NSQF ALIGNED CURRICULUM FOR
DIPLOMA PROGRAMME IN

TEXTILE CHEMISTRY

FOR THE STATE OF UTTAR PRADESH

PREPARED BY:

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PREFACE

An important issue generally debated amongst the planners and educator's 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. The initiatives being taken by the Technical Education, UP to revise the existing curricula of 12 diploma Programs as per the needs of the industry and making them NSQF compliant, are laudable.

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 Programs. The curricula for diploma Programs have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of diploma Program.

The real success of the diploma Program depends upon its effective implementation. However, best the curriculum document is designed, if it 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 muchneeded dynamism in the system.

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1. SALIENT FEATURES OF DIPLOMA PROGRAMME IN TEXTILE CHEMISTRY

1)	Name of the Programme	:	Diploma Programme in Textile Chemistry
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 Practice	:	47 : 53 (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 periods 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 FOR DIPLOMA HOLDER IN TEXTILE CHEMISTRY

Keeping present scenario in view following employment opportunities are visualized in different sectors of employment for diploma holders in Textile chemistry.

(1) Manufacturing Industry

The Textile Chemistry diploma holder will be able to execute following activities:

- Supervisor and managerial job in yarn dyeing production Industry.
- Production Supervisor in Cotton fiber dyeing Industry
- Production Supervisor in Quality assurance Department.
- Production Supervisor in Continuous Processing state of the art plant. .
- Quality Assurance/Control in textile Mills
- Machine installation and maintenance in Process house.
- Assistance in Research and Development in Textile Industry.
- Assistance in Production Planning and Control in Textile Industry.
-Production Supervisor in Carpet Processing Industry.
- Inventory Management
- Marketing and Sales
-New Product Development in different types of fabric.
- Production Supervisor in Dyeing and Finishing Process.
- Textile testing Lab in charge
- Production Supervisor in Knitting Industry
- Garment/Apparel Production Management.
- Technical Textile Industry

(2) Government Departments such as DRDO, Central Silk Board, MSME, National Textile Corporation, Khadi Gramodyog, Ministry of Textiles, Handloom Development Commission, Weaver's Service Centre

- Lab Technician
- Research Assistant
- Cluster Development Officer

- Supervisor
- Handloom Development officer
- Textile Process Service Centre supervisor

(3) Self Employment

- Khadi Yarn and Fabric Processing Unit.
- Trading of Textile Accessories for garment .
- Trading of machine Spare parts.
- Trading of Fabric.
- Start-up of Garment Manufacturing Unit in small scale.
- Trading of Dyes and Chemical.
-Trading of Dyed Yarn.
-Trading of Dyed Fiber.
-Start -up Yarn, Fiber Dyeing house.
- Start-up Swing Thread Manufacturing small industry.
-Start-up of Special Finished fabric like Fire Retardant,. Anti crease, Anti Static,Odur Finish.
-Start Up of Tie-Die, Block, Screen ,Bandhani medium scaleprinting industry

3. LEARNING OUTCOMES OF THE PROGRAMME

The following curriculum areas/subjects have been derived from learning outcomes:

Sr. No.	Learning Outcomes	Curriculum Areas/Subjects
1.	Prepare and interpret drawings of engineering components.	– Engineering Drawing
2.	Prepare simple jobs as per specifications.	– General Mechanical Engineering
3.	Operate conventional machine for machining of components as per specifications	– Workshop Technology
4.	Use cutting tools for machines and machine tools.	– General Workshop Practice
5.	Carry out casting and welding operation.	– Workshop Technology
6.	Prepare process plan for given part.	– Industrial Safety
7.	Carry out work measurement and method study to improve productivity.	– Industrial Safety
8.	Use appropriate practices for conservation of energy and prevention of environment pollution.	– Environmental Studies – Energy Conservation
9.	Interpret factory acts and laws.	– Industrial Management and Entrepreneurship Development
10.	Communicate effectively in English in oral and written form with others.	– Communication Skills – Student Centred Activities (SCA)
11.	Manage resources effectively at workplace.	– Industrial Management and Entrepreneurship Development
12.	Plan and execute given task/project as a team member or leader.	– Industrial Safety
13.	Prepare detailed project proposal and report.	– Project Work
14.	Use computer and IT tools for creating document, making spread sheet and making presentation.	– Basics of Information Technology
15.	Solve real life problems by application of acquired knowledge and skills.	– Project Work
16.	Handle the customers effectively.	– Industrial Management and Entrepreneurship Development
17.	Apply basic principles of Mathematics and Science to solve engineering problems.	– Applied Mathematics – Applied Physics – Applied Chemistry
18.	Basic Mechanical Engg. Gears, belts. Drive transmission, Fuel, Thermodynamics.	General mechanical Engg.
19.	Properties, structure, end uses of Cotton, Jute, Wool and Silk fibre as well as Manmade fibres like Polyester, Polypropylene,	Textile fibres

	Polyamide and their manufacturing Process.	
20.	Draw and sketch flowers, buds and other figures on fabric and Understand the light theory and pigment theory, primary and secondary colours, colour harmony, tints and hues.	Principles of design and colour
21.	Analyze AC circuits and apply electromagnetic induction principles in various electrical equipments and machines	Electrical technology & electronics
22.	Understand the preparatory processes of processing, bleached and mercerized fabric, different types of machineries.	Preparatory chemical processing
23.	Understand the basic concepts of colloids.Ph,Sn1 Sn2 reaction, concept of chemical kinetics.	Physical chemistry
24.	Understand basic dyeing concepts, different types of dyestuffs,application of different dyes on different fibers, fastness properties, different terms of dyeing.	Technology of dyeing
25.	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.	Communication skills
26.	Understand the importance of safety in industry,Prevent the primary level accidents,safety related engineering concepts industry related acts.	Industrial safety
27.	To understand the importance of textile testing ,statistics in testing, fiber testing for various parameters,yarn testing for various parameters.	Textile testing
28.	Understand operating systems,word processing, worksheet and presentation,Internet etc.	Introduction to computer
29.	Understand different types of organic compounds,unit reaction and polymers,the classification and manufacturing of dyes.	Organic chemical technology

30.	Learn the concepts of textile printing, preparatory processes of printing,The application techniques of different types printing,after treatment of textile printing.	Technology of textile printing
31.	define principles and objectives of energy management and energy audit,energy Conservation Act 2001 and its features,various forms & elements of energy,identify electrical and thermal utilities. Understand their basic principle of operation and assess performance of various equipment,identify areas of energy conservation and adopt conservation methods in various systems,evaluate the techno economic feasibility of the energy conservation technique adopted.	Energy conservation
32.	Develop his/her personality as per basic professionalism,learn the inter personnel relationship building blocks, aptitude skills for problem solving,self-awareness, basic interview skills.	Communication skill
33.	Know about various schemes of assistance by entrepreneurial support agencies,conduct market survey,prepare project report,management including its functions in an organization,organizations and their structures,Inculcate leadership qualities, healthy work culture in an organization.	Industrial management andentrepreneurship development
34.	Understand the different auxiliaries and their uses in processing, the evaluation of different surfactants.	Textile processing chemicals and auxiliaries
35.	Understand the history of dyes and dyestuff industry, methods of preparing dyes,colour and chemical constituents of dye.	Chemistry of intermediates and dyes
36.	Understand The different finishing equipment,types of chemical and mechanical finish,finishing ingredients and their application.	Technology of finishing

37.	Understand the process control,TQM,TQC,SIX sigma ,Recent development in processing industry.	Advance wet processing & process control in processing
38.	Understand the basic concept of knitting,concept of loop formation with help of needles, garment making.	Introduction to knitting and garment technology

4. DERIVING CURRICULUM AREAS FROM LEARNING OUTCOMES OF THE PROGRAMME

Designing a curriculum for a course in Textile Chemistry requires a comprehensive approach that covers both the fundamental principles of chemistry and their application in the textile industry. Here are some key curriculum areas to consider:

1. Chemistry Fundamentals:
    - Inorganic Chemistry: Introduction to elements, compounds, and chemical reactions relevant to textiles.
    - Organic Chemistry: Study of organic compounds and their relevance in textile fiber and dye chemistry.
    - Physical Chemistry: Thermodynamics, kinetics, and equilibria as applied to textile processes.

2. Fiber Chemistry:
    - Fiber Structure and Properties: Understanding the structure and properties of natural and synthetic textile fibers.
    - Fiber Processing: Overview of spinning, extrusion, and other fiber manufacturing processes.

3. Dye Chemistry:
    - Dye Classification: Study of various types of dyes used in textile applications, such as direct, reactive, vat, and disperse dyes.
    - Dyeing Techniques: Practical knowledge of dyeing techniques including exhaust, pad, and continuous dyeing.

4. Chemical Finishing:
    - Fabric Finishing: Chemical treatments to enhance properties like water repellency, flame resistance, and wrinkle resistance.
    - Printing and Coating: Techniques for applying patterns, designs, and coatings to fabrics.

5. Color Science:
    - Color Theory: Understanding the principles of color perception, color mixing, and color matching.
    - Color Measurement: Practical techniques for color assessment and quality control in textiles.

6. Analytical Techniques:
    - Spectroscopy: Introduction to UV-Visible, IR, and other spectroscopic methods used in textile analysis.
    - Chromatography: Principles and applications of chromatographic techniques in textile chemistry.

7. Environmental and Sustainable Practices:
    - Sustainable Textile Chemistry: Methods to reduce the environmental impact of textile processes, such as wastewater treatment and eco-friendly dyeing.

- Regulations and Compliance: Understanding and adhering to environmental regulations in textile chemistry.

8. Quality Control and Testing:
    - Textile Testing: Techniques for evaluating the physical and chemical properties of textiles.
    - Quality Assurance: Implementing quality control measures in textile production.

9. Polymer Chemistry:
    - Polymer Science: Understanding the role of polymers in textile materials and processing.
    - Polymerization Techniques: Study of polymerization methods used in creating synthetic fibers.

10. Textile Product Development:
    - Product Innovation: Developing new textiles with desired properties and functionalities.
    - Market Trends: Staying updated on current trends and consumer preferences in the textile industry.

11. Safety and Hazard Management:
    - Chemical Safety: Ensuring the safe handling and storage of chemicals used in textile chemistry.
    - Emergency Response: Training for responding to chemical spills and accidents in the workplace.

12. Research and Development:
    - Research Methods: Techniques for conducting research in textile chemistry.
    - Innovation and Problem-Solving: Applying chemistry knowledge to solve real-world textile challenges.

13. Internship/Practical Experience:
    - Hands-on experience in a textile laboratory or manufacturing facility to apply theoretical knowledge.

14. Capstone Project:
    - A research or practical project that integrates the concepts and skills learned throughout the curriculum.
15. Professional Ethics and Communication:
    - Ethical considerations in the textile industry.
    - Effective communication skills for working in interdisciplinary teams.

Tailoring the curriculum to the specific needs and goals of the students and considering advancements in textile chemistry and technology is essential for ensuring the program remains relevant and up-to-date. Moreover, collaboration with industry partners can provide valuable insights and opportunities for practical experience.

5. ABSTRACT: CURRICULUM AREAS IN TEXTILE CHEMISTRY

Textile Chemistry is a multidisciplinary field that combines the principles of chemistry with the intricate world of textiles. This abstract provides a concise overview of the curriculum areas essential for a comprehensive education in Textile Chemistry.

