

DETAILED CONTENTS

1. Introduction to Engineering Drawing (03 sheets)

   1.1 Introduction to drawing instruments, materials, layout and sizes of drawing sheets and drawing boards.
   1.2 Different types of lines in Engineering drawing as per BIS specifications
   1.3 Practice of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, circles, ellipses and curves, hexagonal, pentagon with the help of drawing instruments.
   1.4 Free hand and instrumental lettering (Alphabet and numerals) – upper case (Capital Letter), single stroke, vertical and inclined at 75 degree, series of 5,8,12 mm of free hand and instrumental lettering of height 25 to 35 mm in the ratio of 7:4

2. Dimensioning Technique (01 sheet)

   Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions)

   Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sunk holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches

3. Scales (02 sheets)

   Scales –their needs and importance (theoretical instructions), type of scales, definition of R.F. and length of scale

   Drawing of plain and diagonal scales

4. Orthographic Projections (06 sheets)

   4.1 Theory of orthographic projections (Elaborate theoretical instructions)
   4.2 Projection of Points in different quadrant
   4.3 Projection of Straight Line (1^{st} and 3^{rd} angle)
      4.3.1. Line parallel to both the planes
      4.3.2. Line perpendicular to any one of the reference plane
      4.3.3. Line inclined to any one of the reference plane.
   4.4 Projection of Plane – Different lamina like square, rectangular, triangular and circle inclined to one plane, parallel and perpendicular to another plane in 1^{st} angle only
   4.5 Three views of orthographic projection of different objects. (At least one sheet in 3^{rd} angle)
   4.6 Identification of surfaces

5 Projection of Solid (02 sheets)

5.1. Definition and salient features of Solid
5.2. Types of Solid (Polyhedron and Solid of revolution)
5.3 To make projections, sources, Top view, Front view and Side view of various types of Solid.

6. Sections (02 sheets)

Importance and salient features

Drawing of full section, half section, partial or broken out sections, Offset sections, revolved sections and removed sections.

Convention sectional representation of various materials, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections

Orthographic sectional views of different objects.

7. Isometric Views (02 sheets)

Fundamentals of isometric projections and isometric scale.

Isometric views of combination of regular solids like cylinder, cone, cube and prism.

8. Common Symbols and Conventions used in Engineering (02 sheets)

Civil Engineering sanitary fitting symbols
Electrical fitting symbols for domestic interior installations

*9. Introduction to AutoCAD (02 sheets)

Basic introduction and operational instructions of various commands in AutoCAD. At least two sheets on AutoCAD of cube, cuboid, cone, pyramid, truncated cone and pyramid, sphere and combination of above solids.

*** Auto CAD drawing will be evaluated internally by sessional marks and not by final theory paper.**

INSTRUCTIONAL STRATEGY

Teacher should show model of realia of the component/part whose drawing is to be made. Emphasis should be given on cleanliness, dimensioning and layout of sheet. Focus should be on proper selection of drawing instruments and their proper use. The institute should procure AutoCAD or other engineering graphics software for practice in engineering drawings. Teachers should undergo training in AutoCAD/Engineering Graphic. Separate labs for practice on AutoCAD should be established.

MEANS OF ASSESSMENT

- Sketches
- Drawing
- Use of software

RECOMMENDED BOOKS

1. A Text Book of Engineering Drawing by Surjit Singh; Dhanpat Rai & Co., Delhi
2. Engineering Drawing by PS Gill; SK Kataria & Sons, New Delhi
3. Elementary Engineering Drawing in First Angle Projection by ND Bhatt; Charotar Publishing House Pvt. Ltd., Anand
4. Engineering Drawing I & II by JS Layall; Eagle Parkashan, Jalandhar
5. Engineering Drawing I by DK Goel, GBD Publication.

MEASURING INSTRUMENTS AND MEASUREMENTS

L	T	P
4	-	2

RATIONALE

The subject of Measuring Instruments and Measurements provides the students necessary knowledge about calibrating, conducting experiments or handling various measuring instruments like Pressure Gauges, Thermometers, Pyrometers, Level Indicators etc.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Understand various process instrumentation in process industry
- Operate various measuring instruments like pressure gauge, thermometer, etc.
- Find errors and test various instruments and justify their use in systems and improve productivity.
- Select instruments for various applications.

DETAILED CONTENTS

1. Introduction and Classification of Instruments (12 Periods)

   Importance of instruments in chemical process industries, General classification of industrial instruments, Functional elements of instruments, Indicating and recording type instruments, Static and dynamic characteristics of instruments, Description and constructional details, working principle, Ranges and applications of Strip chart recorder, Circular chart recorder, Thermal conductivity measuring instrument.

2. Pressure Measurements (12 Periods)

   Absolute, Gauge and Vacuum pressure, Liquid column gauge, Bourden tube gauge, McLeod gauge, Ionization gauge.

3. Temperature Measurement (12 Periods)

   Temperature scales, Bimetallic thermometer, Liquid expansion thermometer, Thermocouples, Resistance thermometer, Optical and radiation pyrometers, Thermistor.

4. Liquid-Level Meters (12 Periods)

   Visual indicators, Float actuated instrument, the-bubbler system, diaphragm box and air trap systems, electrical contact type liquid level indicators. Hydrostatic head density compensator level meter, hydro step, Radar or microwave level indicator, Ultrasonic or sonic level indicator.

5. Mass and Weight Measurement (08 periods)

Two-pan balance and single pan mechanical balances, Single pan electronic balance.

LIST OF PRACTICALS

1. Calibration of Pressure Gauge
2. Calibration of Thermister
3. Calibration of Thermocouple for temperature measurement
4. Calibration of McLeod Gauge for low pressure
5. Calibration of Optical pyrometer.
6. Sketch of single pan electronic balance.
7. Measurement of pressure using Bourden tube.
8. Sketch of diaphragm and air trap system.

INSTRUCTONAL STRATEGY

This subject gives the knowledge of various instruments used to measure various process parameters. So the theoretical knowledge of this subject should be properly imparted to the students with the help of practical examples. The teacher should use audio-visual aids to show the working of these instruments.

MEANS OF ASSESSMENT

- Assignments and Quiz/Class Tests
- End-term Written Tests
- Laboratory Work
- Viva-Voce

RECOMMENDED BOOKS

1. Industrial Instrumentation by Donald.P. Eckmann; CBS., 2004
2. Industrial instrumentation and Control by S.K. Singh; Tata McGraw , 20016
3. Industrial instrumentation, K. Krishnaswamy; New Age International.

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1.	12	22
2.	12	22
3.	12	20
4	12	22
5	08	14

Total	**56**	**100**

GENERAL WORKSHOP PRACTICE – I

(Common for Civil Engineering, Electrical Engineering and Chemical Engineering)

L	T	P
-	-	8

RATIONALE

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices are included in the curriculum in order to provide hands-on experience about use of different tools and basic manufacturing practices. This subject aims at developing general manual and machining skills in the students. In addition, the development of dignity of labour, safety at work place, team working and development of right attitude are the other objectives.

LEARNING OUTCOMES

After completing the course, the students will be able to:

- Identify tools and equipment used and their respective functions.
- Identify different types of materials and their basic properties.
- Use and take measurements with the help of basic measuring tools/equipment.
- Select proper tools for a particular operation.
- Select materials, tools, and sequence of operations to make a job as per given specification/drawing.
- Prepare simple jobs independently and inspect the same.
- Follow safety procedures and precautionary measures.
- Use safety equipment and Personal Protection Equipment.

DETAILED CONTENTS

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus:

1. Carpentry Shop
2. Painting and Polishing Shop
3. Electrical Shop
4. Welding Shop
5. Plumbing Shop

1. CARPENTRY SHOP

General Shop Talk

Name and use of raw materials used in carpentry shop : wood &alternative materials

Names, uses, care and maintenance of hand tools such as different typesof Saws, C-Clamp, Chisels, Mallets, Carpenter's vices, Marking gauges, Try-squares, Rulers and other commonly used tools and materials used in carpentry shop by segregating as cutting tools, supporting tools, holding tools , measuring tools etc.

Specification of tools used in carpentry shop.

Different types of Timbers, their properties, uses & defects.

Seasoning of wood.

Practice

Practices for Basic Carpentry Work

Sawing practice using different types of saws

Assembling jack plane — Planning practice including sharpening of jack plane cutter

Chiselling practice using different types of chisels including sharpening of chisel

Making of different types of wooden pin and fixing methods. Marking measuring and inspection of jobs.

1.3 Job Practice

Job 1	Marking, sawing, planning and chiselling and their practice
Job II	Half Lap Joint (cross, L or T – any one)
Job III	Mortise and Tenon joint (T-Joint)
Job IV	Dove tail Joint (Lap or Bridle Joint)

1.4. Demonstration of job showing use of Rip Saw, Bow saw and Tenon saw, method of sharpening various saws.

2. PAINTING AND POLISHING SHOP

Introduction of paints, varnishes, Reason for surface preparation, Advantages of Painting, other method of surface coating ie. Electroplating etc.

Job Practice

Job 1: To prepare a wooden surface for painting apply primer on one side and to paint the same side. To prepare french polish for wooden surface and polish the other side.

Job II: To prepare metal surface for painting, apply primer and paint the same.

Job III: To prepare a metal surface for spray painting, first spray primer and paint the same by spray painting gun and compressor system.

The sequence of polishing will be as follows:

i) Abrasive cutting by leather wheel
ii) Polishing with hard cotton wheel and with polishing material
iii) Buffing with cotton wheel or buff wheel.

3. ELECTRICAL SHOP

3.1 Study, demonstration and identification of common electrical materials with standard ratings and specifications such as wires, cables, switches, fuses, cleats, clamps and allied items, tools and accessories.

3.2 Study of electrical safety measures and protective devices.

Job I Identification of phase, Neutral and Earth wires for connection to domestic electrical appliances and their connections to three pin plugs.

Job II Carrying out house wiring circuits using fuse, switches, sockets, ceiling rose etc. in batten or P.V.C. casing-caping.

3.3 Study of common electrical appliances such as auto electric iron, electric kettle, ceiling/table fan, desert cooler etc.

3.4 Introduction to the construction of lead acid battery and its working.

Job III Installation of battery and connecting two or three batteries in series and parallel.

3.5 Introduction to battery charger and its functioning.

Job IV Charging a battery and testing with hydrometer and cell tester

4. WELDING SHOP

4.1 Introduction and importance of welding as compared to other material joining processes. Specifications and type of welding machines, classification and coding of electrodes, welding parameters, welding joints and welding positions. Materials to be welded, safety precautions.

4.2 Job Practice

Job I Practice of striking arc (Minimum 4 beads on 100 mm long M.S. flat).

Job II Practice of depositing beads on plate at different current levels. (Minimum 4 beads on M.S. plate at four setting of current

	level).
Job III	Preparation of lap joint using arc welding process.
Job IV	Preparation of T-joint using gas welding or arc welding on 100 mm x 6 mm MS Flat

5. PLUMBING SHOP

Use of personal protective equipments, safety precautions while working and cleaning of shop.

Introduction and demonstration of tools, equipment and machines used in plumbing shop.

Introduction of various pipes and pipe fittings of elbow, nipple, socket, union etc.

Job Practice

Job 1 : Preparation of job using elbow, bend and nipple

Job II: Preparation of job using Union, Tap, Plug and Socket.

Job III: Threading practice on pipe with die

MEANS OF ASSESSMENT

- Workshop jobs
- Report writing, presentation and viva voce

RECOMMENDED BOOKS

1. Workshop Technology I,II,III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publishers Pvt. Ltd. Mumbai.
2. Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar.
3. Workshop Training Manual Vol. I, II by S.S. Ubhi; Katson Publishers, Ludhiana.
4. Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd., New Delhi
5. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
6. Workshop Technology by B.S. Raghuwanshi; Dhanpat Rai and Co., New Delhi
7. Workshop Technology by HS Bawa; Tata McGraw Hill Publishers, New Delhi.

2.1 APPLIED MATHEMATICS - II

L	T	P
5	-	-

RATIONALE

Basic elements of integral calculus, differential calculus, numerical methods, differential m equations included in this course will play a vital role in understanding engineering problem mathematically. This will also develop analytical as well as conceptual abilities among students.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Calculate simple integration by methods of integration
- Evaluate the area under curves, surface by using definite integrals.
- Calculate the area and volume under a curve along areas
- Solve the engineering problems with numerical methods.
- Understand the geometric shapes used in engineering problems by co-ordinate geometry.

DETAILED CONTENTS

1. Integral Calculus - I (20 Periods)

Methods of Indefinite Integration

Integration by substitution.
Integration by rational function.
Integration by partial fraction.
Integration by parts.
Integration of special function

2. Integral Calculus - II (20 Periods)

2.1 Meaning and properties of definite integrals, Evaluation of definite integrals.
2.2 Application : Length of simple curves, Finding areas bounded by simple curves Volume of solids of revolution, centre of mean of plane areas.
2.3 Simposns 1/3rd and Simposns3/8th rule and Trapezoidal Rule : their application in simple cases. Numerical solutions of algebraic equations; Bisections method, Regula-Falsi method, Newton-Raphson's method(without proof), Numerical solutions of simultaneous equations; Gauss elimination method(without proof)

3. Co-ordinate Geometry (2 Dimension) (18 Periods)

3.1 Circle
Equation of circle in standard form. Centre - Radius form, Diameter form, Two intercept form.

4. Co-ordinate Geometry (3 Dimension) (12 Periods)

4.1 Straight lines and planes in space
Distance between two points in space, direction cosine and direction ratios, Finding equation of a straight line (without proof)

INSTRUCTONAL STRATEGY

Basic elements of Differential Calculus, Integral Calculus and differential equations can be taught conceptually along with real engineering applications in which particular algorithm and theory can be applied. Numerical examples will be helpful in understanding the content of the subject.

MEANS OF ASSESSMENT

- Assignments and Quiz/Class Tests
- Mid-term and End-term Written Tests
- Model/Prototype Making

RECOMMENDED BOOKS

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
3 Applied Mathematics-II by Chauhan and Chauhan, Krishna Publications, Meerut.
4. Applied Mathematics-I (B) by Kailash Sinha and Varun Kumar; Aarti Publication, Meerut

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1.	20	28
2.	20	28
3.	18	24
4	12	20
Total	**70**	**100**

2.2 APPLIED PHYSICS – II

L	T	P
5	-	2

RATIONALE

Applied physics includes the study of a diversified topics related to the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects behave. Concrete knowledge of physical laws, analysis and applications in various fields of engineering and technology are given prominence in this course content.

Note: Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to learn and appreciate these concepts and principles. In all contents, SI units should be followed.

LEARNING OUTCOMES

After undergoing this subject, the student will be able to;

- Define wave motion its types (Transverse and Longitudinal), Periodic and Simple Harmonic Motion, solve simple problems.
- Define the terms: frequency, amplitude, wavelength, velocity of a wave.
- Explain various Engineering, Medical and Industrial applications of Ultrasonics.
- Apply acoustics principles to various types of buildings to get best sound effect
- Explain diffraction, interference, polarization.
- Define capacitance and its unit. They will be able to explain the function of capacitors in simple circuits, solve simple problems using C=Q/V
- Explain the role of free electrons in insulators, conductors and semiconductors, qualitatively the terms: potential, potential difference, electromotive force.
- Explain the concept of electric current, resistance and itsmeasurement.
- List the effects of an electric current and their common applications, State and apply Ohm's law, calculate the equivalent resistance of a variety of resistor combinations, determine the energy consumed by an appliance, distinguish between AC and DC electricity
- Explain Biot-Savart Law, Ampere's law, Lorenz Force.
- State the laws of electromagnetic induction, describe the effect on a current-carrying conductor when placed in a magnetic field
- Explain operation of moving coil galvanometer, simple DC motor
- Apply the knowledge of diodes in rectifiers, adapters IC's and various electronic circuits. Apply the concept of light amplification in designing of various LASER based instruments and optical sources.
- Explain total internal reflection and apply this concept for optical fibre and its uses in Medical field and Communication.

DETAILED CONTENTS

1. Wave motion and its applications (12 periods)

Wave motion, transverse and longitudinal wave motion with examples, sound and light waves, relationship among wave velocity, frequency and wave length and its application

Wave equation y = r sin wt, phase, phase difference, principle of superposition of waves

Simple Harmonic Motion (SHM): definition and characteristic, expression for displacement, velocity, acceleration, time period, frequency in S.H.M., Energy of a body executing S. H. M., simple pendulum, concept of simple harmonic progressive wave,

Free, Damped and forced oscillations, Resonance with examples, Q-factor

Definition of pitch, loudness, quality and intensity of sound waves, intensity level, Echo and reverberation, Sabine formula for reverberation time(without derivation), coefficient of absorption of sound, methods to control reverberation time and their applications, Accoustics of building defects and remedy.

Ultrasonics –production, detection, properties and applications in engineering and medical applications.

2. Wave Optics (6 periods)

2.1 Dual nature of light, wave theory of light, laws of reflection and refraction, Snell's law, Power of lens, magnification.
2.2 Two-Source Interference, Double-Slit interference, Interference due to thin films, Fresnel's biprism.
2.3 use of interference making highly efficient solar panel.
2.4 diffraction, Single Slit diffraction, Intensity calculation etc
2.5 Polarization of electromagnetic waves, polarizing sheets, polarizing by Reflection (Brewser's law), Malus law, use of polariods.

3. Electrostatics (12 periods)

Concept of charge, Coulombs law, Electric field of point charges, Electric lines of force and their properties, Electric flux, Electric potential and potentialdifference.

Gauss law of electrostatics: Application of Gauss law to find electric field intensity of straight charged conductor, plane charged sheet and charged sphere.

Capacitor and its working principle, Capacitance and its units. Capacitance of parallel plate capacitor. Series and parallel combination of capacitors (numericals), charging and discharging of a capacitor.

Dielectric and its effect on capacitance, dielectric break down.

Application of electrostatics in electrostatic precipitation of microbes and moisture separation from air and gases in industry for pollution control (Brief explanation only)

4. Current Electricity (12 periods)

Electric Current, Resistance, Specific Resistance, Conductance, Specific Conductance, Series and Parallel combination of Resistances. Factors affecting Resistance, Colour coding of carbon Resistances, Ohm's law.Superconductivity.

Kirchhoff's laws, Wheatstone bridge and its applications (meter bridge and slide wire bridge)

Concept of terminal potential difference and Electro motive force (EMF), potentiometer.

Heating effect of current, Electric power, Electric energy and its units (related numerical problems), Advantages of Electric Energy over other forms ofenergy

Examples of application of DC circuits in various electrical and electronics equipment such as C.R.O, T.V., Audio-Video System, Computers etc.

5. Magneto Statics and Electromagnetism (12 periods)

5.1 Magnetic poles, force on a moving charge, circulating charges, force on a current carrying wire, Hall effect, torque on a current loop.

5.2 Magnetic field due to moving charge(Biot-Savart Law), due to current (Biot-Savart Law), parallel currents, field of a solenoid, Ampere's law.

5.3 Faraday's law, Lenz' law, motional emf, induced electric fields.

5.4 Magnetic dipole and force on a magnetic dipole in a non-uniform field, Magnetization, Gauss' law for magnetism.

5.5 Types of magnetic materials. Dia, para and ferromagnetic materials with their properties,

5.6 Application of electromagnetism in ac/dc motors and generators.

6. Semiconductor physics (8 periods)

Types of materials (insulator, semi conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction diode and its V-I characteristics

Diode as rectifier – half wave and full wave rectifier (centre taped),

Semiconductor transistor, pnp and npn (concepts only)

Application of semiconductor diodes (Zener, LED) and that of transistor as amplifier and oscillator.