1. Chemistry Fundamentals: Grounding students in the core principles of inorganic, organic, and physical chemistry, this curriculum area serves as the foundation for understanding chemical processes in textiles.
2. Fiber Chemistry: Exploring the structure, properties, and manufacturing processes of textile fibers, this area lays the groundwork for textile production.
3. Dye Chemistry: Covering various dye types and dyeing techniques, this section equips students with the knowledge needed to create vibrant, lasting textile colors.
4. Chemical Finishing: Introducing fabric enhancement techniques, such as water repellency and flame resistance, this area demonstrates the transformative power of chemical treatments in textiles.
5. Color Science: Delving into color theory and measurement, this curriculum area fosters expertise in color control and quality assessment.
6. Analytical Techniques: Offering insight into spectroscopy and chromatography, this section enhances students' abilities to analyze and optimize textile processes.
7. Environmental and Sustainable Practices: Addressing environmental concerns, this area teaches sustainable practices and regulatory compliance in textile chemistry.
8. Quality Control and Testing: Equipping students with the skills needed to ensure textile product quality and consistency through rigorous testing.
9. Polymer Chemistry: Highlighting the role of polymers in textiles and the processes of polymerization for synthetic fibers.
10. Textile Product Development: Encouraging innovation, this area empowers students to create textiles with unique properties and functionalities.
11. Safety and Hazard Management: Emphasizing chemical safety and emergency preparedness, this curriculum area prioritizes the well-being of all involved in textile chemistry.
12. Research and Development: Cultivating research skills and problem-solving abilities, this section encourages students to contribute to advancements in textile chemistry.

13. Internship/Practical Experience: Providing real-world exposure to textile chemistry applications, fostering practical skills and industry familiarity.
14. Capstone Project: Synthesizing knowledge and skills gained throughout the program, this project allows students to tackle complex challenges in textile chemistry.
15. Professional Ethics and Communication: Promoting ethical conduct and effective communication, ensuring that graduates are well-rounded professionals.

This curriculum encompasses the holistic knowledge and practical skills necessary for success in the dynamic and innovative field of Textile Chemistry. It prepares students to meet the demands of a sustainable and technologically evolving textile industry while emphasizing ethical responsibility and effective communication.

6. 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	6	-	-	6	-	-
2.	Applied Mathematics	5	5	-	-	-	-
3.	Applied Physics	7	7	-	-	-	-
4.	Applied Chemistry	7	-	-	-	-	-
5.	Engineering Drawing	10	-	-	-	-	-
6.	Basics of Information Technology	-	-	6	-	-	-
7.	General Mechanical Engineering	10	-	-	-	-	-
8.	Textile Fibres	8	6	-	-	-	-
9.	Textile Manufacturing Process	-	6	-	-	-	-
10.	Workshop Practice	-	10	-	-	-	-
11.	Principle of Design &Colour	-	-	6	-	-	-
12.	Electrical Technology & Electronics	-	-	7	-	-	-
13.	Preparatory Chemical Processing	-	-	11	-	-	-
14.	Physical Chemistry	-	-	9	-	-	-
15.	Technology of dyeing	-	-	12	-	13	-
16.	Basics of Information Technology	-	-	-	6	-	-
17.	Industrial Safety	-	-	-	4	-	-
18.	Textile Testing	-	-	-	10	10	-
19.	Environmental Studies	-	-	-	-	-	5
20.	Energy Conservation	-	-	-	5	-	-
21.	Organic Chemical Technology				5		

22.	Industrial Management and Entrepreneurship Development	-	-	-	-	5	-
23.	Technology of Textile Printing	-	-	-	9	-	10
24.	Textile Processing Chemical & Auxiliaries	-	-	-	-	7	-
25.	Chemistry of Intermediates & Dyes	-	-	-	-	8	-
26.	Technology of Finishing	-	-	-	-	-	7
27.	Advance Wet Processing & Process Control in Processing	-	-	-	-	-	7
28.	Introduction To Knitting & Garment Technology	-	-	-	-	-	8
29.	Project Work	-	-	-	-	-	8
30.	Student Centred Activities (SCA)	2	4	3	3	2	3

7. STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN TEXTILE CHEMISTRY

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	4	-	2	4	20	-	20	50	2 ½	-	-	50	70
1.2	*Applied Mathematics-I	5	-	-	4	20	-	20	50	2 ½	-	-	50	70
1.3	*Applied Physics – I	5	-	2	5	20	-	20	50	2 ½	-	-	50	70
1.4	+General Mechanical Eng.	6	-	4	6	20	20	40	50	2 ½	40	3	90	130
1.5	+Engineering Drawing	-	-	10	5	20	-	20	50	3	-	-	50	70
1.6	+Textile Fibers-I	4	-	4	5	20	20	40	50	2 ½	40	3	90	130
#Student Centered Activities (SCA)		-	-	2	1	-	30	30	-	-	-	-	-	30
Total		**24**	**-**	**24**	**30**	**120**	**70**	**190**	**300**		**80**	**-**	**380**	**570**

* Common with other diploma programs

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

\+ Common with Textile Technology/Textile Engineering

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	-	-	4	20	-	20	50	2 ½	-	-	50	70
2.2	*Applied Physics -II	5	-	2	5	20	20	40	50	2 ½	40	3	90	130
2.3	*Applied Chemistry	5	-	2	5	20	20	40	50	2 ½	40	3	90	130
2.4	+Textile Fibers-II	4	-	2	6	20	20	40	50	2 ½	40	3	90	130
2.5	Textile Manufacturing Processes	6	-	-	5	20	-	20	50	2 ½	-	-	50	70
2.6	+Workshop Practice	-	-	10	4	-	30	30	-	-	60	4	60	90
#Student Centered Activities (SCA)		-	-	4	1	-	30	30	-	-	-	-	-	30
Total		**25**	**-**	**20**	**30**	**100**	**120**	**220**	**300**		**80**	**-**	**380**	**650**

* Common with other diploma programmes

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

\+ Common with Textile Technology/Textile Engineering

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	Principle of Design &Colour	6	-	-	4	20	-	20	50	2 ½	-	-	50	70
3.2	Electrical Technology and Electronics	5	-	2	6	20	20	40	50	2 ½	40	3	90	130
3.3	Preparatory Chemical Processing	6	1	4	5	20	20	40	50	2 ½	40	6	90	130
3.4	Physical Chemistry	6	1	2	5	20	20	40	50	2 ½	40	6	90	130
3.5	Technology of Dyeing-I	6	-	6	6	20	20	40	50	2 ½	40	6	90	130
#Student Centred Activities (SCA)		-	-	3	1	-	30	30	-	-	-	-	-	30
Total		**29**	**2**	**17**	**27**	**100**	**110**	**210**	**250**	**-**	**160**	**-**	**410**	**620**

* Common with other diploma programmes

\# Student Centred Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety 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 Skill-II	4	-	2	4	20	10	30	50	2 ½	20	3	70	100
4.2	Industrial Safety	4	-	-	4	20	-	20	50	2 ½	-	-	50	70
4.3	Textile Testing-I	6	-	4	5	20	20	40	50	-	40	6	90	130
4.4	*Basics of Information Technology	-	-	6	2	-	40	40	-	-	60	3	60	100
4.5	Organic Chemical Technology	5	-	-	3	20	-	20	50	2 ½	-	-	50	70
4.6	Technology of Textile Printing-I	5	-	4	5	20	20	40	50	-	40	6	90	130
4.7	*Energy Conservation	3	-	2	3	20	10	30	50	2 ½	20	3	70	100
#Student Centred Activities (SCA)		-	-	3	1	-	30	30	-	-	-	-	-	30
Total		**27**	**-**	**21**	**27**	**120**	**130**	**250**	**300**	**-**	**180**	**-**	**480**	**730**

***** Common with other diploma programme

Student Centred Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety 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	
5.1	*Industrial Management and Entrepreneurship Development	5	-	-	4	20	-	20	50	2 ½	-	-	50	70
5.2	Technology of Dyeing-II	6	1	6	6	20	40	60	50	2 ½	80	3	130	190
5.3	Textile Testing-II	4	2	4	6	20	20	40	50	2 ½	40	3	90	130
5.4	Textile Processing Chemical & Auxiliaries	6	1	-	4	20	-	20	50	2 ½	-	-	50	70
5.5	Chemistry of Intermediates & Dyes	6	2	-	5	20	-	20	50	2 ½	-	-	50	70
5.6	Universal Human Values*	2	-	1	2	-	20	20	-	-	30	3	30	50
5.7	+Industrial Training (4 Week)	-	-	-	3	-	40	40	-	-	80	Viva	80	120
#Student Centred Activities (SCA)		-	-	2	1	-	30	30	-	-	-	-	-	30
Total		**29**	**6**	**13**	**29**	**100**	**150**	**250**	**250**	**-**	**230**	**-**	**480**	**730**

* Common with other diploma programmed

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

+4 weeks structured and supervised, branch specific, task oriented Industrial Training to be organised after V Semester Theory exam. Students will submit a report. There will be80 marks for this training. These marks in VI Sem. will be awarded by the examiner. (Examination marks :80, Sess. marks : 40).

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	*Environmental Studies	3	-	2	3	20	10	30	50	2 ½	20	3	70	100
6.2	Technology of Finishing	6	1	-	4	20	-	20	50	2 ½	-	-	50	70
6.3	Advance Wet Processing & Process Control in Processing	6	1	-	4	20	-	20	50	2 ½	-	-	50	70
6.4	Technology of Textile Printing-II	6	-	4	5	20	20	40	50	2 ½	40	6	90	130
6.5	Introduction to Knitting & Garment Technology	4	-	4	4	20	20	40	50	-	40	3	90	130
6.6	Project	-	-	8	5	-	50	50	-	-	100	Viva	100	150
#Student Centred Activities (SCA)		-	-	3	1	-	30	30	-	-	-	-	-	30
Total		**25**	**2**	**21**	**26**	**100**	**130**	**230**	**250**	**-**	**200**	**-**	**450**	**680**

* Common with other diploma programme

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

\# 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.

9. DETAILED CONTENTS OF VARIOUS SUBJECTS

FIRST SEMESTER

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)

- 1.1 Definition and process of communication
- 1.2 Types of communication - formal and informal, oral and written, verbal and non-verbal
- 1.3 Communications barriers and how to overcome them
- 1.4 Barriers to Communication, Tools of Communication

2 Application of Grammer (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)

4.1 Picture composition
4.2 Writing paragraph
4.3 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 Revathi Srinivas; 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/UBTE/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)

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

   2.2 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.,
3 Applied 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)

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

1.2 Dimensions and dimensional formulae of physical quantities.

1.3 Principle of homogeneity of dimensions

1.4 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

1.5 Limitations of dimensional analysis

1.6 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.

1.7 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)

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

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

2.3 Resolution of Vectors and its application to lawn roller.

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

2.5 Impulse and its Applications

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

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

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

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

3. Work, Power and Energy (10 periods)

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

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

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

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

3.5 Principle of conservation of mechanical energy for freely falling bodies, examples of transformation of energy.
3.6 Power and its units, calculation of power in numerical problems
3.7 Application of Friction in brake system of moving vehicles, bicycle, scooter, car trains etc.