7. Modern Physics (8 Periods)

Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; laser and its characteristics, population inversion, Types of lasers; Ruby and He-Ne lasers, engineering and medical applications of lasers.

Fibre optics: Total internal reflection and its applications, Critical angle and conditions for total internal reflection, introduction to optical fibers, light propagation, types, acceptance angle and numerical aperture, types and applications of optical fibre in communication.

Introduction to nanotechnology, nanoparticles and nano materials,

LIST OF PRACTICALS (To perform minimum six experiments)

1. To determine the velocity of sound with the help of resonance tube.
2. To find the focal length of convex lens by displacement method.
3. To find the refractive index of the material of given prism using spectrometer.
4. To find the wavelength of sodium light using Fresnel's biprism.
5. To verify laws of resistances in series and parallel combination
6. To verify ohm's laws by drawing a graph between voltage and current.
7. To measure very low resistance and very high resistances using Slide Wire bridge
8. Conversion of Galvanometer into an Ammeter and Voltmeter of given range.
9. To draw hysteresis curve of a ferromagnetic material.
10. To draw characteristics of a pn junction diode and determine knee and break down voltages.
11. To find wave length of the laser beam.
12. To find numerical aperture of an optical fiber.

INSTRUCTIONAL STATREGY

Teacher may use various teaching aids like live models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. The teacher should explain about field applications before teaching the basics to develop proper understanding of the physical phenomenon. Use of demonstration and animations can make the subject interesting and may develop scientific temper in the students. Teacher must plan a tour of Science Park/planetarium available in nearby areas in order to enhance the interest in this course.

MEANS OF ASSESSMENT

- Assignment & Quiz
- Mid-Term and End-Term written test
- Model Making
- Actual Lab & Practical Work
- Viva-Voice

RECOMMENDED BOOKS

1. Text Book of Physics (Part-I, Part-II); N.C.E.R.T., Delhi
2. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
3. A Text Book of Optics, Subramanian and Brij Lal, S Chand & Co., New Delhi
4. Practical Physics, by C. L. Arora, S Chand publications
5. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
6. Modern Engineering Physics by SL Gupta, Sanjeev Gupta, Dhanpat Rai Publications.
7. Physics Volume 2, 5th edition, Haliday Resnick and Krane, Wiley publication
8. Fundamentals of Physics by Haliday, Resnick & Walker 7th edition, Wiley publication

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	12	18
2	6	8
3	12	18
4	12	16
5	12	16
6	8	12
7	8	12
Total	**70**	**100**

2.3 APPLIED MECHANICS

L	T	P
5		-2

RATIONALE

The subject Applied Mechanics deals with basic concepts of mechanics like laws of forces, moments, friction, centre of gravity, laws of motion and simple machines which are required by the students for further understanding of other allied subjects. The subject enhances the analytical ability of the students.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Interpret various types of units and their conversion from one to another.
- Analyze different types of forces acting on a body and draw free body diagrams.
- Determine the resultant of coplanar concurrent forces.
- Calculate the co-efficient of friction for different types of surfaces.
- Calculate the least force required to maintain equilibrium on an inclined plane.
- Determine the centroid/centre of gravity of plain and composite laminar and solid bodies.
- Determine velocity ratio, mechanical advantage and efficiency of simple machines

DETAILED CONTENTS

1. Introduction (06 periods)

Concept of engineering mechanics definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields. Definition of Applied Mechanics.

Definition, basic quantities and derived quantities of basic units and derived units

Different systems of units (FPS, CGS, MKS and SI) and their conversion from one to another for density, force, pressure, work, power, velocity, acceleration

Concept of rigid body, scalar and vector quantities

2. Laws of forces (12 periods)

Definition of force, measurement of force in SI units, its representation, types of force: Point force/concentrated force & Uniformly distributed force, effects of force, characteristics of a force

Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of superposition

Composition and resolution of coplanar concurrent forces, resultant force, method of composition of forces, laws of forces, triangle law of forces, polygon law of forces - graphically, analytically, resolution of forces, resolving a force into two rectangular components

Free body diagram

Equilibrant force and its determination

Lami's theorem (concept only)

[Simple problems on above topics]

Type of Load, supports, Beams- analysis for simply supported, cantilever beams

3. Moment (14 periods)

3.1 Concept of moment

3.2 Moment of a force and units of moment

3.3 Varignon's theorem (definition only)

3.4 Principle of moment and its applications (Levers – simple and compound, steel yard, safety valve, reaction at support)

3.5 Parallel forces (like and unlike parallel force), calculating their resultant

3.6 Concept of couple, its properties and effects

3.7 General conditions of equilibrium of bodies under coplanar forces

3.8 Position of resultant force by moment

[Simple problems on the above topics]

4. Friction (14 periods)

Definition and concept of friction, types of friction, force of friction

Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction

Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane.

Calculation of least force required to maintain equilibrium of a body on a rough inclined plane subjected to a force:

a) Acting along the inclined plane Horizontally
b) At some angle with the inclined plane

5. Centre of Gravity (10 periods)

5.1 Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies

5.2 Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion

5.3 Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed
[Simple problems on the above topics]

6. Simple Machines (14 periods)

6.1. Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines

6.2. Simple and compound machine (Examples)

6.3. Definition of ideal machine, reversible and self locking machine

6.4. Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency

6.5. System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency

6.6. Working principle and application of wheel and axle, Weston's Differential Pulley Block , simple screw jack, worm and worm wheel, single and double winch crab. Expression for their velocity ratio and field of their application
[Simple problems on the above topics]

LIST OF PRACTICALS

1. Verification of the polygon law of forces using gravesend apparatus.
2. To verify the forces in different members of jib crane.
3. To verify the reaction at the supports of a simply supported beam.
4. To find the mechanical advantage, velocity ratio and efficiency in case of an inclined plane.
5. To find the mechanical advantage, velocity ratio and efficiency of a screw jack.
6. To find the mechanical advantage, velocity ratio and efficiency of worm and Worm wheel.

7. To find mechanical advantage, velocity ratio and efficiency of single purchase crab.
8. To find out center of gravity of regular lamina.
9. To find out center of gravity of irregular lamina.

10. To determine coefficient of friction between three pairs of given surface.

INSTRUCTIONAL STRATEGY

Applied Mechanics being a fundamental subject, the teacher are expected to emphasize on the application of "Applied Mechanics" in various subjects so that students are able to appreciate the importance of the subject. Students should also be made conversant with the use of scientific calculator to solve numerical problems

MEANS OF ASSESSMENT

Assignments and quiz/class tests, mid and end-term written tests, model/prototype making.

RECOMMENDED BOOKS

1. A Text Book of Applied Mechanics by S Ramamurtham,Dhanpat Rai Publishing Co. Ltd.
2. A Text Book of Engineering Mechanics (Applied Mechanics) by RK Khurmi; S Chand and Co. Ltd., New Delhi.
3. A Text Book of Applied Mechanics by RK Rajput; Laxmi Publications, New Delhi..
4. Text Book of Applied Mechanics by Birinder Singh, Kaption Publishing House, New Delhi.
5. Test Book of Applied Mechanics by AK Upadhya, SK Kataria & Sons, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	8
2	12	18
3	14	20
4	14	20
5	10	14
6	14	20
Total	**70**	**100**

BASICS OF MECHANICAL AND CIVIL ENGINEERING

L	T	P
5	-	2

RATIONALE

Apart from the common core subjects, some engineering subjects are included in the diploma course of electrical engineering. One of these subjects is Elementry Mech. Engg. to impart some necessary knowledge and skill about mechanical nature. Inclusion of the subject is further justified by the fact that in practical field, any job of electrical and civil technician is intermingled with either civil or mechanical engineering. As such the relevant basic topics of these disciplines are included in the content of the subject.

Some study exercises along with some field work have been suggested to give feel of jobs and equipments involved.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Apply Thermodynamics Laws.
- Use of various energy sources.
- Solve basics problems related to fuel and combustion.
- Have an idea of loading on machine components.
- Explain the application of different types of bearings.
- Explain the uses of different types of gears and springs.
- Explain the working principle of different lubrication systems.

SECTION A - MECHANICAL ENGINEERING

DETAILED CONTENTS

1. Thermal Engineering (14 periods)

Sources of Energy

Definition, Concept of thermodynamic system and surroundings, Closed system, Open system, Isolated system, Thermodynamics definition of work. Zeroth law of thermodynamics Basic ideas, conventional and nonconventional forms- Thermal, wind, Solar, Biomass and Nuclear and their uses. Hydel, Tidal,

1.2 Fuels & Combustion:

Combustion of fuels- their higher and lower calorific values. Combustion

equations for carbon, sulphur, hydrogen and their simple compounds. Calculation of minimum amount of air required for complete combustion. Combustion analysis n mass basis and on volume basis. Concept of excess air in a boiler furnace combustion. Heat carried away by flue gases. Analysis of flue

gases by Orsat apparatus. Simple numerical problems

Idea of specific properties of liquid fuels such as detonation, knock resistance (cetane and octane numbers), viscosity, solidification point, flash point and flame point.

2. Machine Components (20 periods)

Brief idea of loading on machine components.

(i) Pins, Cottor and Knuckle Joints.
(ii) Keys, Key ways and spline on the shaft.
(iii) Shafts, Collars, Cranks, Eccentrics.
(iv) Couplings and Clutches.
(v) Bearings-Plane, Bushed, Split-step, ball, Roller bearing, Journal bearing, Foot step bearing, thrust bearing, collar bearing and Special type bearings and their applications.
(vi) Gears

Different types of gears, gear trains and their use for transmission of motion.

Determination of velocity ratio for spur gear trains; spur gear, single and double helical gears, Bevel gears, Mitre wheel, worms, Rack and Pinion. Simple and compound and epicyclic gear trains and their use. Definition of pitch and pitch circle & module.

(vii) Springs

Compression, Tension, Helical springs,Torsion springs, Leaf and Laminated springs. Their use and material.

(08 periods)

3. Lubrication

Different lubrication system for lubricating the components of machines.

Principle of working of wet sump and dry sump system of lubrication. (Explain with simple line diagram). Selection of lubricant based on different application (Requirement with the help of manufacturer catalogue).

SECTION B : CIVIL ENGINEERING

4. Construction Materials (06 periods)

Properties and uses of various construction materials such as stones, bricks, lime, content and timber with their properties, physical/field testing, elements of brick masonry.

5. Foundations (08 periods)

5.1 Bearing capacity of soil and its imporance

5.2 Types of various foundations and their salient features, suitability of various foundations for heavy, light and vibrating machines.

6. Concrete (08 periods)

Various ingredients of concrete, different grades of concrete, water cement ratio, workability, physical/field testing of concrete, mixing of concrete, placing and curing of concrete..

7. RCC (06 periods)

Basics of reinforced cement concrete and its use (elementary knowledge), introduction to various structural elements of a building.

Note: While imparting instructions, teachers are expected to lay more emphasis on concepts and principles. It will be better if the classes for general engineering are conducted by organized demonstrations for explaining various concepts and principles.

LIST OF PRACTICALS

1. Study and Sketch of Pins and Cottor
2. Study and Sketch of Keys and Key ways
3. Study and sketch of Couplings andClutches
4. Study and Sketch of Bearings
5. Study and Sketch of Springs
6. Study of green energy
7. Testing of bricks
   a) Shape and size
   b) Soundness test
   c) Water absorption
   d) Crushing strength
8. Testing of concrete
   a) Slump test
   b) Compressive Strength of concrete cube
9. The students should be taken to different construction sites to show them various construction materials, concreting process and construction of RCC structural elements, foundations and other civil works.

INSTRUCTIONAL STRATEGY

Teachers should lay emphasis on basic principles and use charts in class, visits to labs and

industry may be arranged to demonstrate certain materials and practices.

MEANS OF ASSESSMENT

- Sessional Tests
- End term Tests
- Practicals
- Viva-Voce

RECOMMENDED BOOKS

1. Textbook of Concrete Technology 2nd Edition, by Kulkarni, PD Ghosh TK and Phull, YR; New Age International(P) Ltd, Publishers, New Delhi
2. Materials of Construction by Ghosh; Tata McGraw Hill Publishing Co. Ltd., New Delhi
3. Civil Engineering Materials by TTTI, Chandigarh; Tata McGraw Hill Publishing Co. Ltd., New Delhi
4. Concrete Technology by J.Jha and Sinha; Khanna Publishers, Delhi
5. Building Construction by Jha and Sinha; Khanna Publishers, Delhi
6. Building Construction by Vairani and Chandola; Khanna Publishers, Delhi
7. Civil Engineering Materials by SV Deodhar and Singhai; Khanna Publishers, New Delhi
8. Soil Mechanics and Foundation Engineering by SK Garg; Khanna Publishers, New

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1.	14	20
2.	20	28
3.	08	12
4	06	08
5	08	12
6	08	12
7	06	08
Total	**70**	**100**

FOOTWEAR TECHNOLOGY –I(clicking)

L	T	P
6	-	6

RATINAOL

The objective of this course is to introduce the students to respond to all the needs of footwear production starting from conventional way to most modern and latest clicking technology used in footwear industries: Manual cutting table, Manual and semi-auto press, CNC hydraulic press, Die-less cutting machine, etc. to optimally use the material. The course is also enhancing the knowledge of students to maintain, handle and operate the machines with safety measures.

LEARNING OUTCOME

After undergoing the subject, the students will be able to

- Understand different technologies for footwear manufacture
- Understand different footwear manufacture processes.

DETAILED CONTENTS:

UNIT - 1 INTRODUCTION OF FOOTWEAR (Periods 12)
History of footwear, Purpose of shoes in daily life, Types of Footwear and various components of different types of Footwear,

UNIT – 2 TOOLS AND MACHINES USED IN CLICKING (Periods 12)
Tools employed in the upper and bottom clicking departments such as clicking knife, board, grinder stone etc. Machines used in clicking departments such as Manual and semi-auto press, CNC hydraulic press machine etc.

UNIT – 3 ARRANGEMENT OF CLICKING (Periods 14)
Training to prepare knife making and handling the knife for cutting the components. Marking and cutting of paper patterns and leather components of shoes. Selection of the material, thickness of the blade.

UNIT – 4 CLICKING OF UPPER & BOTTOM COMPONENTS (Periods 16)
Principle of clicking, Method of clicking, General rules of clicking and qualities of a good clicker, Interlocking, Locking continuity, Overcutting, under lay cutting.

UNIT – 5 CLICKING ROOM DESIGN AND MANAGEMENT (Periods 16)
Identification marking and correct pairing, cutting of fabrics by different systems i.e. wrap system, weft system, and biased system of hand and machine clicking. Optimization of upper material.

LIST OF PRACTICALS

Group : 1 (Upper clicking)

The following processes should be covered.

1. Preparation of clicking tools such as clicking knife and pricking awl etc.
2. Examination of defects in leather.
3. Practice in layout, marking and cutting of leather and fabric for upper and lining components.
4. Practice in hand/clicking with clicking knife.
5. Practice in setting and operating of clicking press and splitting machine.
6. Practice in splitting, sorting, pairing and marking of identification marks on cut components.
7. Practice in measuring leather by various methods.
8. Exercise on calculation of storing of leather.
9. Exercise on calculation of material consumption and reduction of wastage.
10. Preparing cost sheet with control on consumption

Group : 2 (Bottom clicking)

The following processes should be covered.

1- Preparing hand tools required for bottom clicking .
2- Examination of defects in leather.
3- Practice in layout, marking and cutting of Bottom leather
4- Practice in hand/clicking.
5- Practice in splitting, sorting, pairing and marking of identification .
6- Use of pattern and gauges for checking thickness and correct preparation of components.
7- Exercise on calculation of material consumption and reduction of wastage.
8- Preparing cost sheet with control on consumption

Group : 3 (Making)

Design , fabrication and making of Chappals or new cut for ladies and gents

INSTRUCTIONAL STRATEGY

Teachers should lay emphasis on basic principles and use charts in class, visits to labs and industry may be arranged to demonstrate certain materials and practices.

MEANS OF ASSESSMENT

- Sessional Tests
- End term Tests
- Practicals

  Viva-Voce

RECOMMENDED BOOKS

1- The Science of Footwear by Ravindra S. Goonetilleke.
2- Footwear Material and Process Technology by Nicholas Brown
3- The Dictionery of Shoe Industry Technology .
4- Manual of shoe making, Compile .
5- Pattern Cutting Hand Book by MH Sharp .

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1.	12	20
2.	14	20
3.	14	20
4.	14	20
5.	16	20
Total	**70**	**100**

GENERAL WORKSHOP PRACTICE –II

(Common for Civil Engineering, Electrical Engineering and Chemical Engineering)

L	T	P
-	-	8

RATIONALE

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices are included in the curriculum in order to provide hands-on experience about use of different tools and basic manufacturing practices. This subject aims at developing general manual and machining skills in the students. In addition, the development of dignity of labour, safety at work place, team working and development of right attitude are the other objectives.

LEARNING OUTCOMES

After completing the course, the students will be able to:

- Identify tools and equipment used and their respective functions.
- Identify different types of materials and their basic properties.
- Use and take measurements with the help of basic measuring tools/equipment.
- Select proper tools for a particular operation.
- Select materials, tools, and sequence of operations to make a job as per given specification/drawing.
- Prepare simple jobs independently and inspect the same.
- Follow safety procedures and precautionary measures.
- Use safety equipment and Personal Protection Equipment.

DETAILED CONTENTS (PRACTICAL EXERCISES)

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus:

1 Fitting Shop
2 Sheet Metal Shop
3 Mason Shop
4 Machine Shop

1. FITTING SHOP

Use of personal protective equipment and safety precautions while working.

Basic deburring processes.

Introduction to fitting shop tools, marking and measuring devices/equipment.

Identification of materials. (Iron, Copper, Stainless Steel, Aluminium etc.)

Identification of various steel sections (flat, angle, channel, bar etc.).

Introduction to various fitting shop operations/processes (Hacksawing, Drilling, Chipping and Filing).

Job Practice

Job I Marking of job, use of marking tools, filing and use of measuring instruments. (Vernier caliper, Micrometer and Vernier height gauge).

Job II Filing a rectangular/square piece to maintain dimensions within an accuracy of ±.25 mm.

Job IIIMaking a cut-out from a square piece of MS flat using hand hacksaw and chipping

Job IV Drilling and tapping practice on MS Flat.

2. SHEET METAL SHOP

2.1. Introduction to sheet metal shop, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material.

Introduction and demonstration of hand tools used in sheet metal shop.

Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine,

Introduction and demonstration of various raw materials used in sheet metal shop e.g. black-plain sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheet etc.

Study of various types of nuts, bolts, rivets, screws etc.

Job Practice

Job I: Shearing practice on a sheet using hand shears.

Job II: Practice on making Single riveted lap joint/Double riveted lap Joint.

Job III :Practice on making Single cover plate chain type, zig-zag type and single rivetted Butt Joint.

3 MASON SHOP

Introduction and importance of Mason shop

Introduction of tools, equipment and machines used in Mason shop

Job Practice

Job I : Preparation of simple bond

Job II : Preparation of Arched bond

Job III: Preparation of RCC structure (column and beam)

4 MACHINE SHOP

4.1 Study and sketch of lathe machine
4.2 Study and Sketch of grinders, milling machine, drilling machine and CNC machine.
4.3 Plain and step turning and knurling practice.
4.4 Study and sketch of planning/shaping machine and to plane a rectangle of cast iron.