4 Rotational Motion (10 periods)

4.1 Concept of translatory and rotatory motions with examples
4.2 Definition of torque with examples
4.3 Angular momentum, Conservation of angular momentum (quantitative) and its examples
4.4 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.
4.5 Rotational kinetic energy, Rolling of sphere on the slant plane,
4.6 Comparison of linear motion and rotational motion.
4.7 Application of rotational motions in transport vehicles, and machines.

5 Motion of planets and satellites (08 periods)

5.1 Gravitational force, Kepler's law of planetary motion,
5.2 Acceleration due gravity and its variation,
5.3 Gravitational Potential and Gravitational potential energy,
5.4 Motion of satellite, orbital velocity and time period of satellite, Total energy and Binding energy of a satellite, Escape energy and escape velocity,
5.5 Types of satellites, Geo-stationary satellite, semi-synchronous, polar satellite (concept only) and their uses in science and technology,
5.6 Concept of Black Holes

6. Properties of Matter (12 periods)

6.1 Elasticity: definition of stress and strain, different types of modulii of elasticity, Hooke's law, significance of stress strain curve
6.2 Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications
6.3 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
6.4 Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature on viscosity, application in hydraulic systems.
6.5 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 (to perform minimum six experiments)

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,
- Viva Voce

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, New Delhi
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

TOPIC WISE DISTRIBUTION OF PERIODS AND MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	15
2	10	15
3	10	15
4	10	15
5	08	10
6	12	16
7	10	14
Total	**70**	**100**

1.4 GENERAL MECHANICAL ENGINEERING

L	T	P
6	-	4

RATIONALE

For every practicing engineer some knowledge of Mechanical Engineering relevant to his discipline is a must. This paper is meant to provide the would be textile technologists elements of mechanical engineering relevant to their work.Topic Wise Distribution of Periods

DETAILED CONTENTS

1. FOUNDATIONS AND INSTALLATIONS:

General principles and considerations for machine foundations, vibrations in machine foundations. Layout of foundation bolts, alignment of machines care and precautions to be used in installation of machines, introduction to Indian Standards on machine foundations. Practice in blueprint reading for installations.

2. PIPE AND PIPE FITTINGS:

Classification of pipes according to materials used, fieldof application, IS specifications of water, air and steam pipes, various types of pipe fittings and their applications, laying of pipes, cuttings threading and jointing of pipes.

3. BEARINGS AND LUBRICATION:

Various kinds of bearings, bush bearing, ball and rollerbearing, thrust bearing and their application in textile machineries. Principle of film lubrication. Various methods of lubrication, lubricants and their properties. Selection of lubricants for various textile machineries.

4. POWER TRANSMISSTION & MATERIAL HANDLING:

(a) Different types of Trolleys used in process house.
(b) Belt and gear drive.

Types of gears, spur gear, bevel gear, helical gear, worm and worm wheel, rack and pinion.

Power transmission by belt, chain and gears. Gear drive, application of various kinds of gears and drives in textile machinery. Variable speed drives.

5. COUPLINGS, CLUTCHES, ECCENTRICS AND CAMS:

Necessity of coupling, types of couplings, rigid and flexible couplings, universal coupling, fluid coupling. Introduction to common types of clutches, eccentrics and cams, their function and use.

6. FUELS AND COMBUSTION :

Common solid, liquid and gas fuels. Their composition, higher and lower calorific values. Calculation of air required for complete combustion of unit mass/volume. Concept of excess air in boiler furnace combustion. Heat carried away by flue gases. Flew gas analysis by Or sat apparatus.

(Simple Numerical Problems)

Idea of specific properties of liquid fuels such as knock resistance (Cetane and Octane numbers). Flash point, Flame point, Solidification point.

7. THERMODYNAMICS:

Concept of thermodynamic systems and surroundings, Work and its relation to heat. First law of thermodynamics and its application to Constant volume, Constant pressure, Constanttemperature and adiabatic processes in dealing with gases and vapors. Representation of these processes in P. V. diagram, calculation of work done.Second law of thermodynamics. Concept of enthalpy, entropy of thermodynamic system. Concept of Heat engine, Heat pump and refrigerator. Carnot cycle efficiency of heatengine,coefficient of performance of refrigerator and heat pump Steady state flow process. Its equation and application.

8. STEAM GENERATION AND STEAM GENERATORS:

Idea of steam generation from water at 0oC. Pressure and temperature curve of steam generation. Idea of wet, drysaturated and super-heated steam. Saturation pressure, temperature, degree of super heat, Enthalpy, Entropy and specific volume of wet, dry saturated and super-heated steam. Use of steam tables for simple calculations. Introduction to water tube, fire tube boilers e. g. Lancashire, Babcock Wilcox's, Cochran and Simple verticalboilers. Boilers mountings and accessories. Steam traps, Reducers, Expansion bends. Boilers specification. Equivalent evaporation, Boiler efficiency, Draught, Chimney height, Conditions for maximum draught through chimney.Measurement of steam consumption. Simple numerical problems.

9. PUMPS & AIR COMPRESSORS:

Elementary knowledge of working of reciprocating,Centrifugal and Vacuum pumps, Blowers and Compressors, Fans and Exhausts Difference between reciprocating and rotary compressors. Their types and working, Single stage and Multi stage compressors. Power required to drive single stage compressor. Volumetric efficiency and effect of temperature on it. Use of compressed in textile industry.

10. REFRIGERATION AND AIR CONDITIONING:

Meaning of the term refrigeration. Its application, Unit. Refrigeration methods. Bellcoleman air cycle, air refrigerator, Vapor compression refrigeration. Analysis of simple saturated cycle for vapor compression refrigerator.

Characteristics of good refrigerants. Properties of common refrigerants such as NH3, Co2, So2 Fe-12.

Air Conditioning:

Meaning of the term and its application. Gas and vapor mixture. Dry and wet bulb temperature, Dew-point, Depressionof wet bulb temperature and Depression of Dew-point.Saturated air, specific humidity, relative humidity, Absolute humidity. Humid specific volume, Heat enthalpy of moist air. Use of psychometric charts and tables. Sensible heating and cooling. Humadification. Dehumadification and their methods.

Air conditioning for human comfort. Air conditioning, for summer and winter. Air conditioning round the year, Psychometric air conditioning. Industrial air conditioning.

1.4 GENERAL MECHNICAL ENGINEERING-LAB

A. Demonstration of the following for study and sketch.

1. (a) Bio Gas Plant.
   (b) Wind Mill.
   (c) Solar Cooker.
   (d) Voltaic Cell Type Solar Energy Converter.

2. Key's, Key ways and Splined shaft e.g. Jib head key, Flat key, Saddle key, Woodruff key, Feather key, Pin key, Splined shaft.

3. Pins- Split pin, Taper cotter type split pin, Cottorpin,Cottor bolts. Foundations Bolts- Lewis rag bolt, Fish tail bolt and Square head bolt.

4. Friction clutch and Coupling- Cone cluch, Plate cluch (Single Pair); Muffcoupling, Flange coupling, Universal or Hook's joint coupling. Flexible coupling- Belt and Pin Type, Coil spring type.

5. Bearings- Plane, Bush, Split step bearings, Ball Roller bearings, Thrust bearings.

6. Gears- Spur gear, Single and Double herical gears, Bevel gears.

7. Gear Trains- Simple spur gear train, Compound gear train,Epicyclic gear train.

8. Compressor and Tension helical springs.

9. Slider Crank Mechanism and Quick Return Mechanism.

Performance Practical's:

10. Determination of velocity ratio of a spur gear train.
11. Velocity diagram of a four bar chain mechanism.
12. Performance evaluation of solar cooker.

NOTE:-

Field visits are recommended for equipment's not available in the institution such as biogas plant, wind mill, Boilers. No need to purchase them. Models of Boilers may be procured for study purpose.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	8	10
2	8	10
3	8	10
4	8	8
5	8	10
6	8	10
7	8	10
8	10	12
9	8	8
10	10	12
Total	**84**	**100**

1.5 ENGINEERING DRAWING

L	T	P
-	-	10

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 25 sheets to be prepared and atleast 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
- Draw the different type of Machine Drawing
- Use basic commands of AutoCAD.

DETAILED CONTENTS

1. Introduction to Engineering Drawing (03 sheets)

   1.1 Introduction to drawing instruments, materials, different types of lines in Engineering drawings as per BIS Specifications .
   1.2 Practice of vertical, horizontal and inclined lines, triangles, rectangles, circles, hexagonal, pentagon with the help of drawing instruments.
   1.3 Free hand and instrumental lettering (Alphabet and numerals) , (Capital Letter), vertical and inclined at 75 degree.

2. Dimensioning Technique (01 sheet)

   2.1 Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions)
   2.2 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)

   3.1 Scales –their needs and importance (theoretical instructions), type of scales, definition of R.F. and length of scale
   3.2 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 (01 sheets)

   5.1. Definition and salient features of Solid
   5.2. To make projections, sources, Top view, Front view and Side view of various types of Solid .

6. Sections (02 sheets)

6.1 Importance and salient features
6.2 Drawing of full section, half section, partial or broken out sections, Offset sections, revolved sections and removed sections.
6.3 Convention sectional representation of various materials, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections
6.4 Orthographic sectional views of different objects.

7. Isometric Views (02 sheets)

7.1 Fundamentals of isometric projections and isometric scale.
7.2 Isometric views of combination of regular solids like cylinder, cone, cube and prism.

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

8.1 Civil & Electrical fitting symbols .

9. Introduction to Machine Drawing (08 Sheets)

9.1 Draw the assembly from part details of objects
9.2 Identify and draw different types of screw threads used in various machines and assemblies as per domestic and international standards
9.3 Draw different types of nuts, bolts and washers
9.4 Draw various locking devices and foundation bolts
9.5 Draw different section of various types of keys and cotter joints
9.6 Draw various riveted joints
9.7 AutoCAD

*** 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 Auto CAD 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.

1.6 TEXTILE FIBRE-I

L	T	P
4	-	4

Learning Outcomes:

After completing the course student will be able to:

- Able to understand the desirable properties of textile fibres, textile fibre classification.
- Able to understand the cultivation of cotton, different cotton varieties, morphological structure of cotton, jute & other natural fibres
- Be able to understand the important properties of wool fibres, their structure & their uses
- Be able to understand & explain the properties of silk fibres, its structure & uses

1.7.1 Introduction: various definitions related to textile fibres, classification of textile fibres, difference between staple & filament, essential & desirable properties of textile fibres, advantages & disadvantages of natural fibres.

1.7.2 Cotton cultivation and harvesting, development of cotton fibres in seed, cotton varieties and grading, morphological structure, physical and chemical properties of cotton fibre and its applications.

1.7.3 Jute cultivation, retting and extraction process, structure of jute fibre, physical and chemical properties of jute fibre and its applications, Introduction to other natural bast fibres like flax, hemp, ramie, banana and leaf fibres etc. and their applications.

1.7.4 Types of wool and its grading, Morphological structure, chemical composition, physical & chemical properties, varieties of wool fibres and their applications, introduction to other animal fibres like angora fibres, camel hair fibre, goat fibre etc. and their applications.

1.7.5 Types of silk and its production, chemical composition and morphological structure of silk, physical & chemical properties of silk and its applications.