MEANS OF ASSESSMENT

- Workshop jobs
- Report writing, presentation and viva voce

RECOMMENDED BOOKS

1. Workshop Technology I,II,III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publishers Pvt. Ltd. Mumbai.
2. Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar.
3. Workshop Training Manual Vol. I, II by S.S. Ubhi; Katson Publishers, Ludhiana.
4. Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd., New Delhi
5. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
6. Workshop Technology by B.S. Raghuwanshi; Dhanpat Rai and Co., New Delhi
7. Workshop Technology by HS Bawa; Tata McGraw Hill Publishers, New Delhi.

ENVIRONMENTAL STUDIES

L T P

3 - 2

RATIONALE

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the ecosystem and controlling pollution by various control measures. He should also be aware of environmental laws related to the control of pollution. He should know how to manage the waste. Energy conservation is the need of hour. He should know the concept of energy management and its conservation.

LEARNING OUTCOMES

After undergoing the subject, the student will be able to:

- Comprehend the importance of ecosystem and sustainable
- Demonstrate interdisciplinary nature of environmental issues
- Identify different types of environmental pollution and control measures.
- Take corrective measures for the abatement of pollution.
- Explain environmental legislation acts.
- Define energy management, energy conservation and energy efficiency
- Demonstrate positive attitude towards judicious use of energy and environmental protection
- Practice energy efficient techniques in day-to-day life and industrial processes.
- Adopt cleaner productive technologies
- Identify the role of non-conventional energy resources in environmental protection.
- Analyze the impact of human activities on the environment

DETAILED CONTENTS

1. Introduction (04 Periods)

   Basics of ecology, eco system- concept, and sustainable development, Resources renewable and non renewable.

2. Air Pollution (04 Periods)

   Source of air pollution. Effect of air pollution on human health, economy, plant, animals. Air pollution control methods.

3. Water Pollution (08 Periods)

   Impurities in water, Cause of water pollution, Source of water pollution. Effect of water pollution on human health, Concept of dissolved O_2, BOD, COD.

Prevention of water pollution- Water treatment processes, Sewage treatment. Water quality standard.

4. Soil Pollution (06 Periods)

4.1 Sources of soil pollution
4.2 Types of Solid waste- House hold, Hospital, From Agriculture, Biomedical, Animal and human, excreta, sediments and E-waste
4.3 Effect of Solid waste
4.4 Disposal of Solid Waste- Solid Waste Management

5. Noise pollution (06 Periods)

Source of noise pollution, Unit of noise, Effect of noise pollution, Acceptable noise level, Different method of minimize noise pollution.

6. Environmental Legislation (08 Periods)

Introduction to Water (Prevention and Control of Pollution) Act 1974, Introduction to Air (Prevention and Control of Pollution) Act 1981 and Environmental Protection Act 1986, Role and Function of State Pollution Control Board and National Green Tribunal (NGT), Environmental Impact Assessment (EIA).

7. Impact of Energy Usage on Environment (06 Periods)

Global Warming, Green House Effect, Depletion of Ozone Layer, Acid Rain.
Eco-friendly Material, Recycling of Material, Concept of Green Buildings.

LIST OF PRACTICALS

1. Determination of pH of drinking water
2. Determination of TDS in drinking water
3. Determination of TSS in drinking water
4. Determination of hardness in drinking water
5. Determination of oil & grease in drinking water
6. Determination of alkalinity in drinking water
7. Determination of acidity in drinking water
8. Determination of organic/inorganic solid in drinking water
9. Determination of pH of soil
10. Determination of N&P (Nitrogen & Phosphorus) of soil
11. To measure the noise level in classroom and industry.
12. To segregate the various types of solid waste in a locality.
13. To study the waste management plan of different solid waste
14. To study the effect of melting of floating ice in water due to global warming

INSTRUCTIONAL STRATEGY

In addition to theoretical instructions, different activities pertaining to Environmental Studies

like expert lectures, seminars, visits to green house, effluent treatment plant of any industry, rain water harvesting plant etc. may also be organized.

MEANS OF ASSESSMENT

−Assignments and quiz/class tests,

−Mid-term and end-term written tests

RECOMMENDED BOOKS

1. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
2. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications, New Delhi.
3. Environmental Pollution by Dr. RK Khitoliya; S Chand Publishing, New Delhi
4. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.
5. Engineering Chemistry by Jain and Jain; Dhanpat Rai and Co. (P) Ltd. Delhi.
6. Environmental Studies by ErachBharucha; University Press (India) Private Ltd., Hyderabad.
7. Environmental Engineering and Management by Suresh K Dhamija; S K Katariaand Sons, New Delhi.
6. E-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	04	10
2	04	10
3	08	20
4	06	14
5	06	14
6	08	20
7	06	12
Total	**42**	**100**

APPLIED MATHEMATICS –III

L	T	P
5	-	-

RATIONALE

Contents of this course provide understanding of some elementary and advanced mathematics algorithms and their applications of solving engineering problems. Content of this course will enable students to use some advanced techniques like Beta-Gamma function, Fourier series, Laplace transform and probability distributions in solving complex engineering problems.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Understand matrix operations and uses of matrix in different problems.
- Apply elementary row and column operations in finding inverse of a matrix.
- Find Eigen values, Eigen vectors of a matrix and their different properties.
- Understand degree/order of differential equations and their solution techniques.
- Use differential equations in engineering problems of different areas.
- Find Fourier series expansion of a function
- Apply Laplace transform and their applications in solving engineering problems.
- Understand concept of probability distribution and their applications.

DETAILED CONTENTS

1. Matrices (16 Periods)

Algebra of Matrices, Inverse

Addition, Multiplication of matrices, Null matrix and a unit matrix, Square matrix, Symmetric, Skew symmetric, Hermitian, Skew hermition, Orthagonal, Unitary, diagonal and Triangular matrix, Determinant of a matrix.

Definition and Computation of inverse of a matrix.

Elementry Row/Column Transformation

Meaning and use in computing inverse and rank of a matrix.

Linear Dependence, Rank of a Matrix

Linear dependence/independence of vectors, Definition and computation of rank of matrix. Computing rank through determinants, Elementary row transformation and through the concept of a set of independent vectors, Consistency of equations.

Eigen Pairs, Cayley-Hamilton Theorem

Definition and evaluation of eign values and eign vectors of a matrix of order two and three, Cayley-Hamilton theorem (without Proof)and its verification, Use in finding inverse and powers of a matrix.

2. Differential Calculus (15 Periods)

2.1 Function of two variables, identification of surfaces in space, conicoids

2.2 Partial Differentiation

Directional derivative, Gradient, Use of gradient f, Partial derivatives, Chain rule, Higher order derivatives, Euler's theorem for homogeneous functions, Jacobians.

2.3 Vector Calculus

Vector function, Introduction to double and triple integral, differentiation and integration of vector functions, gradient, divergence and curl, differential derivatives.

3. Differential Equation(15 Periods)

Formation, Order, Degree, Types, Solution

Formation of differential equations through physical, geometrical, mechanical and electrical considerations, Order, Degree of a differential equation, Linear, nonlinear equation.

First Order Equations

Variable seperable, equations reducible to seperable forms, Homogeneous equtions, equations reducible to homogeneous forms, Linear and Bernoulli form exact equation and their solutions.

Higher Order Linear Equation :

Property of solution, Linear differential equation with constant coefficients (PI for $X=^{ax}$, Sinax, Cosax, X^n, ^{ax}V, XV

Simple Applications

LCR circuit, Motion under gravity, Newton's law of cooling, radioactive decay, Population growth, Force vibration of a mass point attached to spring with and without damping effect. Equivalence of electrical and mechanical system

4. Integral Calculus-II (12 Periods)

Beta and Gamma Functions

Definition, Use, Relation between the two, their use in evaluating integrals.

Fourier Series

Fourier series of f(x),-n<x<n, Odd and even function, Half range series.

Laplace Transform

Definition, Basic theorem and properties, Unit step and Periodic functions, inverse Laplace transform, Solution of ordinary differential equations

5. Probability and Statistics (12Periods)

5.1 Probability

Introduction, Addition and Multiplication theorem and simple problem.

5.2 Distribution

Discrete and continuous distribution, Bionimal Distribution, Poisson distribution, Normal Distribution.

INSTRUCTONAL STRATEGY

The content of this course is to be taught on conceptual basis with plenty of real world examples. The basic elements of Laplace transform, Differential equations and Applications of differential equations can be taught with engineering applications of relevant branch.

MEANS OF ASSESSMENT

− Assignments and Quiz/Class Tests

− Mid-term and End-term Written Tests −
Model/Prototype Making

RECOMMENDED BOOKS

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
3 Applied Mathematics-III by Chauhan and Chauhan, Krishna Publications, Meerut**.**
4. Applied Mathematics-II by Kailash Sinha and Varun Kumar; Aarti Publication, Meerut.
5. E-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1.	16	24
2.	15	20
3.	15	20
4	12	18
5	12	18

Total	**70**	**100**

ANATOMY OF HUMAN FOOT

L	T	P
6	-	6

RATIONALE

The objective of the course is to impart basic knowledge and skills regarding structures of hunam foot and its concepts for footwear manufacture.

LEARNING OUTCOME

After undergoing the subject, the students will be able to

- Understand different type of bones, structure & functions of bones human foot
- Understand different common foot problems
- introduction of defects, disease and disorder

DETAILED CONTENTS

UNIT I BONES (periods 17)
Introduction of human foot, bones of human foot, parts & position of human foot, name of bones, type of bones, structure & functions of bones, features of bones & defects of bones

UNIT II JOINTS (periods 17)

Introduction of joints of human foot, principles & classification of joints (fibrous, cartiligous, synovial etc), type of joints, name of joints, functions of joints & defects of joints

UNIT III ARCHES (periods 17)
Introduction of arches of human foot, type of arches (longitudinal, transverse), name of arches, functions of arches & defects of arches. function of muscles, their origin and insertion balance of power, normal and abnormal balance b/w muscles, muscles of leg and foot.

UNIT IV LIGAMENTS, TENDONS AND FASCIA (periods 17)
Introduction of ligaments tendons and fascia, types of ligaments tendons and fascia, name of ligaments tendons and fascia, functions of ligaments tendons and fascia & defects of ligaments tendons and fascia

UNIT V COMMON FOOT PROBLEMS (periods 16)
Common foot problems introduction of defects, disease and disorder (boil, blister, callus, corn, bunion, hallux valgus, hallux rigidus, hammer toe, clawed toe, mallet toe, gout, humped foot, elephant foot, flat foot, high arch foot, problems of skins and muscle, problems of bones and joints, problems of arches ligaments tendons and fascia

LIST OF PRACTICALS

1. Identification & Introduction of Human Foot bones (Tarsal, Metatarsal, Phalanges)
2. Identification & Introduction of Human Foot joints (Fibrous, Cartiligous, Synovial etc)
3. Identification & Introduction of Human Foot Arches (Longitudinal, Transverse)
4. Identification & Introduction of Human Foot Ligaments Tendons and Fascia
5. Problems of Human & their possible resolutions
6. Demonstration of human foot Skeleton

INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

MEANS OF ASSESSMENT

− Class Test

− Home Assignment −
Attendance

− Sessional Test

RECOMMENDED BOOKS

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	17	20
2	17	20
3	17	20
4	17	20
5	16	20

Total	**84**	**100**

FOOTWEAR DESIGN

L	T	P
6	-	6

RATIONALE

The objective of the course is to impart basic knowledge and skills regarding materials for footwear design.

LEARNING OUTCOME

After undergoing the subject, the students will be able to

- Understand different materials for footwear design.
- Understand different footwear design processes.

DETAILED CONTENTS

UNIT I MEASUREMENTS (15 PERIODS)

Foot and last measurement by different methods different location of points on last and on human foot, different types of measurement on last such as SL, GIRTH, IP VP etc

UNIT II LAST (15 PERIODS)

Introduction and classification of last on basis of material (such as: metal, alloys, wood, pop, pvc etc) design: (such as long boot, casual, formal, sports etc) Uses (such as sandals shoes belleies etc) size system: (such as french, british) brief description of last making (solid, scoop, hingee, telescopic) & tools used for it, allowances & deduction for last

UNIT III SIZE SYSTEM (15 PERIODS)

Introduction of size system, different types of size system such as french size system, british size system and american size system. Their merits and demerits conversion of french to british , british to french , british to American , american to british , french to american and american to french size system.

UNIT IV PATTERN MAKING AND GRADING (15 PERIODS)

Pattern making and grading of shoe, sandles long boot etc , process of pattern making (masking, inner form outer form and mean form making) utilities of masking inner form and outer form ,different type of pattern making, process of pattern grading and utilities of pattern grading

UNIT V FACTOR AFFECTING THE FOOTWEAR INDUSTRY (15 PERIODS)

History of fashion cycle, and its periodical evolution. Factor affecting the footwear industry (such as fashion, trend, style age, gender, durability, comfort ability, cost, uses, demand, supply religious etc) duty of a designer (material, design, construction, components study etc)

LIST OF PRACTICALS

1. Foot measurement- Size, Parts, Different points of foot
2. Last Measurement- SL, IP, IG, Vamp Point, Toe Point, Counter Point
3. Introduction of size system
4. Making Mean Forme, Inner Forme, Outer Forme, Free Hand Sketching of Footwear Design
5. Upper Standard Preparations of Oxford & Derby with Components
6. Upper Standard Preparations of Ankle Boot. Long Boot, Sport Shoes

INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

MEANS OF ASSESSMENT

− Class Test

− Home Assignment −
Attendance

− Sessional Test

RECOMMENDED BOOKS

1- The Science of Footwear by Ravindra S. Goonetilleke.
2- Footwear Material and Process Technology by Nicholas Brown
3- The Dictionery of Shoe Industry Technology .
4- Manual of shoe making, Compile .
5- Pattern Cutting Hand Book by MH Sharp .

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	17	20
2	17	20
3	17	20
4	17	20

5	16	20
Total	84	**100**

MATERIALS FOR FOOTWEAR MANUFACTURE

L	T	P
6	-	-

RATIONALE

The objective of the course is to impart basic knowledge and skills regarding materials for footwear manufacture

LEARNING OUTCOME

After undergoing the subject, the students will be able to

- Understand different materials for footwear manufacture
- Understand different footwear manufacture processes.

DETAILED CONTENTS

UNIT I LEATHER (15 PERIODS)
introduction of leather, classification of leather, physical characteristics of leather, common defects of leather, uses of leather in shoe and goods industry

UNIT II FIBER AND FABRIC (15 PERIODS)
introduction of fiber and fabric, classification of fiber, fabrics used for upper lining, side lining, backer, taping, socking, toe puff and their characteristics , uses of fabric in shoe and goods industry

UNIT III POLYMER, RUBBER & RESIN (20 PERIODS)
introduction of polymer, rubber & resin, classification of polymer, rubber & resin, characteristics of polymer, rubber & resin and their uses in shoe and goods industry, different type of sole material like pvc, pva, pu, eva, vulcanised rubber, tpr etc with their utilities

UNIT IV WOOD, METAL AND BOARD (20 PERIODS)
Types of wood and metal & their uses in footwear industry, different types of fiber board their classification and characteristics & their uses (heel, shank, toe puff/cap, stiffener/back strip of shoes etc)

UNIT V ADHESIVE GRINDERIES AND FINISHING MATERIALS (14 PERIODS)
Type of adhesives and their strength and their utilities, different types of grinderies, uses in shoe industries such as eyelets, rivet, hob nail, pinel, pin, tingles etc, and finishing materials like cream waxes polish and lacquers

INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

MEANS OF ASSESSMENT

- Class Test
- Home Assignment
- Attendance
- Sessional Test

RECOMMENDED BOOKS

1- The Science of Footwear by Ravindra S. Goonetilleke.
2- Footwear Material and Process Technology by Nicholas Brown
3- The Dictionery of Shoe Industry Technology .
4- Manual of shoe making, Compile .
5- Pattern Cutting Hand Book by MH Sharp .

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	15	18
2	15	18
3	20	24
4	20	24
5	14	16
Total	84	100

BASICS OF INFORMATION TECHNOLOGY

L	T	P
-	-	6

RATIONALE

Information technology has great influence on all aspects of life. Primary purpose of using computer is to make the life easier. Almost all work places and living environment are being computerized. The subject introduces the fundamentals of computer system for using various hardware and software components. In order to prepare diploma holders to work in these environments, it is essential that they are exposed to various aspects of information technology such as understanding the concept of information technology and its scope; operating a computer; use of various tools using MS Office/Open Office/Libre Office using internet etc., form the broad competency profile of diploma holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

Note:
Explanation of Introductory part should be demonstrated with practical work. Following topics may be explained in the laboratory along with the practical exercises. There will not be any theory examination.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Identify Computer Hardware Components, Network Components and Peripherals.
- Explain the role of an Operating System.
- Install System and Application Software.
- Explain the function of the system components including Processor, Motherboard and Input-output devices.
- Use Word Processing Software to prepare document.
- Use Spreadsheet Software to create workbooks and automate calculation.
- Use Presentation Software to create interactive presentation.
- Perform fundamental tasks common to most application software including print, scan, save, edit, cut, copy, paste, format, spell and grammar check.
- Find and evaluate information on the Web.
- Install Antivirus.
- Safeguard against Online Frauds, threats and crimes.
- Use online office tools(Google suits)

TOPICS TO BE EXPLAINED THROUGH DEMONSTRATION

1. Introduction to Computers and Peripherals.
   Components of Computer, Types of Computer, CPU, RAM, ROM, Hard disk, USB, Flash drive, CD, DVD,Blue ray, Keyboard, Mouse, Monitor, LCD, Printer, Plotter, Scanner, Modem, Sound Cards, Speakers, CMOS battery, Sharing of Printers.

2. Operation System and Application Software
   System Software, Application Software, Virtualization Software, Utility Software, MS Office/Open Office/Libreoffice, Working with window, Desktop components, Menu bars, creating shortcut of program. Installation of Application softwares, Antivirus and Drivers.

3. Word Processing, Spreadsheet and Presentation
   Usage and creation of word document, spreadsheets and presentation, Google Suits (Google drive, google sheet, google doc. Google presentation)

.

4. Internet
   Basics of Networking – LAN, WAN, Wi-Fi technologies, Concept of IP Addrsses, DNS, Search Engines, e-mail, Browsing and cyber laws.

LIST OF PRACTICAL EXERCISES

1. Identify various components, peripherals of computer and list their functions.
2. Installation of various application software and peripheral drivers
3. Installation of operating system (windows/linux/others)
4. Creation and Management (Rename, delete, search of file and folders)
5. Installation of Antivirus and remove viruses
6. Scanning and printing documents
7. Browsing, Downloading, Information using Internet
8. E-Mail ID creation, comparing, sending and receiving e-mail. Attaching a file with e-mail message.
9. Word Processing (MS Office/Open Office)
   a) File Management
      Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, giving password protection for a file
   b) Page set up
      Setting margins, tab setting, ruler, indenting
   c) Editing a document
      Entering text, cut, copy, paste using tool- bars
   d) Formatting a document
      Using different fonts, changing font size and colour, changing the appearance through bold/italic/underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods

      Aligning of text in a document, justification of document, inserting bullets and numbering

Formatting paragraph, inserting page breaks and column breaks, line spacing

Use of headers, footers: Inserting footnote, end note, use of comments, autotext Inserting date, time, special symbols, importing graphic images, drawing tools

e) Tables and Borders

Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table

Print preview, zoom, page set up, printing options Using find, replace options

f) Using Tools like

Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelops and lables

Using shapes and drawing toolbar,

Working with more than one window .

10. Spread Sheet Processing (MS Office/Open Office/Libre Office)

a) Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, save worksheet, switching between different spread sheets

b) Menu commands:

Create, format charts, organise, manage data, solving problem by analyzing data. Programming with Excel Work Sheet, getting information while working

c) Work books:

Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations

Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet, conditional formatting

d) Creating a chart:

Working with chart types, changing data in chart, formatting a chart, use chart to analyze data

Using a list to organize data, sorting and filtering data in list

e) Retrieve data with query:

Create a pivot table, customizing a pivot table. Statistical analysis of data

f) Exchange data with other application:

Embedding objects, linking to other applications, import, export document.