Recommended Books -

1. वस्त्र रेशे –उत्पादन विशेषताएँ एवं उपयोग –DR. D.B. Shakyawar&Dr. M.K. Singh ,abhishek Publication Chandigarh/ New Delhi.
2. TextileFibrebyGhol and Valanslk`
3. S. P. Mishra, A text book of Fibres Science and technology, New Age International (p) Ltd 2000.
4. H V S Murthy, Textile Fibres- Textile Association Publication 1995.
5. Textile Fibres –I By Dr. V.A. Shenai

List of Experiments

1. To distinguish animal fibres from vegetable fibres.
   (i) With an alkali
   (ii) With an acid
2. To distinguish
   (i) Linen from cotton
   (ii) Silk from wool fibres
3. To identify textile fibres such as cotton, wool, silk, jute under microscope and to draw their longitudinal and cross-sectional views.
4. Checking moisture regain of different natural textile fibres by shirley moisture meter and by good brand conditioning oven.
5. To check the maturity ratio of cotton fibres by 10% caustic soda solution.
6. To identify natural textile fibres by
   (i) Staining test
   (ii) Solubility test
   (iii) Burning test

SECOND SEMESTER

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 :-

1.1 Integration by substitution.
1.2 Integration by rational function.
1.3 Integration by partial fraction.
1.4 Integration by parts.
1.5 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)
   - 1.1 Wave motion, transverse and longitudinal wave motion with examples, sound and light waves, relationship among wave velocity, frequency and wave length and its application
   - 1.2 Wave equation y = r sin wt, phase, phase difference, principle of superposition of waves

1.3 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,

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

1.5 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.

1.6 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)

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

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

3.3 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.

3.4 Dielectric and its effect on capacitance, dielectric break down.

3.5 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)

4.1 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.

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

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

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

4.5 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)

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

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

6.3 Semiconductor transistor, pnp and npn (concepts only)

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

7. Modern Physics (8 Periods)

7.1 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.

7.2 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.

7.3 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 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.

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

2.8 Synthetic lubricants and cutting fluids.

3. Water (14 periods)

3.1 Demonstration of water resources on Earth using pie chart.

3.2 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.

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

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

3.5 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

3.6 Natural water sterilization by chlorine and UV radiation and reverse osmosis.

3.7 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)

5.1 Definition of corrosion and factors affecting corrosion rate.
5.2 Theories of
a) Dry (chemical) corrosion- Pilling Bedworth rule
b) Wet corrosion in acidic atmosphere by hydrogen evolution mechanism
5.3 Definition of passivity and galvanic series
5.4 Corrosion control:
α) 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
β) Inorganic coatings – Anodizing and phosphating,
χ) Organic coatings - use of paints varnishes and enamels
δ) 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)

6.1 Classification of organic compounds and IUPAC Nomenclature
6.2 Definition of polymer, monomer and degree of polymerization
6.3 Brief introduction to addition and condensation polymers with suitable examples (PE, PS, PVC, Teflon, Nylon -66 and Bakelite)
6.4 Definition of plastics, thermo plastics and thermo setting plastics with suitable examples, distinctions between thermo and thermo setting plastics
6.5 Applications of polymers in industry and daily life

LIST OF PRACTICALS

1. Estimation of total hardness of water using standard EDTA solution
2. Estimation of total alkalinity of given water sample by titrating it against standard sulfuric 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,
- Viva Voce

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

2.4

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**

2.4 TEXTILE FIBRES-II
(Common with Textile Technology and Textile Engineering)

L	T	P
4	-	2

RATIONALE

Textile Fibre being the primary input to textile industry, any education in the field of textiles remains incomplete with some knowledge of textile fibres, so whether it is textile technologist or textile chemist knowledge of textile fibres is inevitable. The paper aims to expose the vital aspect of subject to the reader.

LEARNING OUTCOMES

(After completing the course student will be able to:)

1. Explain classification of synthetic fibres, the role of degree of polymerization, molecular weight & other properties needed for fibre forming polymer
2. Explain the process of viscose fibre manufacture & its properties
3. Understand and able to explain different fibre spinning systems viz. melt spinning, solution spinning, dry spinning etc
4. Explain the process of forming fibres like polyester, polyamide, polypropylene & their properties
5. Explain the process of manufacture of PAN, & other high performancefibre

DETAILED CONTENTS

Unit 1:

Classification of man madefibres, definition of regenerated and synthetic fibres,
Concepts of molecular weight, Degree of polymerization, Orientation and Crystallinity,
Characteristics of fibre forming polymer.

Unit 2

Introduction to methods of fibre formation by melt spinning, dry spinning, & wet spinning, manufacturing process of Polyester fibre. Physical & chemical properties of polyester fibres, applications.

Unit 3

Polyamide Fibres – History of development, Different types of polyamide fibres, Manufacturing process of Nylon-6,Nylon-66, Physical & chemical properties of Nylon-6 & Nylon-66 and applications.

Unit 4

Polyacrylonitrile fibres, Manufacturing process of Acrylicfibre, physical and chemical properties of acrylic fibres& its applications.

Unit 5

Introduction to regenerated fibre, Raw material for viscose rayon, Manufacturing sequence of viscose fibre, Introduction to Acetate and Cuprammonium rayons.

Recommended Books :

6. वस्त्र रेशे –उत्पादन विशेषताएँ एवं उपयोग –DR. D.B. Shakyawar & Dr. M.K. Singh ,abhishek Publication Chandigarh/ New Delhi.
7. Textile Fibre by Ghol and Valanslk`
8. S. P. Mishra, A text book of Fibres Science and technology, New Age International (p) Ltd 2000.
9. H V S Murthy, Textile Fibres- Textile Association Publication 1995.
10. Textile Fibres –I By Dr. V.A. Shenai

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	16	20
2	14	20
3	16	20
4	10	20
5	10	20
Total	**56**	**100**

TEXTILE FIBRES-II
(Common with Textile Technology and Textile Engineering)

List of Experiments

1. To distinguish
   i) Nylon from other fibres
   ii) Polysters from other fibres

   iii)Viscose rayon, Cuprammonium rayon and Acetate rayon from other fibres.

2. To distinguish Orlon Acrylic fibres from other fibres.
3. To identify fibres such as viscose rayon, Polyester, Nylon and Acrylic fibres under microscope and to draw their longitudinal and cross-sectional views.
4. Checking moisture regain of different man made textile fibres by shirley moisture meter and by good brand conditioning oven.
5. To identify the man madefibres by
   (i) Staining test

   (ii) Solubility test

   (iii) Burning test

6. To do quantitative estimation of fibres in a blend.

2.5 TEXTILE MANUFACTURING PROCESSES

L	T	P
6	-	-

RATIONALE

Aim of this paper is to give new intrants in the field of textiles first hand knowledge of principles and processes involved in the manufacture of fabrics beginning from fibre. It is to facilitate their further studies in the coming years of the course.

DETAILED CONTENTS

1. MANUFACTURE OF YARN:

Elementary idea of various processes involved in conversion of Fiber into yarn.

(a) Ginning and Mixing:

(i) Object, types and limitations of mixing processes.

(ii) Object and different types of Ginning - Suitability of various Ginning machines according to quality of fiber.

(b) Blow Room Line:

(i) Necessity of blow room line, Various machines used in blow room line and general idea of different processes completed in blow room line Viz. Opening, Cleaning and Lap formation

(ii) General idea of main defects found in blow room lap.

(c) Carding:

(i) Main objects, Line diagram of machines and descriptionof passage of material through Carding machine.

(ii) General concept of Card stripping and grinding.

(d) Draw Frame\:

(i) Passage of materials through machines and main functions involved in the processes.

(ii) General idea of graduated drafting system used in drawing process.

(e) Combing:

Definition and need of combing and preparation of material for combing process.

(f) Simplex (Fly Frame):

(i) Object of the process, Passage of material through machines.

(ii) Definition of bobbin leading and flyer leading machines.

(g) Spinning:

(i) Its objects, Passage of material on machine spindle.

(ii) General idea of spinning defects coming in the process.

2. DOUBLING:

Its objects, type, scope and uses of doubled yarn.

3. REELING:

Its object, methods and types of doffing styles used in reeling processes. Passage of material through reeling machine.

4. MANUFACTURE OF FABRIC:

Elementary idea of various processes involved in conversion of yarn into fabric. Viz.

(a) Winding:

(i) Its objects , types on basis of machine speed and winding packages . Passage of material through and any high speed drum winding machine e.g. Rotoconer

(ii) Faults found in winding package.

(iii)General idea of Pirn winding and its need and advantages.

(b) Warping:

Its main objects, general idea of beam and sectional warping machine.

(c) Sizing:

(i) Its main objects, methods of sizing on the basis of drying system used for drying wet yarn and on the basis of amount of size put on yarn.

(ii) Passage of warpsheet through Slasher sizing machine and knowledge of necessary parts of machine.

(d) Drawing-in & Beaming:

Main objects of drawing in and beaming.

(e) Weaving:

(i) Primary, Secondary and Auxillary motions in weaving process (Only name and functions of all motions).

(ii) Passage of warp on loom . Showing all its necessary parts.

(iii) Limitations of Tappet Shedding, dobby, Shedding, Jaquards Shedding, .

(iv) Name of some modern weaving techniques.

5. SIZING :

Main object and sizing ingredients.

NOTE:

Numerical problems and detailed description of any machine/mechanism are excluded.

SUGGESTED DISTRIBUTION OF MARKS

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

2.6 WORKSHOP PRACTICE

L	T	P
-	-	10

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 Welding Shop
4 Foundry Shop
5 Machine Shop

1. FITTING SHOP

1.1 Use of personal protective equipment and safety precautions while working.

1.2 Basic deburring processes.
1.3 Introduction to fitting shop tools, marking and measuring devices/equipment.
1.4 Identification of materials. (Iron, Copper, Stainless Steel, Aluminium etc.)
1.5 Identification of various steel sections (flat, angle, channel, bar etc.).
1.6 Introduction to various fitting shop operations/processes (Hacksawing, Drilling, Chipping and Filing).
1.7 Job Practice

. Job I Marking of job, use of marking tools, filing and use of measuring instruments. (Vernier caliper, Micrometer and Vernier height gauge).
JobII Filing a rectangular/square piece to maintain dimensions within an accuracy of ±.25 mm.
Job III **M**aking 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.
2.1 Introduction and demonstration of hand tools used in sheet metal shop.
2.2 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine,
2.4 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.
2.5 Study of various types of nuts, bolts, rivets, screws etc.
2.6 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 WELDING SHOP – I

3.1 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.

3.2 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

4 FOUNDRY SHOP

4.1Study of metal and non metals
4.2Study and Sketch of the Foundry tools
4.3Study and sketch of Cupola and pit furnace
4.4To prepare green moulding sand and to prepare moulds (single piece and double piece pattern sweep mould)
4.5.Casting of non ferrous (lead or aluminium)

5 MACHINE SHOP

5.1Study and sketch of lathe machine
5.2Study and Sketch of grinders, milling machine, drilling machine and CNC machine.
5.3 Plain and step turning and knurling practice.
5.4 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

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

THIRD SEMESTER

3.1 PRINCIPLES OF DESIGN AND COLOUR

L	T	P
6	-	-

RATIONALE

Adding aesthetic sense to the fabric by use of colour and development of designs to make it attractive to the consumer is most essential activity in textile manufacturing. This paper aims to equip the incumbent with principles and practices relevant to achieve this goal.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:
1- Draw and sketch flowers, buds and other figures on fabric.
2-Understand the light theory and pigment theory.
3-Understand primary and secondary colours.
4-Understand colour harmony, tints and hues.
5-Understand the weave effect.

DETAILED CONTENTS

1. Drawing, tracing, enlarging reducing and transferring of simple and elaborate figures.
2. Sketching of flowers, buds, leaves, geometrical figures and their assembly to obtain an all over effect in fabric.
3. Preparation of sketches for stripped, check, spotted geometric and diaper patterns, suitable for fabrics.
4. Light and pigment theory of colours.
5. Complementary colours, the chromatic circle.
6. Pigment theory of colour. Classification of colours and attributes of the primary and secondary colours. Modification of colours.
7. Colours in combination, general principles of colour contrast, colour harmony, tints, shades and broken hues.
8. Application of colour and weave effect.
9. Development of textile patterns on different basis such as drop, turn over, drop reverse etc. Unit and repeat compared.

10. Transfer of design of motives on graph paper and pilling of weaves according to structure/texture.

INSTRUCTIONAL STRATEGY

Teachers should show different sketches of leaves,flowers and figures. Teachers should show and prepare chart of light and pigment theory also prepare chart of primary and secondary colour.

MEANS OF ASSESSMENT

1. Assignments and quiz/class tests
2. Mid-term and end-term written tests

RECOMMENDED BOOKS

1. Principle of Design- Watson

Websites for Reference:

www.nptel.ac.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	12	16
2	12	16
3	9	12
4	8	7
5	8	7
6	10	12
7	9	10
8	6	7
9	6	7
10	6	6
Total	**84**	**100**

3.2 ELECTRICAL TECHNOLOGY & ELECTRONICS
(Common With Three Year Diploma Course Carpet Technology, Textile Technology)

L	T	P
5	-	2

RATIONALE

The superiority of electricity as power over other means in use in home or industry cannot be denied. So, it is imperative to introduce the mechanical engineering students to electrical machines and their various uses.

LEARNING OUTCOMES

After completing the course, the students will be able to: • Faraday's Laws of electromagnetic induction. Self and mutual induction. • Relationship of voltage and current for pure resistance, pure inductance, and pure capacitive reactance, impedance. • Production of Three-phase voltage, advantages of three-phase supply. Concept of star and delta connections. • Measurement of power in a single phase and three-phase circuits by wattmeter, Use of digital multimeter for measurement of voltage, current, and testing of devices. • Basic idea of semiconductors P & N type. Semiconductor diodes, Zener diodes, and their applications in rectifiers. • Working principle, Constructional details of D.C. Generators & D.C. Motors. • Working principle and constructional details of a single-phase and 3-phase transformers.

DETAILED CONTENTS

1. Electric Induction (6 Periods)

1.1. Faraday's Laws of electromagnetic induction. Self and mutual induction. Statically and dynamically induced e.m.f., Lenz's law. Fleming's left-hand and right-hand rule.

2. A. C. Theory (6 Periods)

2.1. Production of alternating e.m.f. Definition of cycle, frequency, amplitude, time period, instantaneous, average, R.M.S. maximum values of sinusoidal wave. Form factor, peak factor. Representation of a sinusoidal quantity by a mathematical expression and phasor, phase and phase difference. Relationship of voltage and current for pure resistance, pure inductance, and pure capacitive reactance, impedance. Solution and phasor diagrams of simple R.L.C. series and parallel circuits. Active and reactive power. Significance of P.F.

3. Three Phase Circuits (6 Periods)

3.1. Production of Three-phase voltage, advantages of three-phase supply. Concept of star and delta connections. Relationship between phase and line values of currents and voltages, Power in three-phase circuits, simple numerical problems.

4. Measurement & Measuring Instruments (8 Periods)

4.1. Primary and secondary instruments-Indicating, Recording and Integrated instruments.

4.2. Working principle and construction of the following instruments.

4.3. Ammeter & Voltmeter (Moving coil & Moving Iron). Extension of their ranges.

4.4. Dynamometer type wattmeter.

4.5. Single Phase A. C. Energy Meter.

4.5.1. Measurement of power in a single phase and three-phase circuits by wattmeter, Use of digital multimeter for measurement of voltage, current, and testing of devices.

5. Electronics (6 Periods)

5.1. Basic idea of semiconductors P & N type. Semiconductor diodes, Zener diodes, and their applications in rectifiers. Transistors-PNP and NPN-their characteristics and uses as an amplifier (Brief description only). Principle characteristics and application of SCR. Devices like UJT, FET, DIAC, TRIAC (Brief introduction, Introduction to operational amplifier, Introduction to basic logic gates and microprocessors.

6. D. C. Machines (6 Periods)

6.1. D. C. Generator:

6.2. Working principle, Constructional details, e.m.f. equation, Types of generators and their applications.

6.3. D. C. Motor:

6.4. Working principle, Back e.m.f., Types of D. C. motor and elementary idea of their characteristics. Torque equation, Methods of speed control (Description Only).

7. Transformers (6 Periods)

7.1. Working principle and constructional details of a single-phase and 3-phase transformers, e.m.f. equation, Losses and efficiency, Cooling of transformers, Elementary idea of auto transformers and welding transformers.

8. Synchronous machines (8 Periods)

8.1. Alternators:

8.1.1. Working principle, Types of alternators, Constructional details, E.M.F. equation, Condition for parallel operation.

8.2. Synchronous Motors:

8.2.1. Working principle, Constructional details, Vector diagram, Effect of excitation on armature current and power factor, Synchronous condenser.

9. **Induction Motors (8 Periods)**

9.1. Three Phase Induction Motors:

9.1.1. Working principle and constructional details-Types of induction motors- Slip ring and Squirrel cage. Slip in induction motors. Speed torque characteristic, Starting and speed control. Application of induction motors in industry. General faults and their remedies.

9.2. Single Phase Induction Motors:

9.2.1. Working principle and constructional details and application of single-phase motors (Split phase, Capacitor start and Run Motor). A. C. series motors, General faults and their remedies.

10. **Electro Heating (5 Periods)**

10.1. Types of electro heating. Brief description of resistance ovens and induction furnace and core furnaces.

11. Electroplating (5 Periods)

11.1. Importance of electroplating, Principle of electroplating and equipment used. Processes used in electroplating, Anodizing.

RECOMMENDED BOOKS

1. A Textbook of Electrical Technology Vol - I | Basic Electrical Engineering | By S. Chand'sby B L Theraja and AK Theraja

2. A Textbook of Electrical Technology Volume II : AC And DC MachinesBook 1 of 1: A Textbook of Electrical Technology | by B L Theraja and A K Theraja

3. Electrical & Electronics Engineering Materials, Asian Publishers. Ram Prakash Gupta and Pooja Yadav.

LIST OF PRACTICALS

1. To change the speed and direction of rotation of d.c. shunt motor by
   1.1. Armature control method.
   1.2. Field control method.
2. To change the speed and direction of rotation of d.c. compound motor by
   2.1. Armature control method.
   2.2. Field control method.
3. To measure the terminal voltage with variation of load current of
   3.1. D.C. shunt generator.
   3.2. D.C. compound generator.
4. To perform load test on a single-phase transformer and determine its efficiency.
5. To start and run an induction motor by
   5.1. Star Delta Starter.
   5.2. Auto Transformer Starter.
6. To measure slip of an induction motor by direct loading.
7. To start and change the direction of rotation of an induction motor.
8. To measure the transformation ratio of a single-phase transformer.
9. To measure power and P.F. in a single-phase circuit by Ammeter, Voltmeter, and Wattmeter.
10. To measure power and P.F. in a 3 phase/A.C. circuit by two-wattmeter method.
11. To calibrate a single-phase energy meter at different P.F.'s and different loads.
12. To locate the faults in an electrical machine by a megger.
13. To connect a fluorescent tube and note its starting and running current.
14. To draw characteristics of Silicon Controlled Rectifier (SCR).
15. Testing of electrical devices - Zener, Diode, Transistor, FET, UJT, SCR.
16. Use of operational amplifier as an adder, subtractor, comparator, differentiator, and integrators.

INSTRUCTIONAL STRATEGY

Lectures, assignments, tutorial, group discussion, and literature review.

MEANS OF ASSESSMENT

As per BTE, UP guidelines.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	6	8
2.	6	8
3.	6	8
4.	8	12
5.	6	8
6.	6	8
7.	6	8
8.	8	13
9.	8	13
10.	5	7
11.	5	7
Total	**70**	**100**

3.3 PREPRATERY CHEMICAL PROCESSING

L	T	P
6	1	4

RATIONALE :

Bleaching and mercerization are the processes to improve looks and quality of the textile products. So they are indispensable, their knowledge to students of textile processing is a must.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:
1-understand the preparatory processes of processing
2-evaluate the bleached and mercerized fabric
3-learn different types of machineries used in preparatory processes

DETAILED CONTENTS

1. GENERAL PROCESSES AND EQUIPMENTS:

i Natural and added impurities in cotton, silk, wool, jute, etc. Sequences of preparatory processprior to dyeing for natural and man-made fiber.

2. PREPARATORY PROCESS:

i. Singeing - . Purpose of singeing and detailed working of gas singeing machinewith its advantages and disadvantages.
ii. Desizing - Purpose, desizing agents and desizing methods. Detail study of Enzymatic desizing with its advantages anddisadvantages.
iii. Scouring - Scouring of cotton.
iv. Bleaching - Bleaching of textile fiber with Hypochlorite, Peroxide and Chlorite bleaching with its advantages and disadvantages.

3. MERCERIZATION:

Mercerization, Physical and chemical change during mercerizationProcess parameter, check the efficiency of mercerizationby barium activity number, Absorbency test.

4.PREPARATORY PROCESS FOR WOOL SILK AND SYNTHETIC TEXTILE MATERIAL :

i. Different methods of scouring of wool, machines used Scouring of woolen yarn and fabric-chemical methods and machines used.Carbonizing processes for raw wool and woolen fabrics.
ii. Degumming of silk.
iii. Bleaching of woolen and silk fibers and their blends
iv. Bleaching of various synthetic fiber and their blends
v. Concept of heat setting and its application on synthetic fiber/fabric.

5.AFTER TREATMENT PROCESS:

i. Washing- Its importance, Washing range machines
ii. Drying- Introduction, Thermal drying-Cylinder drying,Stenter drying and radiation drying

6. PREPARATORY MACHENERIES/PROCESSING:

Brief description and working principle of J-box, Kier, Jigger, Winch.

7.EVALUATION:

Evaluation of Bleached and scoured fabric.