11. PowerPoint Presentation (MS Office/Open Office/Libre office)

a) Introduction to PowerPoint

- How to start PowerPoint
- Working environment: concept of toolbars, slide layout & templates.

- Opening a new/existing presentation
- Different views for viewing slides in a presentation: normal, slide sorter.

b) Addition, deletion and saving of slides
c) Insertion of multimedia elements

- Adding text boxes
- Adding/importing pictures
- Adding movies and soun
- Adding tables and charts etc.
- Adding organizational chart
- Editing objects

- Working with Clip Art

d) Formatting slides

- Using slide master
- Text formatting
- Changing slide layout
- Changing slide colour scheme
- Changing background
- Applying design template

12. Google Suits

Using Google drive, Google shut, Google docs, Google slides.

INSTRUCTIONAL STRATEGY

Since this subject is practice oriented, the teacher should demonstrate the capabilities of computers to students while doing practical exercises. The students should be made familiar with computer parts, peripherals, connections and proficient in making use of MS Office/Open Office/Libre office/Google Suit in addition to working on internet. The student should be made capable of working on computers independently.

MEANS OF ASSESSMENT

- Class Tests/Quiz
- Software Installation and Use
- Viva-Voce
- Presentation

RECOMMENDED BOOKS

1. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
2. Information Technology for Management by Henery Lucas, Tata McGraw Hills, New Delhi
3. Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi
4. Computers Today by SK Basandara, Galgotia publication Pvt Ltd. Daryaganj, New

Delhi.

5. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi

6. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
7. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
8. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
9. On Your Marks - Net…Set…Go… Surviving in an e-world by Anushka Wirasinha, Prentice Hall of India Pvt. Ltd., New Delhi
10. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar

Reference websites

1. www. tutorialspoint..com
2. www.sf.net
3. Gsuite.google.com
4. Spoken-tutorial.org
5. Swayam.gov.in

COMMUNICATION SKILLS – II

L	T	P
4	-	2

RATIONALE

Knowledge of English Language plays an important role in career development. This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills as parts of Communication Skill.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Frame correct sentences with illustrations
- Comprehend the language correctly
- Interpret the language correctly
- Use given material in new situations.
- Correspond effectively using various types of writings like letters, memos etc.
- Communicate effectively in English with appropriate body language making use of correct and appropriate vocabulary and grammar in an organised set up and social context.

DETAILED CONTENTS

1. Functional Grammar (16 periods)

Prepositions
Framing Questions
Conjunctions
Tenses

2. Reading (16 periods)

Unseen Passage for Comprehension (Vocabulary enhancement - Prefixes, Suffixes, one word substitution, Synonym and Antonym) based upon the passage should be covered under this topic.

3 Writing Skill (24 periods)

Correspondence

a) Business Letters- Floating Quotations, Placing Orders, Complaint Letters.
b) Official Letters- Letters to Government and other Offices

Memos, Circular, Office Orders

Agenda & Minutes of Meeting

Report Writing

LIST OF PRACTICALS

Note: Teaching Learning Process should be focused on the use of the language in writing reports and making presentations.

Topics such as Effective listening, effective note taking, group discussions and regular presentations by the students need to be taught in a project oriented manner where the learning happens as a byproduct.

Speaking and Listening Skills

1. Debate
2. Telephonic Conversation: general etiquette for making and receiving calls
3. Offering- Responding to offers.
4. Requesting – Responding to requests
5. Congratulating
6. Exploring sympathy and condolences
7. Asking Questions- Polite Responses
8. Apologizing, forgiving
9. Complaining
10. Warning
11. Asking and giving information
12. Getting and giving permission
13. Asking for and giving opinions

INSTRUCTIONAL STRATEGY

Students should be encouraged to participate in role play and other student-centered activities in class rooms and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

RECOMMENDED BOOKS

1 Communicating Effectively in English, Book-I by RevathiSrinivas; Abhishek Publications, Chandigarh

2 Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.

3 High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.

4. e-boos/e-tools/relevant software to be used as recommended by AICTE/NITT, Chandigarh.

Websites for Reference:

1. http://www.mindtools.com/ page 8.html – 99k
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.i

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	16	28
2	16	28
3	24	44

Total	**56**	**100**

FOOTWEAR MACHINERY

L	T	P
6	-	4

RATIONALE

The objective of the course is to impart basic knowledge and skills regarding the footwear and leather goods machinery their operations and maintenance.

LEARNING OUTCOME

After undergoing the subject, the students will be able to

- Understand basis of leather industry machines.
- independently operate and maintain the machines
- establishment of footwear plants

DETAILED CONTENTS

UNIT 1 SELECTION OF SITE (17 PERIODS)

Location and identification of footwear and leather goods manufacturing units, factor influencing the site such a availability of power, transport, raw material market, labor, demand and supply utility of product etc, layout & maintenance of footwear and leather goods plant

UNIT 2 PATTERN MAKING AND CUTTING MACHINE (17 PERIODS)

for upper, lining and fabric, such as cad/cam system, shoe last thermoforming machine, leather area measuring machine, die cutting press, numeric control diesels cutting system, strip cutter etc

UNIT 3 UPPER PREPARATION AND STITCHING MACHINE (17 PERIODS)

splitting machine, stamping machine, skiving machine, upper reinforcement machine, edge trimming & tape attaching machine, vamp crimping machine, plating and printing machine, punching machine, toecap attaching machine, upper lining cementing machine, flat bed sewing machine, cylindrical arm type sewing machine, post bed sewing machine, strobel machine etc

UNIT 4 LASTING MACHINE (17 PERIODS)

insole applying machine, insole trimming machine, back part molding machine, toe upper forming machine, upper edge roughing machine, humidifying chamber for upper and its part, pulling over and lasting machine to fix the uppers to last, waist lasting machine, heel seat lasting machine, lasted shoe pounding machine, punching machine, ironing and stabilizing heat setters, fusing machine etc.

UNIT 5 FINISHING AND COMPONENT PREPARATION MACHINE (17 PERIODS)

Ironing machine, brushing machine, socks cementing machine, skiving machine for toecap, insole cutting machine, metal shank Appling machine, cad cam for heel and sole, injected heel system machine, vulcanizing process machine welt processing and attaching machine to sole etc

LIST OF PRACTICALS

1. Blue print of factory layouts and installation drawing
2. Function and study of Pattern making and cutting machine with their parts.
3. Function and study of Upper preparation and stitching machine with their Parts.
4. Function and study of lasting machine machine with their parts.
5. Function and study of Finishing and component preparation machine with their parts.
6. General check up of all the electrical equipment such as motors, starters, Switches, fuses, etc.
7. Demonstration of operating of the machines.

INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

MEANS OF ASSESSMENT

− Class Test

− Home Assignment −
Attendance

− Sessional Test

RECOMMENDED BOOKS

1. SARKAR K.T THEORY & PRACTICEOF LEATHER MACHIINERY
2. DUTTA S.S AN INTRODUCTION OF THE PRINCIPLES OF LEATHER MACHINERY
3. LEATHER TECHNICIANS HANDBOOK J.H SHARPHOUSE

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	17	20
2	17	20
3	17	20
4	17	20
5	16	20
Total	84	100

FOOTWEAR TECHNOLOGY II (CLOSING)

L	T	P
6	-	6

RATIONALE

The objective of the course is to impart basic knowledge and skills regarding several operations like closing and finishing operations.

LEARNING OUTCOME

After undergoing the subject, the students will be able to

- Perform steps like upper closing and its purpose
- Understanding the steps like skiving ,edge treatment and ornamentation.

DETAILED CONTENTS

UNIT - 1 TOOLS & MACHINES FOR UPPER CLOSING (10 periods)

Introduction and preparation of upper closing tools, introduction to machines used for upper closing, safety precautions for machines and tools

UNIT -2 CHECKING OF CLICKED COMPONENTS & IDENTIFICATION MARKING (10 periods)

introduction to clicked components, their checking and identification marking stamping on lining, color tapes, embossing, decoration and punching for perforation , splitting etc.

UNIT -3 SKIVING & EDGE TREATMENTS (22 periods)

purpose and importance of skiving operation, method of hand and machine skiving, types of skiving such as raw edge, underlay skiving, turn in skiving etc. purpose and importance of edge treatments, types of edge treatments such as raw edge, burnishing, folding, binding, slip bedded, flat bedded, bagged edge etc. ornamentation and its purpose, kinds of ornamental lacing, stitching along edges, embroidery, and perforation.

UNIT- 4 REINFORCEMENT & ASSEMBLING OF UPPER & LINING SECTION (22 periods)

Materials for reinforcement, their purpose, importance and effects like tapping, backing,

staying, stay stitching. Joining of upper and lining sections for upper closing, different kind of

seams such as plain closed seam, open stitched seam, lapped seam. type of stitch such as lock stitch, chain stitch, zigzag stitch etc. difference between seam and stitches, kinds of thread used in closing department.

UNIT – 5 FINISHING OPERATION (20 periods)

Cleaning, edge beating, trimming, eyeleting and checking the quality of closed uppers, description and sequence of operations of upper closing of court shoe, mocassion shoe. durby shoe and oxford shoe. Machines and tools and device employed in the upper closing department.

LIST OF PRACTICALS

Designing & fabrication of shoe uppers by hand / machine process of the following:-

(1) derby
(2) oxford
(3) casual shoe
(4) monk shoe and brogue shoe

The following processes should be covered.

1. Preparation & pre-operation before upper clicking:

(a) Preparation of clicking tools such as clicking knife, board, cutting knife (rampi) stitching and picking etc.
(b) Examination and marking of defects in all types of leathers.
(c) Preparation of layout, marking on leather and fabrics for upper and lining Components.

2. clicking:

(i) upper components cutting - vamp, quarten, toe cap, back strap, and mud guard and apron, tongue, saddle, bars and counter.
(ii) lining components cutting - vamp and quarter of leather and fabrics.
(iii) colouring, marking - such as upper components for sketching, beading, stitching, seam, underlay, overlaping, size, lot and code numbers.

3. upper operation :

(i) upper components spliting and grading.
(ii) upper skiving of different components - vamp, quater, toecap, back strap, mud guard and apron, tongue, saddle, bars and counter.
(iii) ornamental treatment before skiving - edge burnishing, different types of punching and knitting.

4. edge folding :

(i) edge treatment - types of edge treatment - raw edge, folded edge, gimped edge slip wet - bagged edge
(ii) ornamental treatment often beaded edge - different types of edge punching, fancy seams, stitching and fitting devices.

5. Components assembling:

(a) Lining assembling
(1) Quarter lining attachment with plain seam by machine.
(2) vamp lining attachment
(3) Quarter and vamp lining attachment with tongue (Varian method / fitted up method)
(b) upper components assembling
(1) quarter attachment with reinforcement function susc as - taping, backing, staying and stay stitching.
(2) quarter attachment and beading by hammer.
(3) quarter and vamp attachment by plain and fancy seam.

6. upper closing / sewing:
(1) preparation of quarten with lining (fitted method) by machen (fitted and varian method)
(2) preparation of upper with vamp, quarten etc. components by machine (fitted and varian method)
(3) punching and eyeleting for required sizes.

7. Upper finishing:
(1) threads cutting
(ii) Upper cleaning and seams beading
(iii) Antifungal treatment.

INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

MEANS OF ASSESSMENT

− Class Test

− Home Assignment −
Attendance

− Sessional Test

RECOMMENDED BOOKS

1- The Science of Footwear by Ravindra S. Goonetilleke.
2- Footwear Material and Process Technology by Nicholas Brown
3- The Dictionery of Shoe Industry Technology .
4- Manual of shoe making, Compile .
5- Pattern Cutting Hand Book by MH Sharp .

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	12
2	10	12
3	22	26
4	22	26
5	20	24
Total	84	100

ELEMENTARY LEATHER TECHNOLOGY

L	T	P
6	-	4

RATIONALE

The objective of the course is to impart basic knowledge and skills regarding general information about leather and various related processes with latest technology.

LEARNING OUTCOME

After undergoing the subject, the students will be able to

- Understand the meaning of leather technology terms.
- Identification of different types of leathers,
- Know the various works required to do in a leather processing unit.

DETAILED CONTENTS

UNIT 1: INTRODUCTION OF RAW HIDE & SKIN (12 PERIODS)

Introduction of raw hides and skins, anatomical structure, composition of hide & skin, defects, flaying and preservation of raw hides and skins, and classification of leather on the bassis of raw materials, tanning, finishing and uses.

UNIT 2: INTRODUCTION TO PRE TANNING (18 PERIODS)

Introduction and process of soaking, liming, deliming bating, pickling, depickling etc

UNIT 3: INTRODUCTION TO TANNING **(20 PERIODS**

Introduction and process of Tanning (chrome tanning, vegetable tanning, zirconium tanning, alum tanning etc)

UNIT 4: POST TANNING & FINISHING OPERATION (20 PERIODS)

Selection of wet blue, mechanical operation, wetback, rechroming neutralization, retanning, dyeing, fat liquoring etc, finishing of leather (full grain leather, corrected grain leather, nubuck leather, suede leather, aniline leather, semi aniline etc)

UNIT 5: SELECTION OF LEATHER FOR FOOTWEAR & GOODS (14 PERIODS)

Classification of leather, upper leather lining leather sole leather insole leather belt leather harness leather oil seal leather box leather, garment leather gloving leather chamois leather etcetc.

LIST OF PRACTICALS

1. Tannery Practice In All Beam House And Chrome Tanning Operations.
2. Grading/Selection Of Raw Hides And Skins As Per Indian / International Standard
3. Knowldege Of Various Defects In All Tannery Process
4. Identification Of Various Defects In Hides And Skins As Per Indian / International Standard
5. Use Of Ph And Indicators In Beam House & Chrome Tanning Process.

Use Of Chemicals In Beam House & Chrome Tanning Process

INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

MEANS OF ASSESSMENT

− Class Test

− Home Assignment −
Attendance

− Sessional Test

RECOMMENDED BOOKS

- Theory & practice of Leather manufacture by K.T. Sarkar , The Author Publication.
- Fundamentals of Leather manufacture by Heidmann, Ad. Tata McGraw Hill Publishers, New Delhi.

- Analytical Chemistry of Leather Manufacture – P.K.Sarkar, I.L.T.A., Calcutta,
- The Chemistry & Technology of Leather, Vol. – IV – F.O' Flahorty, W.T.Roddy & R.M.Lollar, original edition, Krieger Publishing

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	12	14
2	18	22
3	20	24
4	20	24
5	14	16
Total	84	100

BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

L	T	P
5	-	4

RATIONALE

The objective of the course is to impart basic knowledge and skills regarding basic electrical engineering, which diploma holders will come across in their professional life. This course will provide the students to understand the basic concepts and principles of d.c. and a.c. fundamentals, electromagnetic induction, batteries, transformers, motors distribution system, domestic installation, electrical safety etc. The students will also learn basic electronics including diodes and transistors and their applications.

LEARNING OUTCOME

After undergoing the subject, the students will be able to

- Understand the meaning of basic electrical quantities such as voltage, current,

power etc.

- Use working principle of transformer.
- Use basic Network Theorem and Kirchoff's laws.
- Understand the concept of Junction Diode, transistor and field effect transistor.

DETAILED CONTENTS

1. Application and Advantages of Electricity (03 periods)
   Difference between ac and dc, various applications of electricity, advantages of electrical energy over other types of energy
2. Basic Electrical Quantities (06 periods)
   Definition of voltage, current, power and energy with their units, name of instruments used for measuring above quantities, connection of these instruments in an electric circuit
3. AC Fundamentals (08 periods)
   Electromagnetic induction-Faraday's Laws, Lenz's Law; Fleming's rules, Principles of a.c. circuits; Alternating emf, Definition of cycle, frequency, amplitude and time period. Instantaneous, average, r.m.s and maximum value of sinusoidal wave; form factor and Peak Factor. Concept of phase and phase difference. Concept of resistance, inductance and capacitance in simple a.c. circuit. Power factor and improvement of power factor by use of capacitors. Concept of three phase system; star and delta connections; voltage and current relationship (no derivation)
4. Transformers (06 periods)
   Working, principle and construction of single phase transformer, transformer ratio, emf equation, losses and efficiency, cooling of transformers, isolation transformer, CVT, auto transformer (brief idea), applications
5. D.C. Circuits (10 periods)
   Ohm/s law, resistivity, effect of temperature on resistance, heating effect of electric current, conversion of mechanical units into electrical units.
   Kirchoff's laws, application of Kirchoff's laws to solve, simple d.c. circuits
   Thevenin's theorem, maximum power transfer theorem, Norton's theorem and superposition theorem, simple numerical problems.
6. Basic Electronics (22 periods)
   Basic idea of semiconductors – P and N type; diodes, Zener diodes and their applications,
   6.2 Introduction to BJT : NPN and PnP transistors, other symbols and mechanism of current flow, explanation of fundamental current relations. Comparison of CB, CE and CC configuration transistor as amplifier in CE configuration.
   6.3 Field Effect Transistor (FET) : Construction, Operation and Characteristics of Junction FET, Comparison of SFET, MOSFET & CMOS.

LIST OF PRACTICALS

1. Identification of Resistor, Capacitor, Inductor, Transformer, LBD etc
2. Familiarization with multimeter/CPO etc.
3. Measurement of wave shapes of half wave rectifier and full wave rectifier.
4. Plot the P&T characteristics and determination of its parameter from this characteristics.
5. Connection and reading of an electric energy meter
6. Use of ammeter, voltmeter, wattmeter, and multi-meter
7. Study of different types of fuses, MCBs and ELCBs
8. Study of Zener diode as a constant voltage source and to draw its V-I characteristics
9. To draw V-I characteristics of PN junction diode
10. Verify Thevenin and Norton theorem

INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

MEANS OF ASSESSMENT

− Class Test

− Home Assignment −
Attendance

− Sessional Test

RECOMMENDED BOOKS

1.
2. Basic Electrical Engineering by PS Dhongal; Tata McGraw Hill Publishers, New Delhi
3. A Text Book of Electrical Technology, Vol. I and II by BL Thareja; S Chand and Co., New Delhi
4. Basic Electricity by BR Sharma; Satya Prakashan, New Delhi
4. Basic Electrical Engineering by JB Gupta, S Kataria and Sons, Delhi
5. Experiments in Basic Electrical Engineering by SK Bhattacharya and KM Rastogi, New Age International Publishers Ltd., New Delhi
6. Basic Electronics by VK Mehta; S Chand and Co., New Delhi
7. Electrical Machines by SK Bhattacharya; Tata McGraw Hill, New Delhi
8. Basic Electronics and Linear Circuits by NN Bhargava and Kulshreshta, Tata McGraw Hill New Delhi.
9. Electronic principles by SK Sachdev, Dhanpat Rai and Sons, New Delhi.
10. Electronic Devices and circuits by Rama RaddyNarora Publishing House Pvt. Ltd. New Delhi.
11. Principles of electrical and electronics Engineering by VK Mehta; S Chand and Co. New Delhi
12. Digital Electronics by Malvino

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	03	05
2	06	10
3	09	15
4	06	10

5	10	18
6	22	42
Total	**56**	**100**

INDUSTRIAL TRAINING OF STUDENTS

It is needless to emphasize further the importance of Industrial Training of students during their 3 years of studies at Polytechnics. It is industrial training, which provides an opportunity to students to experience the environment and culture of industrial production units and commercial activities undertaken in field organizations. It prepares student for their future role as diploma engineers in the world of work and enables them to integrate theory with practice. Polytechnics have been arranging industrial training of students of various durations to meet the above objectives.