PREPRATERY CHEMICAL PROCESSING

LIST OF EXPERIMENTS

1. Design of cotton

   (a) Acid Designing
   (b) Enzymatic Designing

2. Scouring of cotton and to estimate scouring loss.

3. Bleaching of cotton with bleaching powder.

4. Bleaching of cotton with sodium hypochloride.

5. Bleaching of cotton with hydrogen peroxide.

6. Mercerization of cotton.

7. Scouring of wool and silk.

8. Carbonizing of wool.

9. Bleaching of wool and silk with hydrogen peroxide sodium hypochloride.

10. Bleaching of synthetic fiber with sodium chlorite.

11. Bleaching of blends with sodium chlorite.

INSTRUCTIONAL STRATEGY
Teacher should take theory lecture, demonstration of concepts and prototype

MEANS OF ASSESSMENT
1.Assignments and quiz/class tests
2.Mid-term and end-term written tests

RECOMMENDED BOOKS:

3. Technology of Bleaching- VOL 3 V.A. SHENAI
4. Bleaching ,mercerizing and Dyeing of Cotton Materials – R.S.Prayag
5. Dyeing of wool ,silk and manmade fibers- R.S.Prayag

Websites for Reference:
www.nptel.ac.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	12
2	16	19
3	16	19
4	16	19
5	10	12
6	10	12
7	6	7
Total	**84**	**100**

3.4 PHYSICAL CHEMISTRY

L	T	P
6	1	4

RATIONALE :

Knowledge of principles of physical chemistry is useful for textile processing activities for better control and qualities. The paper deals with such principles relevant to activities in textile processing house.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:
1- understand the basic concepts of colloids.
2-understand the concept of chemical kinetics.

DETAILED CONTENTS

1. COLLOIDAL CHEMISTRY:

Particle size and colloidal state, Types of colloids, Dispersed phase and dispersion phase. Preparation of colloidal solution by dispersion and condensation methods. Tyndall effect, Brownian movement, cataphoresis, emulsions, Absorption. Application of colloids in industry and in nature.

2. pH VALUE:

Importance of pH value in textile chemistry, measurement of pH value by observation and by pH meter.

3. CATALYST AND CATALYSIS:

Elementary treatment of theories of catalysis. Negative and positive catalysis, Catalytic poisoning. Application of catalysts in textile industry.

4. LAW OF MASS ACTION:

A detailed study of law of mass action. Application of law of mass action to reactions used in textile chemistry.

5. CHEMICAL KINETICS:

Rate of a reaction, Expressing rate of a reaction, Factors influencing rate of a reaction.

Order of a reaction. Reactions of First, Second and Third order. Methods of determining order of a reaction. Molecularity and temperature dependence of reaction rates.

Concept of activation. Catalysis, Influence of catalysts on reaction rates and equilibrium.

Concept of free energy and its application in dyeing and bleaching.

6. PROPERTIES OF LIQUIDS:

Liquids, vapour pressure and its determination, Heat of fusion, heat of vaporization and their relation with vapour pressure.

Surface Tension - Its measurement by

i. Capillary Rise Methods
ii. Stalagmo Meter
iii. Tension Balance Methods.
iv. Roll Surface in washing

Viscosity:

(i) Temperature dependence of viscosity determination of viscosity by viscometer.

(ii) Roll of viscosity in preparing painting paste.

Refractive Index:

Abbus refractometer.

7. APPLICATION OF PHYSICAL CHEMISTRY:

Its application in various textile chemical processes such as bleaching, dyeing and printing

PHYSICAL CHEMISTRY

LIST OF EXPERIMENTS

1. Determination of surface tension by drop weight method using stalagmometer.

2. Determination of viscosity using Ostwald's viscometer.

3. Simple titrations on pH meter.

4. Estimation of the following oxidizing agents -

i. Bleaching Powder.
ii. Sodium Hydrosulphite.
iii. Hydrogen Peroxide.

5. Simple volumetric exercise on iodometry and iodimetry.

6. Analysis of acid and alkali.

7. Determination of solid/active contain of common finishing agents.

8. Determination of nature of emulsion.

INSTRUCTIONAL STRATEGY
Teacher should take theory lecture, demonstration of concepts and prototype

MEANS OF ASSESSMENT
- Assignments and quiz/class tests
- Mid-term and end-term written tests

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	8	10
2	8	10
3	8	10
4	12	14
5	20	23
6	20	23
7	8	10
Total	**84**	**100**

3.5 TECHNOLOGY OF DYEING-I

L	T	P
6	-	6

RATIONALE :

Dyeing is not a new thing to textile industry but the improvements in the process and developments of techniques together make it an intersting case of study. Knowledge of chemicals and techniques used in the process is important for persons concerned.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to.
1- Understand basic dyeing concepts.
2-understand different types of dyestuffs.
3-application of different dyes on different fibers.
4-understand fastness properties of dyes.
5-understand different terms of dyeing.

DETAILED CONTENTS

1. HISTORY OF DYEING OF TEXTILE:

Definitions and brief history of dyeing of textiles.

2. CLASSIFICATION OF DYESTUFFS:

Classification of dyestuffs on the basis of methods of application.

3. APPLICATION OF NATURAL DYES IN DIFFERENT TEXTILE FIBER.

4. GENERAL TERM IN TECHNOLOGY OF DYEING:

General terms and definitions used in technology of dyeing, Such as dyeing- assistants, mordants, dye-bath, standing bath, levelling agent, liquor ratio, exhaustion, mangle expression.

5. DYEING MACHINERY/EQUIPMENTS:

Dyeing of Textiles in different forms, i.e. loose fibre in yarn and fabric and machinery/equipment used such as jigger, tensionless enclosed jigger. Hank dyeing machine, winch dyeing machine, package dyeing machine, paddle dyeing machine, molten metal machine, padding mangles.

6. **CONCEPT AND MECHANISM OF DYEING**

(i) Various principles of Dyeing, Theory of Dyeing, Dyeing Mechanism- Adsorption, Diffusion, Dye fibre attachment (Fixation), Equilibriums between dye solution and fibre.
(ii) Dyeing System - Different types of bond formation between dyes and fibres.
(iii) Mechanism and method of Dyeing synthetic fibres and fabrics
(iv) Concept of glass transition temperature (Tg), Tg of different Synthetic fibre such as polyester, acrylic, nylon, etc.

7. **DIRECT DYESTUFFS:**

Principles of dyeing and methods of dyeing cellulosic material. After treatments of materials dyed with direct dyestuffs to improve fastness properties.

8. **BASIC DYESTUFFS:**

Principle of dyeing and methods of dyeing cotton, wool silk and jute.

9. ACID DYESTUFFS:

Principle of dyeing and methods of dyeing wool and silk with acid, chrome mordents and metal complex dyes.

10. SULPHUR DYESTUFFS:

Principle of dyeing and methods of dyeing cotton.

A. Defects like Bronziness, Tendering and their Remedies.

B. Soluble Sulpher Dyes - Methods of dyeing cotton.

11. VAT DYESTUFFS:

Principle of dyeing, Classification and methods of dyeing cotton.

12. SOLUBILIZED VAT DYESTUFFS:

Application to cotton.

TECHNOLOGY OF DYEING-I

LIST OF EXPERIMENTS

1. Demonstration on prescribed machinery, preparation of line diagrams (Given as in theory paper).
2. Dyeing of cotton with direct dyes.
3. After treatments of material dyed with direct dyes.
4. Dyeing of wool and jute with basic dyes.
5. Dyeing of wool and silk with acid dyes.
6. Dyeing of wool and silk with metal complex dyes.
7. Dyeing of wool and silk with acid mordant dyes.
8. Dyeing of cotton with sulphur black dye and after treatment to prevent tendering.
9. Dyeing of cotton with vat dyestuffs (At least three experiments by different methods).
10. Dyeing of cotton with solubilized vat dyes.

INSTRUCTIONAL STRATEGY

Teacher should take theory lecture, demonstration of concepts and prototype

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS

1. Bleaching ,mercerizing and Dyeing of Cotton Materials – R.S.Prayag
2. Dyeing of wool ,silk and manmade fibers- R.S.Prayag
3. Technology of Dyeing- V.A. shenai

Websites for Reference:
https://nptel.ac.in/

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	2	3
2	2	3
3	4	6
4	12	15
5	8	10
6	14	15
7	8	10
8	8	10
9	6	6
10	6	6
11	8	10
12	6	6
Total	**84**	**100**

FOURTH SEMESTER

4.1 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)

    1.1 Prepositions
    1.2 Framing Questions
    1.3 Conjunctions
    1.4 Tenses

2 Reading (16 periods)

    2.1 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)

    3.1. Correspondence
        a) Business Letters- Floating Quotations, Placing Orders, Complaint Letters.
        b) Official Letters- Letters to Government and other Offices
    3.2. Memos, Circular, Office Orders
    3.3. Agenda & Minutes of Meeting
    3.4. 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-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR,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.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	16	28
2	16	28
3	24	44
Total	**56**	**100**

4.2 INDUSTRIAL SAFETY

(Common To Three Year Diploma Course Carpet Technology, Textile Technology, Textile Design)

L	T	P
4	-	-

RATIONALE

Textile industry is one of the major industries of the country. Its safety problems are much more different than those of others. So it is vital to give youngsters willing to enter into this field, knowledge of general principles of industrial safety focusing on problems in textile industry.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:
1- Understand the importance of safety in industry.
2- Prevent the primary level accidents
3- Understand the safety related engineering concepts
4- Understand industry related acts

DETAILED CONTENTS

1. INTRODUCTION:

Need for Industrial Safety - Legal Humanitarian, Economic and Social consideration. Safe working conditions and productivity, Unsafe conditions and Hazards. Cost of accidents- Direct or Indirect social cost, financial cost. Role of management and workers participation in Industrial Safety. Safety management principles and practices.

2. PRINCIPLES OF ACCIDENT PREVENTION:

Definitions - Accident, Injury, Dangerous occurrences, Unsafe acts, Unsafe conditions and hazards. Theories of accidents prevention, Principles and methods of accidents preventions.

3. SAFETY PRECAUTIONS IN SPINNING AND WEAVING:

Safe guarding of machines- Statutory provisions related to safe guarding of machinery and working near unguarded machines. Ergonomics of machine guarding. Types of guards and guarding machines in textile industry. Incidential safety devices. Guarding of machines and safety precautions in Openning, Cleanning, Carding, Drawing, Combing, Fly frame, Ring frames, Rotors (spinning), Winding, Doubling, Warping, Sizing and Weaving operations.

4. SAFETY PRECAUTION IN CHEMICAL PROCESS :

Safety Precautions in Bleaching, Dyeing, Printing, Finishing and Accidental Hazards. Chemical Hazards in Wet Processing. Effluent in textile processing.

4 SAFETY ENGINEERING

Material Handling:

Ergonomics of material handling, Principles of correct method of lifting objects of different size, shape and weight with safe use of accessories for manual handling.

Safety aspects of design and construction and use of material handling machinery use in textile industry- Lifts, Forks, Motor Trolleys, Over head cranes and Chain Pullies.

Principle of good illumination at work place and its recommended minimum standard. Lighting and Colour.

Danger From Electricity:

Safe limits of amperage and voltages. Means for cutting over loads and short circuit protection. earth fault protection. Protection of joints and conductors.

Fire explosion, Common cause for industrial fire detection and alarm. Knowledge of water system, Carbon Dioxide System, Foam Extinguishers system and Dry Chemical Extinguishing Systems for extinguishing fire, Sprinklers.

Health and Welfare:

Health hazards in Textile industry, Occupational diseases. Personal production equipments. Special precautions for specific work environment.

6. SAFETY STATUTES:

Employees welfare and legislation. Indian Boiler Act and Regulation. The Water (Control of Pollution) Act and Rules. The Air (Pollution) Act and Rules. The Noise (Pollution) Act and Rules.