This document includes guided and supervised industrial training of 4 weeks duration to be organized during the semester break starting after second year i.e. after 4th semester examinations. The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that a training schedule may be drawn for each student before starting of the training in consultation with the training providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, important machines and materials used in the training organization.

Equally important with the guidance is supervision of students training in the industry/organization by the teachers. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

An external assessment of 50 marks has been provided in the study and evaluation scheme of 5th Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

Teachers and students are requested to see the footnote below the study and evaluation scheme of 4th semester for further details.

The teacher along with field supervisors will conduct performance assessment of students.
The components of evaluation will include the following:

a) Punctuality and regularity	15%
b) Initiative in learning new things	15%
c) Presentation and VIVA	15%
d) Industrial training report	55%

TESTING AND QUALITY CONTROL

L	T	P
6	-	6

RATIONALE

The objective of the course is to impart basic knowledge and skills regarding listing techniques to maintain quality control.

LEARNING OUTCOME

After undergoing the subject, the students will be able to

- Understand the meaning of quality control.
- Know the various quality related parameters.
- Know and maintain qaauality thru various listing techniques.

DETAILED CONTENTS

Unit-I (12 PERIODS)

Machines and apparatus used for carrying out physical and chemical tests on leathers, chemicals materials, synthetic products, rubber and fabric such as Analytical/ Electronics balance, shrinkage tester, tensometer, abrassion resistance tester, flexometer, lastometer, rub fastness tester, stiffness tester, apparent density apparatus, thickness measuring gauge, soxhlet extractor, kjeldalh's distillation unit, Scuff Resistance, Crockmeter, etc.

Unit-II (18 PERIODS)

Methods for measurement of thickness of leather units , width of leather, area of leather. Methods for determination of apparent density, tensile strength, modulus elongation at specified load and elongation at break. Methods for measurements of tear and double hole stitch tear strength and tounge tear strength.

Unit-III (18 PERIODS)

Measurements of shrinkage temperature, absorption of water by gravimetric and by kubelka methods. Resistance to cracking of grain , crack index, Colour fastness by wet and dry methods . Light fastness , Relative Stiffness Test, abrasion, permeability test of water and water vapour , adhession test, shape retention test, oil test, flex endurance test for sole, fatigue test etc

Unit-IV (20 PERIODS)

Determination and analysis of volatile matter, moisture content, total ash content , solvent extractable substances, nitrogen and hide substance content , water soluble inorganic and organic substance ,sulphated ash of water soluble , chromic oxide content, total oil and fats content , Analysis of vegetable tanned leathers for fixed tannin, degree of tannage , analysis of aluminium in alum tanned leather , zirconium content etc.

Unit-V (16 PERIODS)

Visual examination of thread used, neatness and straightness of stitching, number of stitches in an inch, proper fixing of zip fastners, correct sizes and measurements. Official methods of sampling and analysis. Indian standard specifications for leather, synthetics, rubber, foam, grinderies, fittings, etc. Principles of inspection - improcess inspection and quality control system in factories - Functions of inspection such as quality marking centres as Indian standardInstitution.ExportInspectionetc.

LIST OF PRACTICALS

1. Measurement and thickness of the leather sample. (V.T. or C.T.)
2. Determination of the apparent density of the cylindrical leather sample.
3. Find out the percentage of water absorption in V.T. sole leather.
4. Find out the tensile strength of leather sample by tensile M/C
5. Find out the stitch tear resistance of leather sample sample by T.M.
6. Determination of the abrasion & resistance of the sole leather.
7. Find out the shrinkage temperature by shrinkage testing.
8. Find out the tongue tear strength by tensile M/C.
9. Find out the grains crackness circulations.
10. Flexing resistance by Flexometer.
11. Wet and dry rub fastness testing by colour fastness tester.
12. Determination of Scruff resistance and Crockmeter Test

INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

MEANS OF ASSESSMENT

− Class Test

− Home Assignment −
Attendance

− Sessional Test

RECOMMENDED BOOKS

- Theory & practice of Leather manufacture by K.T. Sarkar , The Author Publication.
- Fundamentals of Leather manufacture by Heidmann, Ad. Tata McGraw Hill Publishers, New Delhi.
- Analytical Chemistry of Leather Manufacture – P.K.Sarkar, I.L.T.A., Calcutta,
- The Chemistry & Technology of Leather, Vol. – IV – F.O' Flahorty, W.T.Roddy & R.M.Lollar, original edition, Krieger Publishing

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	12	15
2	18	21
3	18	21
4	20	24
5	16	19
Total	84	100

LEATHER GOODS & GARMENT MANUFACTURE

L	T	P
6	-	6

RATIONALE

The objective of the course is to impart basic knowledge and skills regarding leather goods & garment manufacture.

LEARNING OUTCOME

After undergoing the subject, the students will be able to

- Understand the meaning of leather goods.
- Know the various leather goods quality related parameters.
- Know various garment manufacture techniques.

DETAILED CONTENTS

UNIT-I (17 PERIODS)

Characteristics and Classification of Leather Goods: Light & Heavy Leather Goods, sports goods , Industrial and consumer leather goods Materials used for leather goods . Selection of leather for various leathers goods . Stretchlessness , waterproofness and Shape retention property for the leather goods

UNIT-II (17 PERIODS)

Development and Making of leather Goods : Sports goods such as football, Vollyball, hockey balls, cricket ball, Sports gloves such as wicket keeping, batting , football ,hockey gloves, introduction of harness & saddle. Golf equipment kits, consumer goods as key case, cigarette case, coin purse, etc,

UNIT-III (16 PERIODS)

Tools, fitting and machines used in leather goods such as buttons, rivets, D-ring, buckles locks, metal fittings, hinges, handles, zips and fasteners, Adhesive used in leather goods, polishes, lacquers ,emulsions and antifungal chemicals used in leather goods industry. Industrial sewing machine, cloth cutting machine, button hole and button stitching machines, Ironing press, Tools used in garment manufacture such as gimping scissors, Wooden and iron hammers, measuring tapes, dummies for checking fittings

UNIT-IV (17 PERIODS)

Characteristics and Classification of leather garments on the basis of animals , tanning , finishing and uses . cow , buff, calf , kid , sheep goat, chrome , vegetable, full grain , corrected grain suede, nubuck , printed , fur , embossed , pigmented etc leather . Materials used for garment manufacturing . Principles of tailoring such as size measurement and fittings. Uses non leather materials as a substitute or in combination with leather for garment manufacturing .

UNIT-V (17 PERIODS)

Designing and manufacturing of garments . Preparation of patterns, Principles of cutting of components , arrangements of patterns to minimize wastage of leather, colour matching, Type of stitching and attachments used, Sequence of operations for assembly of components for garments, Ironing and finishing, Inprocess checking and final checking of measurements

and overall quality, Freehand sketching, drafting and preparation of patterns

LIST OF PRACTICAL

1. Manufacturing of key case, mobile phone cover, ladies purse.
2. Making of football volleyball, sports gloves and industrial gloves.
3. Free hand sketching of jackets, Safari, ladies coat, skirts.
4. Taking measurements for size and fittings.
5. Designing of gloves, tie and cap/hat.
6. Preparation of 3 items of garment and one item of each gloves ties and cap/hat.

   Note: If leather is not available practice may be done on Rexene or foam

INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

MEANS OF ASSESSMENT

− Class Test

− Home Assignment −
Attendance

− Sessional Test

RECOMMENDED BOOKS

- Theory & practice of Leather manufacture by K.T. Sarkar , The Author Publication.
- Fundamentals of Leather manufacture by Heidmann, Ad. Tata McGraw Hill Publishers, New Delhi.
- Leather bags and purses by elsie morchrie.
- Analytical Chemistry of Leather Manufacture – P.K.Sarkar, I.L.T.A., Calcutta,

SUGGESTED DISTRIBUTION OF MARKS

Topic no	Time Alloted (Periods)	Marks Alloted (%)
1	17	21
2	17	20
3	16	19
4	17	20
5	17	20

TOTAL	**84**	**100**

POLLUTION CONTROL AND INDUSTRIAL SAFETY

LT P

5 - 6

RATIONALE

A Chemical Engineering technician must have the knowledge of different types of pollution caused due to industrialization so that he may help in balancing the eco-system and control the pollution by means of control devices. The technician must know various types of accidents which occur in chemical plants and how to safeguard them to avoid injury to men and material. Hence this subject.

LEARNING OUTCOMES

After completion of this course, the students will be able to:

- Understand different types of pollution caused due to industrialization.
- Balance pollutants to save the ecosystem
- Control pollution by means of control devices
- Have knowledge of different Acts and rules about the environmental protection.
- Manage solid wastes to reduce the pollution.
- Have Knowledge of various types of accidents which occur in chemical plants

DETAILED CONTENT

1 Introduction (10 Periods)

Environment and Pollution, Classification of pollution e.g. Land, Water, Air, Noise.Environment Impact assessment Studies, Character and origin of industrial wastes.

2. Air Pollution (10 Periods)

i) Definition of air pollution, Types of Air pollutants and their sources like SPM, SOX, NOX, NH_3, F, C1, CFC, CO_2 etc.
ii) Air Pollution control equipment in industries.
   a) Settling chamber
   b) Cyclone
   c) Scrubber (dry & wet)
   d) Multicyclone
   e) Electrostatic precipitator
   f) Bag Filter
iii) Ambient air quality measurement & their standards
iv) Vehicular Pollution and its control
v) Noise Pollution and its control mechanism

3. Water Pollution (10 Periods)

Water pollution, standards for drinking water, domestic waste water and industrial waste water. Methods of measurement of various parameter like BOD, SS, pH, COD, TDS etc. Methods of treatment of industrial waste water like

a) Chemical treatment
b) Physio-Chemical treatment
c) Bio-chemical treatment
d) Any other advance treatment

4. Environment Protection (15 Periods)

Environmental protection from hazardous chemicals waste:
Terminology relating to chemical hazards and air pollution, classification of chemical hazards and hazardous chemicals, codes of safety for operational hazards in laboratories, industries etc. (Reference should be made of I.S. Codes)

5. Radio Active Pollution (10 Periods)

Sources and effect on human, animal, plant and material. Measurement, means to control, preventive measures.

6. Solid Waste Management (10 Periods)

Municipal solid waste, biomedical waste, Plastic waste and its management, solid waste disposal methods such as open dumping, sanitary landfilling composting, incineration.
Importance of development of green area

7. Pollution Acts

A water pollution prevention control Act 1974, Air Pollution Act 1981, Environment protection Act 1986, Hazardous chemical manufacturing, storage and impact rules 1989 and hazardous waste and management and handling rules 1989, Regulation and control Rules 2000.

8. Safety in Chemical Industry (25 Periods)

Receiving and storing chemicals- transporting and moving chemicals- Safety in chemical reactions, pipe-lines with color coding in chemical factories. Precautions in the case of processes in operations involving explosive or inflammable dusts, gases, vapours etc. Maintenance of chemical plants-corrosion health hazards in common chemical processes, Fire hazards and their prevention. Codes of practice and specification for safety equipment (Reference should be made from I.S. Codes), case study of major chemical process industries disasters/accidents.

LIST OF PRACTICALS

1. Determination of pH value.
2. Determination of turbidity
3. Determination of total solids, suspended solids and total dissolved solids.
4. Determination of dissolved oxygen (DO)
5. Determination of BOD.
6. Determination of COD
7. Determination of sulphate in water
8. Determination of chloride in water
9. Prepare chart for treatments of different solid waste.
10. Removal of suspended impurities from air using fabric filter.
11. Removal of suspended solids by coagulation

INSTRUCTIONAL STRATEGY

Case Study of any disaster should be undertaken. Study should be data based.

Field visit to the industries should be planned.

Student should encouraged to undertake project work related to environmental problems.

MEANS OF ASSESSMENT

- Class Test
- Home Assignment
- Attendance
- Sessional Test

RECOMMENDED BOOKS

1. Safety in Process Plant Design by Wells
2. Safety and Accident Prevention in Chemical Operation by H. H, Tanacatte and W. S. Wood
3. Engineering Chemistry by P.C. Jain

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Periods)	Marks Allotted (%)
1.	6	8
2.	6	8
3.	6	8
4.	10	14
5.	6	8
6.	8	12
7.	8	12
8.	20	28
Total	**70**	**100**

FINANCIAL COSTING AND ACCOUNTING

L	T	P
5	-	-

RATIONALE

The objective of the course is to give focus on the cost accounting, evaluation and application of budget and used in leather footwear industry.

LEARNING OUTCOME

After undergoing the subject, the students will be able

- To understand the cost elements for leather / footwear industry
- To understand the budgeting control in leather / footwear industry.
- To understand the economic importance of leather/footwear industry.

DETAILED CONTENTS

UNIT-I (17 PERIODS)

Cost accounting, elements of cost, classification of cost elements-examples from leather footwear industry, method of costing, accounting principles-basic records, depreciation, depreciation methods-preparation & interpretation of profit & loss statement-balance sheet, fixed assets-current assets.

UNIT-II (17 PERIODS)

Cost profit volume analysis, breakeven analysis, standard costing, analysis of variance, costing of leather & leather product-material, labor, power, overhear expenses, current assets & liability decision, estimation of working capital requirements, managements of accounting receivable-inventory-cash-inventory valuation methods.

UNIT-III (17 PERIODS)

Budget. types of budgets, budgeting& control in tanneries & leather product industry, cost estimates & demand forecasting for leather & leather products, different sources of finance, budget preparation, annual cost, variable cost & allocation of cost, semi & variable cost, capital budgeting, payback & present value method, foreign exchange, exchange rates, risk strategies.

UNIT-IV (17 PERIODS)

leather products, india's share at the global level, india competitors & their strength, international prices , indian government policies in the leather sector, economic importance of leather, present & past condition of indigenous leather industry & leather product industry of india, market constraints (quality, image, brand name & merchandising method

UNIT-V (16 PERIODS)

marketing & export concept, strategies, product planing & development, decision making, sales promotion, export golden rules for successful exporting, necessary steps for documents.

INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

MEANS OF ASSESSMENT

- Class Test
- Home Assignment
- Attendance
- Sessional Test

RECOMMENDED BOOKS

1- S.n. Maheswaran,management accounting and financial control, sultan chand,1992
2- Thukaram rao me, cost accounting and financial management new age international bnglalore 2004

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	17	20
2	17	20
3	17	20
4	17	20
5	16	20
Total	**84**	**100**

RENEWABLE ENERGY SOURCES

LTP
4 - -

RATIONALE

Energy is an important input in all sectors of country's economy. Standard of living of a country can be directly judged by per capita consumption of energy. In light of energy crises and environmental concerns, renewable energy is the only solution to save our planet. Hence this subject.

LEARNING OUTCOMES

After completion of this course, the students will be able to:

- Understand the importance and applications of various renewable sources of energy
- Understand the types of biogas plants and electricity generation from biomass
- Identify usage of different types of wind turbines
- Understand the working of various types of collectors and applications of solar energy
- Understand different geothermal power plants
- Understand the usage of tidal and wave energy
- Understand the importance of hydrogen energy

DETAILED CONTENTS

1. Renewable and Non-Renewable Sources of Energy (06 Periods)

Introduction

Need of renewable sources of energy

Renewable sources of energy such as biomass, wind, solar, geothermal, tidal and wave, hydrogen energy.

2. Biomass Energy (08 Periods)

2.1. Introduction to biomass energy
2.2. Resources of biomass energy
2.3. Types of biogas plants-fixed dome and floating type
2.4. Electricity generation from biomass
2.5. Other useful products from biomass

3. Wind Energy (06 Periods)

3.1. Introduction to wind energy
3.2. Site selection of wind mill
3.3. Types of Wind Turbines-Horizontal axis wind turbine (HWAT) and vertical axis wind turbine (VAWT), their construction, working, advantages and disadvantages

4. Solar Energy (20 Periods)

4.1. Introduction to solar energy, solar spectral and greenhouse effect
4.2. Classification of solar thermal collectors- flat type, focusing type and central tower receivers, their construction and working

4.3. Application of solar energy like solar cooker, solar water heater, solar crop dryers and solar pond
4.4. Solar photo voltaic- construction and working principle
4.5. Solar energy storage methods

5. Geothermal Energy (06 Periods)

5.1. Introduction and its significance
5.2. Geothermal Power Plants-dry stream, flash steam and binary cycle

6. Tidal and Wave Energy (06 Periods)

6.1. Generation of Tidal and Wave Energy
6.2. Tidal Power Plant
6.3. Wave Power Plant

7. Hydrogen Energy (04 Periods)

7.1. Methods for hydrogen production
7.2. Storage of Hydrogen
7.3. Transportation of Hydrogen-through pipelines and containers

INSTRUCTION STRATEGY

This subject is of great importance, therefore the teachers are expected to lay considerable stress on renewable sources, their importance, production, utilization and storage system. As far as possible, the teaching of the subject must be supplemented by showing the videos on working principle of various renewable energy equipment and also visits to nearby places where such equipmentis installed.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests

LIST OF REFERENCE BOOKS

1. Non Conventional Energy Sources by G.D. Rai; Khanna Publishers, New Delhi.
2. Renewable and Conventional Energy by S. Rao; Khanna Publisher, New Delhi
3. Non-Conventional Sources of Energy by Umesh Chandra Sharma; Studium Press, Texas, USA
4. Solar Energy by S.P. Sukhatme; Tata McGrawHill Publishing Co. Ltd., New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Periods)	Marks Allotted %
1	06	10
2	08	14
3	06	10
4	20	38
5	06	10
6	06	10
7	04	08
Total	**56**	**100**

UNIVERSAL HUMAN VALUES

L-T-P

2-0-1

Course Objectives

This introductory course input is intended

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually
   enriching interaction with Nature

Thus, this course is intended to provide a much needed orientational input in value education to the young enquiring minds.

Course Methodology

1. The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. It is free from any dogma or value prescriptions.
3. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.
4. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.
5. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

The syllabus for the lectures is given below:

- After every two lectures of one hour each, there is one hour practice session.
- The assessment for this subject is as follows:
- Sessions Marks (Internal): 20
- Practical Marks (External): 30
- Total Marks: 50

UNIT 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels

UNIT 2: Understanding Harmony in the Human Being - Harmony in Myself!

1. Understanding human being as a co-existence of the sentient 'I' and the material the Body'
2. Understanding the needs of Self ('I') and 'Body' - *Sukh* and *Suvidha*
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
4. Understanding the characteristics and activities of 'I' and harmony in 'I'
5. Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail
6. Programs to ensure *Sanyam* and *Swasthya*

-Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

1. *Understanding Harmony in the family – the basic unit of human interaction*
2. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*;
   a. Trust (*Vishwas)* and Respect (*Samman)* as the foundational values of relationship
3. Understanding the meaning of *Vishwas*; Difference between intention and competence
4. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship
5. Understanding the harmony in the society (society being an extension of family): *Samadhan, Samridhi, Abhay, Sah-astitva*as comprehensive Human Goals
6. Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj),* Universal Order (*SarvabhaumVyawastha)*- from family to world family!

-Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT 4: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

1. Understanding the harmony in the Nature

2. Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature
3. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space

4. Holistic perception of harmony at all levels of existence
   -Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
4. Competence in professional ethics:
   a) Ability to utilize the professional competence for augmenting universal human order
   b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
   c) Ability to identify and develop appropriate technologies and management patterns for above production systems.
5. Case studies of typical holistic technologies, management models and production systems
6. Strategy for transition from the present state to Universal Human Order:

a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
b) At the level of society: as mutually enriching institutions and organizations

7. To inculcate Human Values among Students:The Role of self ,Parents and Teachers -Practice Exercises and Case Studies will be taken up in Practice Sessions.

Practical Session also Includes Different Yogic Exercises and Meditation Session

INSTRUCTONAL STRATEGY

The content of this course is to be taught on conceptual basis with plenty of real world examples.

MEANS OF ASSESSMENT

−Assignments and quiz/class tests,
−Mid-term and end-term written tests
−Practical assessment

Reference Material

The primary resource material for teaching this course consists of

a. The text book (Latest Edition)

R.R Gaur, R Asthana, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi.

b. The teacher's manual (Latest Edition)

R.RGaur, R Asthana, G P Bagaria, A foundation course in Human Values and

professional Ethics – Teachers Manual, Excel books, New Delhi.

In addition, the following reference books may be found useful for supplementary reading in connection with different parts of the course:

1. B L Bajpai, 2004, *Indian Ethos and Modern Management*, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Purblishers.
3. Sussan George, 1976, *How the Other Half Dies,* Penguin Press. Reprinted 1986, 1991
4. Ivan Illich, 1974, *Energy & Equity,* The Trinity Press, Worcester, and HarperCollins,

USA

5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.

6. Subhas Palekar, 2000, *How to practice Natural Farming,*Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
7. A Nagraj, 1998, *Jeevan Vidya ekParichay,*Divya Path Sansthan, Amarkantak.
8. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if peoplemattered*, Blond & Briggs, Britain.
9. A.N. Tripathy, 2003, *Human Values*, New Age International Publishers.

Relevant websites, movies and documentaries

1. Value Education websites, http://uhv.ac.in, *http://www.aktu.ac.in*
2. Story of Stuff, *http://www.storyofstuff.com*
3. Al Gore, *An Inconvenient Truth*, Paramount Classics, USA
4. Charlie Chaplin, *Modern Times*, United Artists, USA
5. IIT Delhi, *Modern Technology–the Untold Story*
6. Case study Hevade Bazar Movie
7. RC Shekhar , Ethical Contradiction ,Trident New Delhi
8. *Gandhi A., Right Here Right Now, Cyclewala Production*

SUGGESTED DISTRIBUTION OF MARKS

Unit	Time Allotted (Periods)	Marks Allotted (%)
1	08	20
2	08	20
3	08	20
4	08	20
5	10	20
Total	**42**	**100**

FOOTWEAR TECHNOLOGY-III (CONSTRUCTION)

L	T	P
6	-	6

RATIONALE

The objective of the course is to give focus on the cost accounting, evaluation and application of budget and used in leather footwear industry.

LEARNING OUTCOME

After undergoing the subject, the students will be able

- To understand the cost elements for leather / footwear industry
- To understand the budgeting control in leather / footwear industry.
- To understand the economic importance of leather/footwear industry.

DETAILED CONTENTS

UNIT-I (17 PERIODS)

Preparation of awl. Types of stitches required for various purposes. Relation of awl stitches and threads to material and size of stitches. Principles of drafting and its importance in lasting of shoes of different constructions (Welted, veldt shoes) welt
attaching by hand and machine (staples shank fitting, bottom filling, sole attaching by hand and machine, bottom levelling, sole nailing.)

UNIT-II (17 PERIODS)

Modern methods of footwear construction including direct moulded, injection moulded and cemented unit sole : purpose and relative merits of the various methods of footwear construction in relation to their use. Importance of conditioning, damping, mulling, heat setting and drying. Detailed study of cemented shoe construction. Adhesives and machines used in cemented construction. Upper leather dressing, cleaning and shoe lacing, Heel attaching and top piece attaching by hand and machine.

UNIT-III (17 PERIODS)

Different types of edge trimming, fore part and waist trimming, heel scouring, heel front buffing, inking, edge setting by hand and machine, bottom buffing, bottom finishing, upper leather cleaning and dressing, fitting and sock, shoe lacing, checking and packing for different types of footwear.

UNIT-IV (17 PERIODS)

The aims and objects of finishing, their utility. The relation between heel pairing and heel scouring, edge trimming and setting, common faults in finishing. Inspection recognition and elimination of faults. The use of heat and heat effects in shoe processes. Various tools, equipments and machinery employed for finishing. There use and general maintenance. The vital parts of machines and their minor adjustments

UNIT-V (16 PERIODS)

Material used for packing, individual and trend ship packing. Export packing, use of

fungicides for export packing. Defect removing methods- such as wrinkles on lining twisted back strap, High and low quarters, Soft toe and back, soft stifner etc.

LIST OF PRACTICALS

1. Preparation of hand tools required in finishing departments.
2. Practice in setting and operating heel attaching trimming and finishing machine.
3. Practice in heel attachments by hand and machine.
4. Practice in trimming sole and heel by hand and machine.
5. Practice in heel scouring, heel front buffing, edge setting, heel colouring, waxing and setting by hand and machine, bottom buffing, bottom finishing of different methods, upper leather, cleaning and dressing; fitting of socks, shoe lacing, checking and boxing.
6. Exercise in rectifying finishing defects.
7. Preparation of colors shades for various types of leathers.
8. Practice on different types of fancy finishing.
9. Exercise on calculation of material consumption, reduction of wastage.
10. Preparing cost sheet for finished footwear.

RECOMMENDED BOOKS

- The make it yourself shoe book by Christine lewis clark
- Shoe repairing by henry karg
- Tips for shoe production vol . 1 by A WILHELM
- Tips for shoe production vol . 2 by A WILHELM
- Tips for shoe production vol . 3 by A WILHELM

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	17	20
2	17	20
3	17	20
4	17	20
5	16	20

Total	**84**	**100**

CAD/CAM FOR FOOTWEAR

L	T	P
6	-	4

RATIONALE

The objective of the course is to give focus on the cad /cam and software used in leather footwear industry.

LEARNING OUTCOME

After undergoing the subject, the students will be able

- To understand the CAD elements for leather / footwear industry
- To understand the CAM in leather / footwear industry.
- To understand the economic importance of computer and software in footwear industry.

DETAILED CONTENT

UNIT-I PRINCIPLES OF CAD/CAM (17 PERIODS)

Define CAD/CAM and its utilization & scope in footwear and leather goods industry. Types of CAD/CAM software available for footwear industry . Digital to analog conversion (DAC) and Analog to digital conversion(ADC) . Introduction and application of computer graphics. Screen coordinates in 2D and 3D and its transformation. Video graphics arrays (VGA) & Super video graphics arrays (SVGA). . Pattern grading of different size system through cad . Different wastage calculation through cad or manual design.

UNIT-II HARDWARE (17 PERIODS)

Basics of Computer fundamentals . introduction to computers. Introduction to input and output devices . Introduction to storage devices . Principals of data communication . Hardware configuration . Basic understanding of the following: digitizer (2d and 3d), 2d and 3d coder and encoder, plotter , cutter ,and modem. Local area network (LAN) and wide area network (WAN). CNC and its implementation in footwear industry.

UNIT-III SOFTWARE (17 PERIODS)

Different types of operating system such as single user and multi user , single tasking and multi tasking , different types of processoser and their application ,parts of the processors such as ALU (Arithmetic Logic Unit) and CU (Control Unit) , different types of system software & application software and their utilities , different languages used in programing , uses of compliers , assembler and other software terms like html,http,url,pdf,doc,cd ,dvd, floppy, wi-fi etc..

UNIT-IV PATTERN MAKING & GRADING (17 PERIODS)

Outer, inner & mean forme and its digitization through cad . Pattern marking ,Pattern making ,Pattern allowances , Pattern matching , Pattern grading. Pattern testing . wastage calculation for first wastage, second wastage and third wastage through cad and cam.

UNIT-V IMAGE PROCESSING (16 PERIODS)

Introduction to image processing . Its fundamentals , its application and its Principles . strategies for the collection of data for Image enhancement . Image restoration , colour

Image processing, Images compression.

LIST OF CAD/CAM PRACTICLES

1. Digitisation of mean forme.
2. Digitisation of last.
3. Shell modification.
4. Extraction of patterns from shell
5. Pattern testing
6. Grading pattern
7. Costing of patterns.

RECOMMENDED BOOKS

- Digital image processing by rafel c.gonzalez and Richard e. woods.
- Fundamentals of digitals image processing by anil k jain PHI
- CAD-CAM administration handbook for solid works by ants palgi and mr alar jogi.
- Fundamentals of computer by e balagurusamy.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	17	20
2	17	20
3	17	20
4	17	20
5	16	20
Total	**84**	**100**

ENERGY CONSERVATION

L T P
3 - 2

RATIONALE

The requirement of energy has increased manifolds in last two decades due to rapid urbanization and growth in industrial/service sector. It has become challenging task to meet ever increasing energy demands with limited conventional fuels and natural resources. Due to fast depletion of fossil fuels and a tremendous gap between supply and demand of energy, it is essential to adopt energy conservation techniques in almost every field like industries, commercial and residential sectors etc. Energy conservation has attained priority as it is regarded as additional energy resource. Energy saved is energy produced. This course covers the concepts of energy management and its conservation. It gives the insight to energy conservation opportunities in general industry and details out energy audit methodology and energy audit instruments.

LEARNING OUTCOMES

After undergoing this subject, the students will be able to:

- define principles and objectives of energy management and energy audit.
- understand Energy Conservation Act 2001 and its features.
- understand various forms & elements of energy.
- identify electrical and thermal utilities. Understand their basic principle of operation and assess performance of various equipments.
- identify areas of energy conservation and adopt conservation methods in various systems.
- evaluate the techno economic feasibility of the energy conservation technique adopted.

DETAILED CONTENTS

1. Basics of Energy

   Classification of energy- primary and secondary energy, commercial and non-commercial energy, non-renewable and renewable energy with special referenceto solar energy, Capacity factor of solar and wind power generators.

   Global fuel reserve

   Energy scenario in India and state of U.P. Sector-wise energy consumption (domestic, industrial, agricultural and other sectors)

   Impact of energy usage on climate

2. Energy Conservation and EC Act 2001

   Introduction to energy management, energy conservation, energy efficiency and its need

   Salient features of Energy Conservation Act 2001 & The Energy Conservation

(Amendment) Act, 2010 and its importance. Prominent organizations at centre and state level responsible for its implementation.

Standards and Labeling: Concept of star rating and its importance, Types of product available for star rating

3. Electrical Supply System and Motors

Types of electrical supply system

Single line diagram

Losses in electrical power distribution system

Understanding Electricity Bill: Transformers Tariff structure, Components of power (kW, kVA and kVAR) and power factor, improvement of power factor, Concept of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC)

Transformers: Introduction, Losses in transformer, transformer Loading, Tips for energy savings in transformers

Electric Motors

Types of motors, Losses in induction motors Features and characteristics of energy efficient motors, Estimation of motor loading, Variation in efficiency and power factor with loading, Tips for energy savings in motors

4. Energy Efficiency in Electrical Utilities

Pumps: Introduction to pump and its applications, Efficient pumping system operation, Energy efficiency in agriculture pumps, Tips for energy saving in pumps

Compressed Air System: Types of air compressor and its applications, Leakage test, Energy saving opportunities in compressors.

Energy Conservation in HVAC and Refrigeration System: Introduction, Concept of Energy Efficiency Ratio (EER), Energy saving opportunities in Heating, Ventilation and Air Conditioning (HVAC) and Refrigeration Systems.

5. Lighting and DG Systems

Lighting Systems: Basic definitions- Lux, lumen and efficacy, Types of different lamps and their features, Energy efficient practices in lighting

DG Systems: Introduction, Energy efficiency opportunities in DG systems, Loading estimation

6. Energy Efficiency in Thermal Utilities

Thermal Basics: Thermal energy, Energy content in fuels, Energy Units and its conversions in terms of Metric Tonne of Oil Equivalent (MTOE)

Energy Conservation in boilers and furnaces : Introduction and types of boilers, Energy performance assessment of boilers, Concept of stoichiometric air and excess air for combustion, Energy conservation in boilers and furnaces, Do's andDon'ts for efficient use of boilers and furnaces

Cooling Towers: Basic concept of cooling towers, Tips for energy savings in cooling towers

Efficient Steam Utilization

7. Energy Conservation Building Code (ECBC)

ECBC and its salient features

8. Waste Heat Recovery and Co-Generation

   Concept, classification and benefits of waste heat recovery

   Concept and types of co-generation system

9. General Energy Saving Tips
   Energy saving tips in:
   Lighting

   Room Air Conditioner

   Refrigerator

   Water Heater

   Computer

   Fan, Heater, Blower and Washing Machine

   Colour Television

   Water Pump

   Cooking

   Transport

10. Energy Audit

    Types and methodology

    Energy audit instruments

    Energy auditing reporting format

PRACTICAL EXERCISES

1. To conduct load survey and power consumption calculations of small building.
2. To check efficacy of different lamps by measuring power consumption and lumens using lux meter.
3. To measure energy efficiency ratio (EER) of an air conditioner.
4. To measure effect of valve throttling and variable frequency drive (VFD) on energy consumption by centrifugal pump.
5. To measure and calculate energy saving by arresting air leakages in compressor.
6. To measure the effect of blower speed on energy consumed by it.

STUDENT ACTIVITIES ON ENERGY CONSERVATION/ENERGY EFFICIENCY

- Presentations of Case Studies
- Debate competitions
- Poster competitions
- Industrial visits
- Visual Aids

INSTRUCTIONAL STRATEGY

Teachers are expected to lay considerable stress on understanding the basic concepts in energy conservation, principles and their applications. For this purpose, teachers are expected to give simple problems in the class room so as to develop necessary knowledge for comprehending the basic concepts and principles. As far as possible, the teaching of the subject must be supplemented by demonstrations and practical work in the laboratory. Visits to industries must be carried out. Expert from industry must be invited to deliver talks on energy conservation to students and faculty.

RECOMMENDED BOOKS

1. Guide book on General Aspects of Energy Management and Energy Audit by Bureau of Energy Efficiency, Government of India. Edition 2015
2. Guide book on Energy Efficiency in Electrical Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
3. Guide book on Energy Efficiency in Thermal Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
4. Handbook on Energy Audit & Environmental Management by Y P Abbi & Shashank Jain published by TERI. Latest Edition

Important Links:

(i) Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India. www.beeindia.gov.in.

(ii) Ministry of New and Renewable Energy (MNRE), Government of India. www.mnre.gov.in.

(iii) Uttar Pradesh New and Renewable Energy Agency (UPNEDA), Government of Uttar Pradesh. www.upneda.org.in.

(iv) **Central Pollution Control Board (CPCB),** Ministry of Environment, Forest and Climate Change, Government of India. www.cpcb.nic.in.

(v) Energy Efficiency Sevices Limited (EESL). www.eeslindia.org.

6.3 LEATHER AND PRODUCT MERCHANDISING

L	T	P
6	-	-

RATIONALE

The objective of the course is to impart knowledge on leather and leather products merchandising that relates to the domestic and global leather and leather product merchandising.

LEARNING OUTCOME

After undergoing the subject, the students will be able to

- understand the basic principles of marketing management
- understand the purchasing principles and management
- fundamentals of procurement and merchandising
- basic knowledge of retail sector
- Knowledge of global marketing and global sourcing.

DETAILED CONTENTS

UNIT-I PRINCIPLES OF MARKETING MANAGEMENT (17 PERIODS)

introduction, definition, importance and scope of marketing, philosophies of marketing management, elements of marketing- needs, wants, demands, customer, markets and marketers, marketing vs selling. consumer markets and industrial markets. Concept of organizations, qualities of marketing manager. Organizations, qualities of marketing manager. Marketing environment, factors affecting marketing environment, marketing information system and marketing research, strategic marketing planning.

UNIT-II PRINCIPLES & PRACTICE OF MERCHANDISING (17 PERIODS)

Merchandising concepts, technology, systems, planning, merchandise pricing and budgeting, sample handling- managing merchandise assortments- developing and presenting product lines- introduction to shipping operation.

UNIT-III RETAIL SECTOR OF LEATHER (17 PERIODS)

overview of retailing, changing retail environment-typology of retail buying- understanding the consumer - competitive strategies in the retail industry - retail location location strategy, store layout & design- product planning and selection , inventory management - retail pricing , retail communication - customer service.

UNIT-IV GLOBAL SOURCING OF LEATHER (17 PERIODS)

globalization and its influences- the role and importance of global sourcing - global sourcing process and strategy - investigation and tendering- supplier , selection and development- operationalization of global sourcing strategy- performance measurement - the benefits and challenges of global sourcing- coping with customer clearance uncertainties- sourcing on the internet - supplier relationship development- merchandising language for sourcing.

UNIT-V EXPORT STRATEGIES & GOVERNMENT PROMOTION (16 PERIODS)

Export- meaning & growth, preliminaries for exporting, compulsory formalities financing, insurance, documents, leather industry, government promotion, policies for growth of leather industry

INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

MEANS OF ASSESSMENT

- Class Test
- Home Assignment
- Attendance
- Sessional Test

RECOMMENDED BOOKS

1- The Indian Leather Industry-Secretariat For Industrial Assistance, Govt. Of India
2- Kothari's Desk Book Series- The Leather Industry
3- Economic Of Leather Industry-B.R.Rau, Calcutta University Press(1920)
4- Apparel Product Design & Merchandising Strategies By Cynthia L. Regan Publisher Prentice Hall

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	17	20
2	17	20
3	17	20
4	17	20
5	16	20
Total	**84**	**100**

6.5 INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

L	T	P
5	-	-

RATIONALE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. It may be further added that an entrepreneurial mind set with managerial skills helps the student in the job market. This subject focuses on imparting the necessary competencies and skills of enterprise set up and its management.

LEARNING OUTCOMES

After undergoing this course, the students will be able to :

- Know about various schemes of assistance by entrepreneurial support agencies
- Conduct market survey
- Prepare project report
- Explain the principles of management including its functions in an organisation.
- Have insight into different types of organizations and their structures.
- Inculcate leadership qualities to motivate self and others.
- Manage human resources at the shop-floor
- Maintain and be a part of healthy work culture in an organisation.
- Use marketing skills for the benefit of the organization.
- Maintain books of accounts and take financial decisions.
- Undertake store management.
- Use modern concepts like TQM, JIT and CRM.