INSTRUCTIONAL STRATEGY

Teacher should take theory lecture, demonstration of concepts and prototype

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS

Health and Safety for Textile Industry by R Vettriselvan, T Jeya Sudha
A Text Book on Industrial Safety by Harsimran Singh Sodhi, Doordarshi Singh

Websites for Reference:

https://nptel.ac.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	18
2	6	11
3	10	18
4	10	18
5	14	24
6	6	11
Total	**56**	**100**

4.3 TEXTILE TESTING-I

(Common To Textile Technology)

L	T	P
6	-	4

RATIONALE

As the name implies this paper aims to develop in the incumbent the capability of testing the products and its components for desired results. Without it a product can never be claimed for any standard.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:
1- To understand the importance of textile testing
2- To understand use of statistics in testing
3- To understand fiber testing for various parameters
4- To understand yarn testing for various parameters

DETAILED CONTENTS

1. IMPORTANCE OF TEXTILE TESTING:

Introduction to textile testing, properties of fibres, yarns and fabrics and their relevance in assessing the performance, of textiles during and after manufacture. Brief introduction of ISO.

2 Sampling and Quality Control :

Definition of sample, sample size, sampling Technique, Introduction to quality control, Accuracy of measurement, presentation and analysis of data, SQC charts analysis of defects, difference between average and correlation. Standard deviation and coefficient of variation.

3. FIBRE TESTING:

i. Fibre Length (mean length, effective length and staple length. .Fibre Length Measurement - Use of Baer sorter, Fibrograph, Uster-stapler, their principles of operation.
ii. Fibre Fineness Measurement - By cutting and weighing method, Shefieldmicronair, Aerlometer, Maturity of cotton by caustic soda method and by airflow methods.
iii. Role of Humidity - Absolute Humidity, Relative Humidity, moisture Regain, Moisture content.
iv. Introduction to H.V.I. (High Volume Instruments)
v. Fiber strength testing by Precisely strength tester. stelometer.

4. YARN TESTING:

i. Concept of count, its measurement by different methods. Concepts of S & Z twist, relation between tpi, twist multiplier and count.
ii. Measurement of yarn twist by Rock bank twist tester, continuous twist tester and by twist and untwist methods.
iii. Measurement of yarn diameter by microscope.
iv.

5. EVENNESS:

Nature of irregularities – short term, medium term and long term variations, periodic and non-periodic irregularities. Analysis of classmate and classifaults

TEXTILE TESTING-I
LIST OF EXPERIMENT

1. To find the count of yarn
   (i) by physical balance
   (ii) by yarn quadrants balance.
   (iii)by Bessley yarn balance.
   and to calculate Coefficient of variation (CV).

2. To calculate yearn count by wrap reel and to calculate C.V..

3. Determine the twist of yarn per inch/per meter in double yarn and its individual components by continuous twist tester and twist and untwist tester.

4. Findout the hank of sliver and roving with the aid of wrap block machine.

5. Find the staple length of fibre by Bare Sorter.

6. Measure fibre fineness by flowing air through a sample of fibre by micronaire.

7. Find out fibre length by analytical digital fibrograph.

8. Find out lea strength of cotton yarn by lea strength tester (Power driven) and CSP.

9. Test evenness of the yarn by evenness tester.

10.. Find out fiber strength by stelometer.

INSTRUCTIONAL STRATEGY

Teacher should take theory lecture, demonstration of concepts and prototype

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS

1. Textile Testing- J.E.Booth
2. Physical testing of textile by B P Saville

Websites for Reference:
https://nptel.ac.in/

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	10
2	14	20
3	25	30
4	25	25
5	10	15
Total	**84**	**100**

4.4 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 sound
- 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

Online Resources

1. www. tutorialspoint..com
2. www.sf.net
3. Gsuite.google.com

4.5 ORGANIC CHEMICAL TECHNOLOGY

L	T	P
6-	-	

RATIONALE

Use of organic compound in textile processes is well known. So the knowledge of organic chemistry with its relevance to textile industry is essential for the personnel's concerned.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:
1-Understand different types of organic compounds.
2-Understand unit reaction and polymers.
3- Understand the classification and manufacturing of dyes.

DETAILED CONTENTS

1. ORGANIC COMPOUNDS:

Their classification, Systems of nomenclature of

i. Aliphatic Compounds
ii. Aromatic Compounds

2. ALIPHATIC COMPOUNDS:

Nomenclatures and classification of compounds, General Method of preparation and properties of alkane, alkene, alkynes,Halogen derivative, amino compounds, Hydroxy compound, Aldehyde,Ketone and acids.

3. AROMATIC COMPOUNDS:

Classification and system of nomenclature of Aromatic compounds. General methods of preparation. Properties and uses of aromatic hydrocarbons, Halogen derivatives, Hydroxy compounds, Nitro compounds,Sulphuric acid derivatives, Amino compounds, Diazonium compounds, Acids and their important derivatives.

4. UNIT REACTIONS:

Introduction to following reaction and their application in textile chemistry.

i. Nitration

ii. Sulphonation

iii. Halogenation

iv. Diazotization.

5. POLYMERS:

What is monomer and polymers. Different types of monomer and polymer. Definition of repeat unit, degree of polymerization functionality of monomer. Classification of polymer, molecular mass/ weight of polymer. Glass transition temp (Tg) of polymeric materials.

INSTRUCTIONAL STRATEGY

Teacher should take theory lecture, demonstration of concepts and prototype

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS

The complete Technology Book on Dyes and dye intermediates-Dr. Himadri Panda
Chemistry of intermediates and dyes- V.A. Shenai

Websites for Reference:

www.niir.org/book

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	16	19
2	18	22
3	18	21
4	16	19
5	16	19
Total	**84**	**100**

4.6 TECHNOLOGY OF TEXTILE PRINTING -I

L	T	P
6	-	4

RATIONALE

Printing is not a new thing to textile industry but the improvements in the process and developments of techniques together make it an interesting case of study. Knowledge of chemicals and techniques used in the process is important for persons concerned

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:
1-Learn the concepts of textile printing
2-Learn the preparatory processes of printing
3-Learn the application techniques of different types printing
4-Learn after treatment of textile printing

DETAILED CONTENTS

(1): INTRODUCTION:
Introduction to printing, methods and styles of printing, classification of printing thickeners and methods of thickeners paste preparation.

(2): CLOTH PREPRATION:
Preparation of cloth for print paste preparation, wetting agents, hygroscopic chemicals dispersing agents, oxidative and reducing agents etc., precautions.

(3): METHODS OF PRINTING:
block printing, block preparation, roller printing, roller engraving andchroming, Screen printing-preparation of screens, Manual and automatic flat-bed screen printing ,rotary screen printing, rotary screen preparation-manual and photosensitive, its method ofapplication, merits and demerits. Faults and prevention in printing methods.

(4): AFTER TREATMENT:
General methods of print fixation, and machines used for after treatment of printing goods-steaming, ageing, curing etc. Pigment printing of cotton, binder emulsion, print paste recipe and steps involved.

(5):. VARIOUS STYLE OF PRINTING:
direct, resist & discharge style of printing of cotton using direct, reactive and vat colours.

TECHNOLOGY OF TEXTILE PRINTING

LIST OF EXPERIMENTS

1. Printing of cotton with blocks, screens, stencils.

2. Printing of cotton by direct style using direct, vat, reactive, solubilised vat, rapid fast, rapidogen, aniline black, azoic and pigments.

3. Printing of blends.

4. Coloured discharge and coloured resist under vat, azoic, aniline black and reactive dyes.

INSTRUCTIONAL STRATEGY

Teacher should take theory lecture, demonstration of concepts and prototype

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS

1. Technology of Printing - V.A. Shenai
2. Printing - D.G. Kale
3. Technology of textile printing – R.S. Prayag
4. Textile Printing- L W C Miles (Dyers Company Publication Trust, Bradford, England)

Websites for Reference:

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	12
2	17	20
3	30	36
4	10	12
5	17	20
Total	**84**	**100**

4.6 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

1.1 Classification of energy- primary and secondary energy, commercial and non-commercial energy, non-renewable and renewable energy with special reference to solar energy, Capacity factor of solar and wind power generators.
1.2 Global fuel reserve
1.3 Energy scenario in India and state of U.P. Sector-wise energy consumption (domestic, industrial, agricultural and other sectors)
1.4 Impact of energy usage on climate

2. Energy Conservation and EC Act 2001

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

2.2 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.

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

3. Electrical Supply System and Motors

3.1 Types of electrical supply system

3.2 Single line diagram

3.3 Losses in electrical power distribution system

3.4 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)

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

3.6 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

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

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

4.3 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

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

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

6 Energy Efficiency in Thermal Utilities

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

6.2 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 and Don'ts for efficient use of boilers and furnaces

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

6.3 Efficient Steam Utilization

7. Energy Conservation Building Code (ECBC)

7.1 ECBC and its salient features

7.2 Tips for energy savings in buildings: New Buildings, Existing Buildings

8 Waste Heat Recovery and Co-Generation

8.1 Concept, classification and benefits of waste heat recovery

8.2 Concept and types of co-generation system

9 General Energy Saving Tips

Energy saving tips in:

9.1 Lighting
9.2 Room Air Conditioner
9.3 Refrigerator
9.4 Water Heater
9.5 Computer
9.6 Fan, Heater, Blower and Washing Machine
9.7 Colour Television
9.8 Water Pump
9.9 Cooking
9.10 Transport

10 Energy Audit

10.1 Types and methodology
10.2 Energy audit instruments
10.3 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.
(vi) Electrical India, Magazine on power and electrical products industry. www.electricalindia.in.

FIFTH SEMESTER

5.1 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 mindset 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)

    1.1 Concept /Meaning and its need
    1.2 Qualities and functions of entrepreneur and barriers in entrepreneurship

    1.3 Sole proprietorship and partnership forms and other forms of business organisations

1.4 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)

2.1 Scanning of the business environment
2.2 Salient features of National and Haryana State industrial policies and resultant business opportunities
2.3 Types and conduct of market survey
2.4 Assessment of demand and supply in potential areas of growth
2.5 Identifying business opportunity
2.6 Considerations in product selection
2.7 Converting an idea into a business opportunity

3. Project report Preparation (06 Periods)

3.1 Preliminary project report
3.2 Detailed project report including technical, economic and market feasibility
3.3 Common errors in project report preparations
3.4 Exercises on preparation of project report
3.5 Sample project report

SECTION –B

MANAGEMENT

4. Introduction to Management (06 Periods)

4.1 Definitions and importance of management
4.2 Functions of management: Importance and process of planning, organising, staffing, directing and controlling
4.3 Principles of management (Henri Fayol, F.W. Taylor)
4.4 Concept and structure of an organisation
4.5 Types of industrial organisations and their advantages
4.6 Line organisation, staff organisation
4.7 Line and staff organisation
4.8 Functional Organisation

5. Leadership and Motivation (08 Periods)

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

5.2 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)

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

6.2 Material and Store Management: Introduction functions, and objectives, ABC Analysis and EOQ

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

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

7. Work Culture (08 Periods)

7.1 Introduction and importance of Healthy Work Culture in organization
7.2 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)

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

9.2 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/UBTE/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**

5.2 TECHNOLOGY OF DYEING-II

L	T	P
6	1	6

RATIONALE

Dyeing is as old as the manufacture of fabrics. Now it is an important activity in the textile processing house. One can say that dyeing itself is an industry today. Therefore it is imperative to introduce the students of the textile chemistry with the subject.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:
1-Learn the application techniques of azoic colours, reactive dyestuffs,pigment, oxidation and mineral colours
2-Learn after-treatments
3-Learn dyeing of different blends
4-Learn dyeing of Knitted goods

DETAILED CONTENTS

1. AZOIC COLOURS:

Principle of dyeing and methods of dyeing cotton and silk.