DETAILED CONTENTS

SECTION – A

ENTREPRENEURSHIP

1. Introduction (04 Periods)

Concept /Meaning and its need

Qualities and functions of entrepreneur and barriers in entrepreneurship

Sole proprietorship and partnership forms and other forms of business organisations

Schemes of assistance by entrepreneurial support agencies at National, State, District –level, organisation: NSIC, NRDC, DC, MSME, SIDBI, NABARD, NIESBUD, HARDICON Ltd., Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubators (TBI) and Science and Technology Entrepreneur

Parks

2. Market Survey and Opportunity Identification/Ideation (04 Periods)

Scanning of the business environment

Salient features of National and Haryana State industrial policies and resultant business opportunities

Types and conduct of market survey

Assessment of demand and supply in potential areas of growth

Identifying business opportunity

Considerations in product selection

Converting an idea into a business opportunity

3. Project report Preparation (06 Periods)

Preliminary project report

Detailed project report including technical, economic and market feasibility

Common errors in project report preparations

Exercises on preparation of project report

Sample project report

SECTION –B

MANAGEMENT

4. Introduction to Management (06 Periods)

Definitions and importance of management

Functions of management: Importance and process of planning, organising, staffing, directing and controlling

Principles of management (Henri Fayol, F.W. Taylor)

Concept and structure of an organisation

Types of industrial organisations and their advantages

Line organisation, staff organisation

Line and staff organisation

Functional Organisation

5. Leadership and Motivation (08 Periods)

Leadership: Definition and Need, Qualities and functions of a leader, Manager Vs leader, Types of leadership, Case studies of great leaders

Motivation: Definition and characteristics, Importance of self motivation, Factors affecting motivation, Theories of motivation (Maslow, Herzberg, Douglas, McGregor)

6. Management Scope in Different Areas (14 Periods)

Human Resource Management: Introduction and objective, Introduction to Man power planning, recruitment and selection, Introduction to performance appraisal methods

Material and Store Management: Introduction functions, and objectives, ABC

Analysis and EOQ

Marketing and sales: Introduction, importance, and its functions, Physical distribution, Introduction to promotion mix, Sales promotion

Financial Management: Introductions, importance and its functions, knowledge of income tax, sales tax, excise duty, custom duty, VAT, GST

7. Work Culture (08 Periods)

Introduction and importance of Healthy Work Culture in organization
Components of Culture

7.3 Importance of attitude, values and behavior

7.4 Behavioural Science – Individual and group behavior.

7.5 Professional ethics – Concept and need of Professional Ethics and human values.

8. Basic of Accounting and Finance (10 Periods)

8.1 Basic of Accounting: Meaning and definition of accounting, Double entry system of book keeping, Trading account, PLA account and balance sheet of a company

8.2 Objectives of Financial Management: Profit Maximization v/s Wealth Maximization

9. Miscellaneous Topics (10 Periods)

Total Quality Management (TQM): Statistical process control, Total employees Involvement, Just in time (JIT)

Intellectual Property Right (IPR) : Introduction, definition and its importance, Infringement related to patents, copy right, trade mark

INSTRUCTIONAL STRATEGY

Some of the topics may be taught using question/answer, assignment, seminar or case study method. The teacher will discuss stories and case studies with students, which in turn will develop appropriate managerial and entrepreneurial qualities in the students. In addition, expert lecturers may also be arranged from outside experts and students may be taken to nearby industrial organisations on visit. Approach extracted reading and handouts may be provided.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/Prototype making.

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development and Management by J.S.Narang; Dhanpat Rai & Sons, Delhi.
3. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
4. Handbook of Small Scale Industry by PM Bhandari
5. Entrepreneurship Development and Management by MK Garg
6. E-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	04	06
2	04	06
3	06	08
4	06	08
5	08	12
6	14	20
7	08	12
8	10	14
9	10	14
Total	**70**	**100**

6.6 PROJECT WORK

L	T	P
-	-	8

RATIONALE

Project Work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. In addition, the project work is intended to place students for project oriented practical training in actual work situation for the stipulated period.

LEARNING OUTCOMES

After undergoing the project work, the students will be able to:

- Apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project.
- Develop understanding regarding the size and scale of operations and nature of field-work in which students are going to play their role after completing the courses of study
- Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.
- Develop firsthand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems related to the world of work.
- Develop abilities like interpersonal skills, communication skills, positive attitudes and values etc.
- Assemble/fabricate and test an electronics gadget.

General Guidelines

The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (say at the end of second year). Students should be allotted a problem of interest to him/her as a major project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

This practical training cum project work **should not be considered** as merely conventional industrial training in which students are sent at work places with either minimal or no supervision. This experience is required to be planned in advance and supervised on regular basis by the polytechnic faculty. For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience to students. It is necessary that each organization is visited well in advance and activities to be performed by students are well defined. The chosen activities should be such that it matches with the curricular interest to students and of professional value to industrial/ field organizations. Each teacher is expected to supervise and guide 5-6 students.

The project assignments may consist of:

1. Preparation of a project profile for setting up factory/sports goods leather garments/leather goods factory.
2. Work study in footwear industry and suggesting measures for increasing productivity.
3. Problems connected with the development and marketing of footwear.
4. Conduct market study and forecast fashion profile in selected regions.
5. Problems related to raw material substitution, cost and waste reduction.
6. Evolve designs and make product range for footwear/leather goods.

Problems suggested by industry may also be considered for project work.

Case Studies

NOTE:

The list is only the guideline for selecting a project; however a student is at liberty to select any other related project of his choice independently under guidance of his teacher.

A suggestive criterion for assessing student performance by the external (person from industry) and internal (teacher) examiner is given in table below:

Sr. No.	**Performance Criteria**	**Max.** Marks**	**Rating Scale**				
			Excellent	**Very Good**	**Good**	**Fair**	**Poor**
1.	Selection of project assignment	10%	10	8	6	4	2
2.	Planning and execution of considerations	10%	10	8	6	4	2
3.	Quality of performance	20%	20	16	12	8	4
4.	Providing solution of the problems or production of final product	20%	20	16	12	8	4
5.	Sense of responsibility	10%	10	8	6	4	2
6.	Self expression/ communication skills	5%	5	4	3	2	1
7.	Interpersonal skills/human relations	5%	5	4	3	2	1
8.	Report writing skills	10%	10	8	6	4	2

9	Viva voce	10%	10	8	6	4	2
Total marks		**100**	**100**	**80**	**60**	**40**	**20**

General Guidelines

The overall grading of the practical training shall be made as per following table.

1. In order to qualify for the diploma, students must get "Overall Good grade" failing which the students may be given one more chance to improve and re-evaluate before being disqualified and declared "not eligible to receive diploma". It is also important to note that the students must get more than six "goods" or above "good" grade in different performance criteria items in order to get "Overall Good" grade.

	Range of maximum marks	Overall grade
i)	More than 80	Excellent
ii)	79 <> 65	Very good
iii)	64 <> 50	Good
iv)	49 <> 40	Fair
v)	Less than 40	Poor

Important Notes

2. These criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.

3. The criteria for evaluation of the students have been worked out for 200 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.

4. The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria.

5. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific nearby industries are approached for instituting such awards.

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations in such an exhibition.

10. RESOURCE REQUIREMENT

PHYSICAL RESOURCES

(A) Space requirement

Norms and standards laid down by All India Council for Technical Education (AICTE) are to be followed to work out space requirement in respect of class rooms, tutorial rooms, drawing halls, laboratories, space required for faculty, student amenities and residential area for staff and students.

(B) Equipment requirement:

Following Laboratories are required for diploma programme in Leather Technology Footwear (CASD) Engineering:

Communication Laboratory
Applied Physics Laboratory
Applied Chemistry Laboratory
Engineering Drawing
Electrical Engineering Laboratory
Basics of IT/Computer Applications \Laboratory
Carpentry Shop
Painting and Polishing Shop
Basics of Electrical and Electronic Engg.
Welding Shop
Fitting and Plumbing Shop
Sheet Metal Shop
Mason Shop
Machine Shop
Footwear Workshop
Footwear Workshop Design Shop
Footwear Workshop Garment Shop
Footwear Workshop Leather Goods Shop
Process of Leather Manufacture Shop
Environment Engineering Laboratory
Energy conservation lab

EQUIPMENT REQUIRED FOR LEATHER TECHNOLOGY FOOTWEAR (CASD)

Sr. No.	Description	Qty	Total Price (Rs)
COMMUNICATION LABORATORY			
1.	Stools	40	10,000
2.	Display Board/Screen	2	6,000
3.	Sound recording and playing system	1	6,000
4.	Audio cassettes	60	2,000
5.	Overhead Projector	1	5,000
6.	Transparencies slides	100	500
7.	TV, VCR and camera for video recording	1 each	20,000
8.	English spoken course	1	2,000
9.	A Quiz room equipped with two way audio system, back projection system and slide projector	1	30,000
10.	Miscellaneous	LS	1,500
APPLIED PHYSICS LABORATORY			
1.	Vernier calipers Working length 160 mm, Internal and external dia with locking arrangement	12	2,000
2.	Screw Gauges Working length 15 mm, pitch 0.5 mm, least count .005 mm	12	2,000
3.	Spherometers Distance between legs 2.5 mm, pitch 0.5 mm, least count .005 mm.	12	2,000
4.	Mirrors (convex, concave)	5 Each	1,500
5.	Pendulum Setup	02	4,000
6.	Gravesand's Apparatus	02	3,000

7.	Inclined Plane Setup	02	2,000
8.	Flywheel Setup	02	4,000
9.	Prism	05	1,500
10.	Spectrometer	02	25,000
11.	DC Ammeters Moving coil weston-type ammeter with ebonite stand	10	3,500
12.	DC Miliammeters	2	1,000
13.	DC Microammeters	2	700
14.	DC voltmeters	10	700
15.	DC Millivoltmeters	10	2,000
16.	Sensitivity Galvanometer	2	800
17	Student Galvanometers	10	4,000
18.	Demonstration type DC Ammeters Range; 0 to 1 Amp.	2	1,000
19.	D type DC Voltmeter Range : 0 to 1 Volt	2	1,000
20.	D type Galvanometers Sensitivity : 20 microamperes per scale division,	8	8,000
21.	Resistance boxes (dial type) assorted	8	8,000
22.	Rheostats	10	4.000
23.	Miscellaneous items (Spring, Pan, Glycerine, Optic fibre, Ferromagnetic material)	LS	2,000
24.	Fortin's Barometer (Wall type)	2	20,000
25.	Stoke's Apparatus	2	10,000
26.	Gumther's Apparatus	2	16,000
27.	Resonance Tube Apparatus with accessories and Tuning fork set	2	14,000

28.	Sodium Lamp setup with Biprism	2	10,000
29.	Ohmic resistance coil	10	5,00

30.	Slide wire bridge	2	8,000
31.	PN Junction diode Apparatus	2	10,000
32.	Laser (as per requirement)	1	1,00,000
33.	Numerical aperture setup	1	25,000
34.	Miscellaneous	LS	3,000
APPLIED CHEMISTRY LABORATORY			
1.	Digital Balance	1	80,000
2.	Burette 50ml	30	3,000
3.	Pipette 25ml	60	4,000
4.	Beakers 100ml	60	4,000
5.	Burette stand	30	30,000
6.	Glazed tile	30	1,000
7.	Conical flask 50ml (Titration flask)	60	4,000
8.	Standard (Measuring) flask (to prepare standard solution) 250ml/100ml	30	6,000
9.	Able's Flash Point apparatus	2	10,000
10.	(1/10)°C thermometer	06	6,000
11.	Candles	20	100
12.	Crucible with lid	06	2,000
13.	Muffle furnace	1	18,000
14.	Decicators	06	8,000
15.	Pair of tongue (small and big)	24 (small) 2 (big)	2,000
16.	Chemicals		
	- EDTA-1 kg - Eriochrome Black-T(solochrome black T)-200g - Buffer solution (NH_3 - 2.5 ltr, NH_4Cl – 1 kg) - Zinc sulphate- 500g		

	- H_2SO_4- 2.5 ltr - Phenolphthalein indicator (as per requirement) - Methyl orange indicator (as per requirement)	LS		20,000

	- Charcoal (as per requirement) - Kerosene- 1 ltr		
17.	Miscellaneous	LS	2,000

ENGINEERING DRAWING			
1.	Drawing Boards (700 x 500mm)	60	25,000
2.	Draughtsman Tables	60	1,80,000
3.	Draughtsman Stools	60	40,000
4.	Computer Aided Drawing (CAD) Software	30 User	5,00,000
5.	Model of different wooder joints	1	1,000
6.	Model of different screw threads	1	1,000
7.	Model of various locking devices	1	1,000
8.	Model of various joints	1	1,000
9.	Cut section Model of various couplings	1	3,000
10.	Miscellaneous	LS	5,000
ELECTRICAL AND ELECTRONICS ENGINEERING LABORTORY			
1.	Voltmeter	5	7,500
2.	Ammeter	5	10,000
3.	CRO	1	15,000
4.	Wattmeter	5	10,000
5.	Multimeter	1	4,000
6.	Resistive load	1	4,000
7.	Regulated supply	1	8,000
8.	Signal generator	1	5,000
9.	Rheostat	2	2,500
10.	Lead acid battery	1	4,000
11.	Cables, Coils, Lamp (as per requirements)	LS	1,500
12.	Resistance, Inductor, Capacitor (as per requirements)	LS	1,500

13.	Miscellaneous/Electronics Components	LS	2,500

BASICS OF IT LABORATORY/COMPUTER APPLICATIONS LABORATORY

1.	Computer System with latest configuration	30	8,00,000
2.	Printer (MFP)	1	25,000
3.	Printer (Laser)	1	35,000
4.	Plotter	1	75,000
5.	Digitiser	1	50,000
6.	Antivirus Software	LS	10,000
7.	Internet Facility on Computers	LS	2,00,000
8.	LCD Projector	1	35,000
9.	UPS	60	1,20,000
10.	Software (latest windows, latest MS Office)	1	1,00,000
11.	Scanner	1	10,000
12.	Software MATLAB	1	2,00,000
13.	Miscellaneous	LS	5,000
CARPENTRY SHOP			
1	Work benches fitted with carpenter vices	5	20,000
2.	Circular saw grinder	1	6,000
3.	Wood cutting band saw-vertical	1	10,000
4.	Bench grinder	1	5,000
5.	Drilling machine	1	8,000
6.	Wood turning lathe	1	40,000
7.	Wood Planner	1	20,000
8.	Tool accessories measuring and marking Instruments	25	25,000
9.	Band saw blade brazing unit	1	10,000

10.	Miscellaneous	LS	1,500

Sr. No.	Description	Qty	Total Price (Rs)
PAINTING AND POLISHING SHOP			
1.	Spray gun with hose pipe	1	1,000
2.	Paint brushes	20	2,000
3.	Paint/Varnish	LS	2,000
4.	Air Compressor with 2 hp motor	1 set	10,000
5.	Miscellaneous	LS	2,000
ELECTRICAL SHOP			
1.	Tool kit (Plier, Screw driver, Knife, Steel rule, hammer, scriber, pincer steel tape etc.)	20	20,000
2.	Fuses, Switches, Plugs, Sockets, Ceiling rose, Wires, cleats, Clamps, Test lamp, Tester.(as per requirement)		8,000
3.	Electric Iron	1	1,500
4.	Electric kettle	1	1,500
5.	Ceiling fan/table fan	1	2,500
6.	Desert cooler	1	5,000
7.	Lead acid battery	2	8,000
8.	Battery Charger	1	6,000
9.	Miscellaneous		3,000
WELDING SHOP			
1.	Electrical welding transformer set with accessories	3	30,000
2.	Gas Cutting Unit	1	3,000
3.	Work benches with vices	3	5,000
4.	Welding generator set	1	10,000
5.	Oxy acetylene welding set with accessories	1	7,000
6.	Acetylene generating set	1	6,000
7.	Electric welder tool kit	10	10,000

8.	Projection welding machine	1	15,000
9.	Brazing equipment with accessories	1	10,000
10.	Soldering irons	3	1,000

11.	Pedestal grinder	1	10,000
12.	Metal spraying gun	1	10,000
13.	Spot welder	1	25,000
14.	TIG welding set	1	1,00,000
15.	MIG welding set	1	1,00,000
16.	Welding Partition Screen	5	2,500
17.	Miscellaneous	LS	3,000
FITTING AND PLUMBING SHOP			
1.	Work benches with vices (4 vices on each bench)	5	30,000
2.	Marking tables with scribers	4	24,000
3.	Surface plates	5	20,000
4.	Accessories like calipers, V blocks, height, gauges steel rules and scribers	25	50,000
5.	Tool kits – taps, dies, drills	25	40,000
6.	Tool kits – chiesels, hammers, files, hacksaw	25	25,000
7.	Drilling machine	2	12,000
8.	Pipe vice	4	1,000
9.	Chain wrenches	5	1,250
10.	Ring spanner set	5	600
11.	Pipe die set 2”	2 set	1,000
12.	Pipe bending device	1	5,000
13.	Various plumbing fittings	LS	2,000
14.	Miscellaneous	LS	1,500
SHEET METAL SHOP			
1.	Hammers	8	3,000

2.	Mallets (Hard & Soft)	5	2,000
3.	Sheet and wire Ganges	LS	8,00
4.	Shearing Machine	1	20,000

5.	Bar folding Machine	1	20,000
6.	Burring machine	1	10,000
7.	Various sheet (black plain, galvanized iron, corrugated, Aluminium)	1 Each	1,000
8.	Hand Shears/Snippers	4	2,000
9.	Nuts, Bolts, Rivets, Screw	LS	5,00
10.	Miscellaneous	LS	1,000
MASON SHOP			
1.	Mason Trowel	10	1,000
2.	Concrete Finishing Trowel	10	1,000
3.	Gauging Trowel	10	1,000
4.	Margin Trowel	10	1,000
5.	Pointing Trowel	10	1,000
6.	Round Trowel	10	1,000
7.	Mason/Brick Hammer	10	3,000
8.	Comb hammer	10	3,000
9.	Blocking chisel	10	1,000
10.	Plumb bob	10	500
11.	Spirit level	10	1,000
12.	Straight Edge	10	1,000
13.	Jointer	10	1,000
14.	Masonry Pan	10	1,500
15.	Steel Measuring Tape	10	500
16.	Miscellaneous (Bricks, Blocks, Stones, Sand, Cement)	10	3,000
MACHINE SHOP			
1.	Centre lathes	10	6,00,000
2.	Grinder	1	10,000
3.	Universal milling machine	1	1,25,000
4.	Shaper	2	1,20,000

5.	Plainer	2	1,20,000
6.	Work bench	3	10,000
7.	Precision instruments	1	10,000

8.	Hand tools and accessories	2	8,000
9.	CNC trainer lathe	1	4,00,000
10.	Miscellaneous	LS	5,000

FOOTWEAR WORKSHOP		
Sr.	Particulars	Unit
1.	Upper splitting M/C Feeding Speed : 4 Ele-Mec/Vario-Opz Installed Pawer : 2.7 KW Knife Dimensions : 0.7X50X3100mm Max. Splitting Thickness : 8mm Min. Splitting Thickness : 0.6/0.2mm Working width : 420mm	01
2.	Clicking press Maximum cutting power : 20-30 Ton Maximum stroke : 110mm Cutting Table : 900X450mm Arm width : 380mm Motor : 1.5 HP Net weight (with oil) : 780Kg. Size : 900X1000X1370mm	02
3.	Sewing Machine (a) Flat bed sewing M/C Stickiness per minute : 200-3200 (b) Zig Zag sewing M/C Stitches per minute : 2000-2600 S.P.M. Stitch Lenght : 5mm Width of Zig Zag : 8mm-12mm Needle : DPX17 Needle bar strocke : 34-35mm Thickness of the sewn products : Light – Medium upto 10mm (c) Post bed sewing M/C single needle Stitches Per minute : 2200-2600 S.P.M. Maximum Stitch Length :6mm Lift of pressure foot : llmm (by knee) Needle : DPX5 Needle bar strocke : 36mm Hook Type : Vertical Rotating Hook Link Take Up Lever (d) Post bed sewing M/C double needle (e) Cording M/C (f) Stroebel Stitching Machine (g) G Heavy Duty Sewing M/c	10 01 05 01 01 01 02

4.	Mechanical clicking press for bottom components	01

5.	Strap cutting M/C Cutting Width : 2-350 mm Cutting Thickness : 10mm Working Width : 350mm	02
6.	Glamping hand drive M/C	01
7.	Binding M/C	01
8.	Pull over M/C	01
9.	Heal lasting M/C	01
10.	Pounding M/C Dimensions : 650X500X1300mm Power : 550W, 220V Voltage : 440V Production : 3000 pairs/8 hours	01
11.	Roughing M/C	
12.	A. Edge trimming M/C (For lining) Power : 0937KW Net Weight : 64Kg Dimensions : 1100X530X1165mm B. Edge trimming M/C (For Sole) C. Hell Attaching machine (For Lining)	01 01 01
13.	Heal trimming M/C	01
14.	Ironing Machine	01
15.	Working Tables with stoob	60
16.	Decorative punching M/C	01
17.	Dies, toobs, moulds, lasts etc.	L.S.
18.	Tools boxes for students	60
19.	Thickness measuring gauge	02
20.	Pattern shear	02
21.	Pattern Binding M/C	01
22.	Pattern Vaccum Forming M/C	01

FOOTWEAR WORKSHOP		
Sr.	Particulars	Unit
24.	Tapping & Seam Rubbing M/C complete with devices.	01
25.	Top Cap applicator thermoplastic two stations	01
26.	Lining trimming M/C with strorepening device	01
27.	Automatic Eyeletting & punching M/C	01
28.	Stitch marking M/C	01
29.	Back part moulding M/C	01
30.	Mocassion performing M/C	01
31.	Mocassion performing M/C with one beating head (electric)	01
32.	Vamp clapping M/C	01
33.	Insole trimming & attaching M/C	01
34	Conditioning M/C	01
35.	Forepart Lasting M/C with Adhesive tapes	01
36.	Conditioning for back port	01
37.A.	Heal setting plant with 4 chambers and single vaccum	01
B.	Reactivating plant for sales	01
38.	Delasting (Slip Last) M/C	01
39.	Spray booth with sprayer etc.	01
40.	DVP Two station machine	01
41.	Thickness measuring Machine Capacity : 1mm-35mm for thickness of raw hide Operated : Electronics Power : 3 Phase Induction Motor 1.5HP	01
42.	Compressor for Pneumatic machine Motor : 2HP Tank capacity : 115 lit. Air Delivery : 340L/min. Pressure : 10 Bar	01

43.	Punching Machine Punching Width : 36 mm Feed : 0-60mm Speed : 250-350/min. Motor : 200W Net Weight : 45 Kg. Dimension 365X370X360mm or Standard	01
44.	Simplex Matie 33 mts. conveyor with 1 mech. tier	01
45.	Two colour horizontal injection moulding M/C with moulds etc.	01

46.	D.M.S. M/C 4 bed with moulds etc.	01

FOOTWEAR WORKSHOP DESIGNING SHOP		
Sr.	Particulars	Unit
1.	Pattern Binding Machine Hydraulic pattern binding machine. Binding precision is 0.1-1 mm, Electrically operated, 440 volts supply, Weight less than 150 kg, power 1.5 kg.	01
2.	Shoe Last (Fiber, PVC) Hing Last- Derby Oxford Sporty 41/42 size male, 37/38 Female Medium Fitting Boot Last 41/42 size male, 37/38 Female Medium Fitting	01
3.	Designing Tools	30 Sets
4.	Designing Table	30 Sets

FOOTWEAR WORKSHOP GARMENT SHOP		
Sr.	Particulars	Unit
1.	Needle feed M/C	01
2.	Swing Machine Power Operated Stitches per minute 200-2600 Maximum Stitch Length 6mm Lift of pressure foot 11mm (by knee)	01
3.	Button hole M/C For punching cloths, hats, umbrella, Work system, pneumatically or automatic Punching Width 36mm Max. Feed 0-60mm Speed 250-350/min Motor : 200 W	01
4.	Button sewing M/C	01

FOOTWEAR WORKSHOP LEATHER GOODS SHOP		
Sr.	Particulars	Unit
1.	Football panel cutting M/C Machine should be able to cut the size given below Pentagon Panel Size 4.5 cm (Each Core) Hexagon Pannel Size 4.5 cm. (Each Core) Combing punch in each core 9 No. Punching width up to maxi. 8mm.	01
2.	Football shaping M/C Machine is design for shaping the football/Volleyball Sphere of panel circumference 60-70cm Air pressure min. 1 Kgf/cm2	01
3.	Planni meter	01
4.	Belt cutting Machine Width Half Inch to 2 Inch Cutting Thickness 10 mm Max. No. of Belt Cutting at a time 6 No. Motor 1 HP. Speed 200-250 RPM	01
5.	Belt Spliting Maching Power	01
6.	Belt Edge Skiving M/c	01
7.	Belt Adhesive Coating M/C	01
8.	Belt Pressing M/C	01
9.	Belt Side Decorating M/C Machine mechanical and electrical Power operated single phase on 220V	01
10.	Belt Punching M/C (Manual)	
11.	Belt Colouring M/C	
12.	Belt Eyelet Fixing M/C	
13.	Belt Finishing M/C	
14.	Belt Creasing M/C	
15.	Belt Edge Making M/C	
16.	Leather Round Belt Making M/c (Circular Strip Cutting M/c)	

17.	Spacer for Round Belt	
18.	Strap Cutting M/C	
19.	Belt Punching & Fixing M/C	

	Punching Width Feed Speed Motor Dimension	36mm 0-60 mm 250-350/min. 200W 365X370X360mm or standard	
20.	Spray Gun Capacity 500ml, Made of stainless Steel		

FOOTWEAR WORKSHOP		
Sr.	Particulars	Unit
1.	Proctor Extractor	01
2.	Muffle Furnace	01
3.	Water distillation plant	01
4.	Platinum Crussible	02
5.	Gas Plant	01
6.	Oven	02
7.	Soxlet Apparatus	02
8.	pH Meter	02
9.	Magnetic Stirrer	01
10.	Hot plate & Mantle Heater	02
11.	Refrigerator	01
12.	Fuming cup board	01
13.	Mantle Heater set	01
b.	Physical Testing Lab	
1.	Shrinkage Tester	01
2.	Humidity & Temperature Control	02
3.	Thickness Measuring Gauge	01
4.	Hardness tester	01

5.	Ross Flening M/C	01
6.	Flexometer For Upper Leather	01
7.	Colour Fastness Tester	01

8.	Precision Lasto meter	01
9.	SATRA type sole adhension tester	01
10.	SATRA Tensile Tester	01
11.	Shoe Hardness Tester for Rubber	01
12.	Bally Cantrometer	01
13.	Fibre Board Flexing M/C	01
14.	Furniture & Fixture	01
15.	Water Absorption Machine Static (Kubelca Method)	01
16.	Water Absorption Machine Dynamic (Heavy Leather)	01
17.	Water vapour permeability tester	01
18.	Flexometer	01
19.	Abrasion Tester	01
20.	Dynamic water Absorption tester	01
21.	Tensile Testing machine (Computerised)	02

PROCESS OF LEATHER MANUFACTURE SHOP (Experimental Tannery/Leather Trade Engg.)		
Sr.	Particulars	Unit
1.	Wooden paddle	02
2.	Small experimental drum steel	02
3.	Spray booth with compressor & exhaust fan & guns etc	01
4.	Tubewell with pump & motor	01
5.	Wooden houses	08
6.	Fleshing and scudling Knives	06
7.	Fleshing and scudling beams	06
8.	Misc tools	
9.	Mini Auto spray with 4-6 guns	01
10.	Auto toggling Humidily fixers	01
11.	Shaving M/C	01
12.	Dayana vac. drying M/C	01
13.	Molissa staker	01
14.	Finiflex	01
15.	Dusting off M/C	01
16.	Wooden Sample Drum Operated : 3 Phase Induction Motor 440 Volt Supply Power : 1.5 HP Capacity : 5 Kg-50Kg Rawide Size : 10 Fit Diameter	01
17.	Shaving Machine (Mechanical)	01
18.	Splitting Machine	01
19.	Sammying/Setting Machine	01
20.	Toggling Frame with Toggles	01
21.	Drying Chamber	01

22.	Slowcon Staking Machine/Molisa Staker	01
23.	Buffing Machine 1800 mm (Double Width)	01

24.	Glazing Machine	01
25.	Area Measuring Machine	01
26.	Dhakia Setting Machine (For Sole Leather)	01
27.	Hydraulic Press (Ironing & Embossing) Operated : 3 Phase Induction Motor 440Volt Supply Power : 1.5HP At the Tem. up to 60^{o}C embossing	01
28.	Weight Bridge/Balance	01
29.	Baby Boiler	01
30.	Vacuum Drying Machine	01
31.	Compressor	01
32.	Polishing Machine	01
33.	Roller Coater (Small Size)	01
34.	Hand Setting Machine	01
35.	Seasoning Table-II	01
36.	Aquamix (Rotomix)	01
37.	Spray Gun Capacity 500 ml, Made of Stainless Steel	01
38.	Thickness Measuring Gauge	01
39.	Electronic Balance	01
40.	Experimental Drum	01
41.	Hand Flashing Knife	01

ENVIRONMENT ENGINEERING LABORATORY		
1.	pH Meter	01
2.	Turbidity Meter	01
3.	Oven with Temperature Controller and Forced Air Circulation Type	01
4.	B.O.D. Incubator	01
5.	Water Analysis Kit	01
6.	High Volume Sampler	01
7.	Electrical Balance for weighing upto 1/10 of milligram (capacity)	01

ENERGY CONSERVATION LABORATORY

1	Clamp meter	02
2	Multimeter	02
3	Power Analyser	01
4	Different types of lamps (LS) − 60 W lamp, 230 V , 100 V − 200 W lamp − 500 W lamp − 100 W lamp, 110 V, 150 V	10
5	Lux meter	02
6	Standard window A.C.	01
7	Anemometer	02
8	Thermometer	03
9	Flow meter	02
10	Pumping set with at least two pumps of different capacity.	1 set
11	Pressure gauge fitted on discharge lines	1 set
12	Variable Frequency Drive	02
13	A small compressor with a small network of pipe line fitted with suitable pipeline, pressure gauge, safety valve and loading / unloading pressure switch.	1
14	Stop watch	2
15	Small blower (1.5 kW motor) with inlet and outlet ducts of approximately one meter length on both sides	1

POLLUTION CONTROL AND INDUSTRIAL SAFETY

1	BOD incubator (5 C- 50C) with digital temperature indicator	1
2	COD Heater	1
3	Refrigerator, 280 ltrs.	1
4	Laboratory oven 2'x2'x2'	1
5	Turbidity meter (0-4000 NTU)	1

6	TDS portable meter	1
7	Electronic balance (0.001 grams)	1
8	Beakers	1

9	Conical flask, round bottom flasks	1
10	Condenser, reflux condenser	1
11	BOD bottles, rubber pipe, burette, pipette etc.	LS

NOTE:

In addition to the above, laboratories in respect of physics, chemistry, Computer Centre etc will be required for effective implementation of the course. Provision for photocopiers, PC facilities along with LCD Projection System etc. has also to be made.

(C) Furniture Requirement

Norms and standards laid down by AICTE be followed for working out furniture requirement for this course.

Human Resources Development:

Weekly work schedule, annual work schedule, student teacher ratio for various group and class size, staffing pattern, work load norms, qualifications, experience and job description of teaching staff workshop staff and other administrative and supporting staff be worked out as per norms and standards laid down by the AICTE.

11. EVALUATION STRATEGY

INTRODUCTION

Evaluation plays an important role in the teaching-learning process. The major objective of any teaching-learning endeavor is to ensure the quality of the product which can be assessed through learner's evaluation.

The purpose of student evaluation is to determine the extent to which the general and the specific objectives of curriculum have been achieved. Student evaluation is also important from the point of view of ascertaining the quality of instructional processes and to get feedback for curriculum improvement. It helps the teachers in determining the level of appropriateness of teaching experiences provided to learners to meet their individual and professional needs. Evaluation also helps in diagnosing learning difficulties of the students. Evaluation is of two types: Formative and Summative (Internal and External Evaluation)

Formative Evaluation

It is an on-going evaluation process. Its purpose is to provide continuous and comprehensive feedback to students and teachers concerning teaching-learning process. It provides corrective steps to be taken to account for curricular as well as co-curricular aspects.

Summative Evaluation

It is carried out at the end of a unit of instruction like topic, subject, semester or year. The main purpose of summative evaluation is to measure achievement for assigning course grades, certification of students and ascertaining accountability of instructional process. The student evaluation has to be done in a comprehensive and systematic manner since any mistake or lacuna is likely to affect the future of students.

In the present educational scenario in India, where summative evaluation plays an important role in educational process, there is a need to improve the standard of summative evaluation with a view to bring validity and reliability in the end-term examination system for achieving objectivity and efficiency in evaluation.

STUDENTS' EVALUATION AREAS

The student evaluation is carried out for the following areas:

- Theory
- Practical Work (Laboratory, Workshop, Field Exercises)
- Project Work

- Professional Industrial Training

A. Theory

Evaluation in theory aims at assessing students' understanding of concepts, principles and procedures related to a course/subject, and their ability to apply learnt principles and solve problems. The formative evaluation for theory subjects may be caused through sessional /class-tests, home-assignments, tutorial-work, seminars, and group discussions etc. For end- term evaluation of theory, the question paper may comprise of three sections.

Section-I

It should contain objective type items e.g. multiple choice, matching and completion type. Total weightage to Section-1 should be of the order of 20 percent of the total marks and no choice should be given in this section. The objective type items should be used to evaluate students' performance in knowledge, comprehension and at the most application domains only.

Section-II

It should contain short answer/completion items. The weightage to this section should be of the order of 40 percent of the total marks. Again, no choice should be given in section-II

Section-III

It may contain two to three essay type questions. Total weightage to this section should be of the order of 40 percent of the total marks. Some built-in, internal choice of about 50 percent of the questions set, can be given in this section

Table II : Suggested Weightage to be given to different ability levels

Abilities	**Weightage to be assigned**
Knowledge	10-30 percent
Comprehension	40-60 percent
Application	20-30 percent
Higher than application i.e. Analysis, Synthesis and Evaluation	Upto 10 percent

B. Practical Work

Evaluation of students performance in practical work (Laboratory experiments, Workshop practicals/field exercises) aims at assessing students ability to apply or practice learnt concepts, principles and procedures, manipulative skills, ability to observe and record, ability to interpret and draw conclusions and work related attitudes. Formative and summative evaluation may comprise of weightages to performance on task, quality of product, general behaviour and it should be followed by viva-voce.

C. Project Work

The purpose of evaluation of project work is to assess student's ability to apply, in an integrated manner, learnt knowledge and skills in solving real life problems, manipulative skills, ability to observe, record, creativity and communication skills. The formative and summative evaluation may comprise of weightage to nature of project, quality of product, quality of report and quality of presentation followed by viva-voce.

D. Professional Industrial Training

Evaluation of professional industrial training report and viva-voce/ presentation aims at assessing students' understanding of materials, industrial processes, practices in the industry/field and their ability to engage

In activities related to problem-solving in industrial setting as well as understanding of application of learnt knowledge and skills in real life situation. The formative and summative evaluation may comprise of weightages to performance in testing, general behaviour, quality of report and presentation during viva-voce.

12. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION

This curriculum document is a Plan of Action and has been prepared based on exhaustive exercise of curriculum planning and design. The representative sample comprising selected senior personnel (lecturers and HODs) from various institutions and experts from industry/field have been involved in curriculum design process.

The document so prepared is now ready for its implementation. It is the faculty of polytechnics who have to play a vital role in planning instructional experiences for the courses in four different environments viz. class-room, laboratory, library and field and execute them in right perspective. It is emphasized that a proper mix of different teaching methods in all these places of instruction only can bring the changes in stipulated students behaviour as in the curriculum document. It is important for the teachers to understand curriculum document holistically and further be aware of intricacies of teaching-learning process (T-L) for achieving curriculum objectives. Given below are certain suggestions which may help the teachers in planning and designing learning experiences effectively. These are indicative in nature and teachers using their creativity can further develop/refine them. The designers of the programme suggest every teacher to read them carefully, comprehend and start using them.

(A) Broad Suggestions:

1. Curriculum implementation takes place at programme, course and class-room level

   Respectively and synchronization among them is required for its success. The first step towards achieving synchronization is to read curriculum document holistically and understand its rationale and philosophy.

2. An academic plan needs to be prepared and made available to all polytechnics well in advance. The Principals have a great role to play in its dissemination and, percolation upto grass-root level. Polytechnics, in turn are supposed to prepare institutional academic plan.

3. HOD of every Programme Department along with HODs and incharges of other departments are required to prepare academic plan at department level referring to institutional academic plan.

4. All lecturers/Senior lecturers are required to prepare course level and class level lesson plans referring departmental academic plan.

(B) Course Level Suggestions

Teachers are educational managers at class room level and their success in achieving course level objectives lies in using course plan and their judicious execution which is very important for the success of programme by achieving its objectives.Polytechnic teachers are required to plan various instructional experiences viz. theory lecture, expert lectures, lab/workshop practicals, guided library exercises, field visits, study tours, camps etc. In addition, they have to carry out progressive assessment of theory, assignments, library, practicals and field experiences. Teachers are also required to do all these activities within a stipulated period of time. It is essential for them to use the given time judiciously by planning all above activities properly and ensure execution of the plan effectively.

Following is the gist of suggestions for subject teachers to carry out T-L process effectively:

1. Teachers are required to prepare a course plan, taking into account departmental academic plan, number of weeks available and courses to be taught.

2. Teachers are required to prepare lesson plan for every theory class. This plan may comprise of contents to be covered, learning material for execution of a lesson plan. They may follow steps for preparing lesson plan e.g. drawing attention, state instructional objectives, help in recalling pre-requisite knowledge, deliver planned subject content, check desired learning outcomes and reinforce learning etc.

3. Teachers are required to plan for expert lectures from field/industry. Necessary steps are to plan in advance, identify field experts, make correspondence to invite them, take necessary budgetary approval etc.

4. Teachers are required to plan for guided library exercises by identification of course specific experience requirement, setting time, assessment, etc. The assignments and seminars can be thought of as terminal outcome of library experiences.

5. Concept and content based field visits may be planned and executed for such content of course which is abstract in nature and no other requisite resources are readily available in institute to impart them effectively.

6. There is a dire need for planning practical experiences in right perspective. These slots in a course are the avenues to use problem based learning/activity learning/ experiential learning approach effectively. The development of lab instruction sheets for the course is a good beginning to provide lab experiences effectively.

7. Planning of progressive assessment encompasses periodical assessment in a semester, preparation of proper quality question paper, assessment of answer sheets immediately and giving constructive feed back to every student.

8. The student centred activities may be used to develop generic skills like task Management, problem solving, managing self, collaborating with others etc.

9. Where ever possible, it is essential to use activity based learning rather than relying on delivery based conventional teaching all the time.

10. Teachers may take initiative in establishing liaison with industries and field organizations for imparting field experiences to their students.

11. Students be made aware about issues related to ecology and environment, safety, concern for wastage of energy and other resources etc.

12. Students may be given relevant and well thought out project assignments, which are purposeful and develop practical skills. This will help students in developing creativity and confidence for their gainful employment.

13. A Project bank may be developed by the concerned department of the polytechnics in consultation with related Industry, research institutes and other relevant field organizations in the state.

LIST OF EXPERETS

The following experts participated in workshop for Developing the Curricula Structure and Contents of Diploma Programme in LEATHER TECHNOLOGY FOOTWEAR (CASD) **for UP State at IRDT, Kanpur:**

1- Sh. Jitender Kumar , Head of Department , Government leather Institute , Kanpur .

2- Sh. Bharat Singh , Head of Department , Government leather Institute , Agra

3- Sh. Shishir Shrivastawa , Head of Department , Government leather Institute , Agra

4- Sh. Satender Singh, Lecturer, Government leather Institute , Kanpur

5- Sh. D.N. Swami, Lecturer, Government leather Institute , Kanpur

6- Dr. Abhishek Kumar Lal, Expert , Leather Technology , H. B.T.U. Kanpur

7- Sh. Narender Kumar Singh , Expert , Central Leather Research Institute Jajmau kanpur .

8- Sh. Vishal Agarwal , Course Coordinator , IRDT, Kanpur