(a) Naptholation
(b) Diazotization of bases.
(c) Alkali binding agents.
(d) Stabilized diazofast salts.

2. REACTIVE DYESTUFFS:

Chemistry and methods of dyeing cotton, wool and silk. Classification of Reactive dyes, Brief description of Vinyl Sulphone, Bi-functional, HE and ME Reactive Dyes.

3. PIGMENT COLOURS:

Chemistry of Dyeing of cotton with Pigments Colours.

4. OXIDATION COLOURS:

(i) Aniline black and diphenyl black and their application to cotton.

5. MINERAL COLOURS:

i. Dyeing of Mineral Khaki on cotton.

ii. Preparation and dyeing of acetate rayons with disperse and azoic colours.

6.DISPERSE DYESTUFF:

i. Preparation and dyeing of acetate rayons with disperse colours.
ii. Preparation and dyeing of polyester fibre with desperse dyes by various methods, i.e. Conventional carrier , high temperature high pressure and Thermosol method.
iii. Nature and classification of carriers in chemicals. Mechanism involved in carrier dyeing for polyester with its advantages and disadvantages.

7.BLEND DYEING:

Dyeing of Polyester/Cotton, polyester/wool, cotton/silk, wool/acrylic etc. popular blends with single bath and double bath method.

8. Dyeing of Knitted goods

9. ATER TREATMENT :

Soaping, washing and drying of goods.

TECHNOLOGY OF DYEING-II

LIST OF EXPERIMENTS

1. Dyeing of cotton and silk with azoic colours (at least two experiments by different methods)by exhaustion and padding.

2. Dyeing of cotton with cold and hot brand reactive dyes by exhaustion, pad batch and pad dry cure.

3. Dyeing of cotton with pigment dyes.

4. Dyeing of cotton with aniline black.

5. Dyeing of mineral Khaki on cotton.

6. Dyeing of cotton with phthalogen blue.

7. Dyeing of acetate rayon with disperse dyes.

8. Dyeing of polyamide fibers with dispersed acid dyes.

9. Dyeing of polyester with dispersed dyes with and without carrier, high temperature and thermosol method.

10. Dyeing of polyacrylic with basic dyes.

11. Dyeing of blends of cots-wool, terry-wool, polyester-cotton (solid shade, cross dyeing and reserve dyeing).

12. Demonstration and preparation of line diagrams of prescribed machines in theory.

13. Dyeing of compound shades and shade matching.

14. Colour matching.

INSTRUCTIONAL STRATEGY

Teacher should take theory lecture, demonstration of concepts and prototype

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS

1. Bleaching ,mercerizing and Dyeing of Cotton Materials – R.S.Prayag
2. Dyeing of wool ,silk and manmade fibers- R.S.Prayag
3. Technology of Dyeing- V.A. shenai

Websites for Reference:
https://nptel.ac.in/

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	12	15
2	10	12
3	10	12
4	10	12
5	10	12
6	12	15
7	8	10
8	6	6
9	6	6
Total	**84**	**100**

5.3 TEXTILE TESTING-II

(Common To Textile Technology)

L	T	P
4	2	4

RATIONALE

As the name implies this paper aims to develop in the incumbent the capability of testing the products and its components for desired results. Without it a product can never be claimed for any standard.

LEARNING OUTCOMES

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

1- Understand the different dimension of fabric.
2- Learn the tensile testing concepts of textile.
3- Learn the basic Textile chemical testing.

DETAILED CONTENTS

1. FABRIC DIMENSIONS:

i. Measurement of fabric thickness. Measurement of crimpby crimp tester.

ii. Air permeability of fabrics, its measurement by air permeability tester.

iii. Crease recovery of fabrics, factors effecting crease recovery, measurements of crease recovery by crease recovery tester.

iv. Water repellency tests.

v. Abrasion resistance test on fabric by MortindaleAbrasion Tester.

2. TENSILE TESTING OF TEXTILES:

i. Yarn strength testing, types of testing machines, single yarn strength testing and Lea strength testing.

ii. Fabric strength testing by cut strip, grab strip and revealed strip methods.

iii. Fabric tear testing by tongue tear, trapezoid tear test.

iv. Bursting strength testing by hydraulic strength tester.

3. TEXTILE CHEMICAL TESTING:

i. estimation of blend composition (Nylon,Polyester,Acrylic,Polyethylene,Cotton,wool,silk).

ii. Colour fastness to light

iii. Colour fastness to washing

iv. Colour fastness to rubbing

v. Colour fastness to perspiration

vi. Colour fastness to chlorine

vii. Water absorbency test

TEXTILE TESTING-II
LIST OF EXPERIMENT

1. Examine the bursting strength of a fabric by bursting strength tester.

2. Find out the relative abrasion properties of fabrics by Martindale abrasion tester.

3. Find the breaking strength of different textile fabrics by means of cloth strength tester (power driven).

4. Measure crimp by Shirley crimp meter.

5. Find out air permeability of fabric by air permeability tester.
6. Measure crease recovery of fabric by crease recovery tester.

7. Test of pilling of fabrics by computerized pilling tester.
8. Estimation of final pH value of finished fabric.
9. Light fastness test
10. Washing fastness test
11. Rubbing fastness test
12. Perspiration fastness test
13. Absorbency test

INSTRUCTIONAL STRATEGY

Teacher should take theory lecture, demonstration of concepts and prototype

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS

TEXTILE TESTING – J.E.BOOTH

Websites for Reference:

www.nptel.ac.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	20	36
2	20	36
3	16	29
Total	**56**	**100**

5.4 TEXTILE PROCESSING CHEMICALS AND AUXILIARIES

L	T	P
6	1	-

RATIONALE

Textile processing requires use of variety of chemicals having their specific function. The knowledge of these chemicals is imperative for the persons concerned with the processing.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:
1-Understand the different auxiliaries and their uses in processing.
2-Understand the evaluation of different surfactants.

DETAILED CONTENTS

A. AUXILIARIES

1. Introduction to textile auxiliaries, Meaning of the term and their function.
2. Classification of textile auxiliaries according to their use.
3. Surface activity, wetting and detergency.
4. Biodegradability of surfactant.
5. Sequestering agents
6. Function, Properties and Application of auxiliaries in scouring, bleaching, mercerizing.

B. DYEING & PRINTING AUXILIARIES :

Functions, Properties and application of various dyeing and printing auxiliaries with examples.

C. FINISHING AUXILIARIES

Functions, Properties and application of various finishing auxiliaries with examples.

D. EVALUATION :

Evaluation of some important textile auxiliaries such as wetting,Detergency, leveling agents, etc.

INSTRUCTIONAL STRATEGY
Teacher should take theory lecture, demonstration of concepts and prototype

MEANS OF ASSESSMENT
- Assignments and quiz/class tests
- Mid-term and end-term written tests

RECOMMENDED BOOKS
Technology of Textile Processing Volume V, Chemistry of Textile Auxiliaries.- V.A.Shenai

Websites for Reference:

https://nptel.ac.in/

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	20	28
2	12	24
3	12	24
4	12	24
Total	**56**	**100**

5.5 CHEMISTRY OF INTERMIDIATES AND DYES

L	T	P
6	2	-

RATIONALE

Dyeing is and important activity in textile industry.So knowledge of dyes and other intermediate chemicals is essential for persons concerned with these activities.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:
1-Learn about the history of dyes and dyestuff industry.
2-Learn about different methods of preparing dyes.
3-Learn basic chemical constituents of dye.

DETAILED CONTENTS

1. HISTORY OF DYESTUFF DEVELOPMENT:

Historical development of dyestuff industry. Classification of dyes according to their chemical constitution.

2. METHODS OF PREPARING DYES:

General methods of preparing Nitroso. Nitro, Azo. Anthraquinone, vat, solubilised vat with one or two examples of dye preparation (not by name), Preparation of reactive dyes- Procian and Vinyl Sulphone.

3. CHEMICAL CONSTITUTION OF DYES:

Basic terms of color chemistry Theory of color, Relation between chemical constitution of dyes. Concept of light and pigment theory. Chemistry of metal complex dye, Chemistry of after treatment of direct dye.

INSTRUCTIONAL STRATEGY

Teacher should take theory lecture, demonstration of concepts and prototype

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS

1.Introduction to the chemistry of dyestuffs- V.A. Shenai

2.Chemistry of Dyes and Principles of Dyeing-V.A.Shenai

Websites for Reference:

https://nptel.ac.in/

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	25	33
2	25	33
3	34	34
Total	**84**	**100**

5.7 INDUSTRIAL TRAINING (4 WEEKS)

L	T	P
-	-	2

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 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 has been provided in the study and evaluation scheme of 6th 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.

INSTRUCTIONAL STRATEGY

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

MEANS OF ASSESSMENT

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

- Punctuality and regularity 15%
- Initiative in learning new things 15%
- Presentation and VIVA 15%
- Industrial training report 55%

SIX SEMESTER

6.1 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)

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

2. Air Pollution (04 Periods)

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

3. Water Pollution (08 Periods)

    3.1 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 Erach Bharucha; University Press (India) Private Ltd., Hyderabad.
7. Environmental Engineering and Management by Suresh K Dhamija; S K Katariaand Sons, New Delhi.
8. E-books/e-tools/relevantsoftware to be used as recommended by AICTE/UBTE/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**

6.2 TECHNOLOGY OF FINISHING

L	T	P
6	1	-

RATIONALE

Importance of finishing activities to textile products cannot be over looked. The technology involved in the activity is matter of great interest and value to the persons concerned.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:
1-Learn the Different types of finishes
2-Learn about different finishing equipments
3-learn about different finishinh ingredients and their application techniques

DETAILED CONTENTS

1. INTRODUCTION AND CLASSIFICATION OF TEXTILE FINISHING.

i. Detail introduction and classification of textile finishing.

2. FINISHING ACTIVITIES, INGRADIENTS & EQUIPMENTS:

i. Starch preparation tanks, starching mangles, back filling machines and their working.

ii. Principles and working of drying cylinders, stenters (clip and pin) hot flue and float drier.

iii. Purpose of damping and damping machine.

iv. Function of calendering, different types of calenders as plain, chasing, friction, schriener, emboss and felt.

v. Purpose of raising and working of raising machine.

vi. Principle and working of Sanforizing/Zero-Zero finishing

vii. Rot and mildew proofing agents and their application.

viii.Wash and Wear Finishes - Crease resisting agents as Urea formaldehyde, Malamine formaldehyde, Di-methylol Ethylene Urea (DMEU), Di-methylol, Di-hydroxy ethylene urea (DMDHEU), Propylene Urea, Carbamates etc, their application to cellulosic materials, catayst and other additives used in anticrease finishing..

ix. Water Proof/Water Repellent Finishes -Application of Aluminum Soaps, Wax emulsions, Reactive softners and Silicone emulsions, their applications for water-proof and water-repellent finish.

x. Flame Retardent Finishes -Application of borax, boric acid, phosphoric acid urea, THPC (Tetra Kis Hydroxy Phosphonium Chloride), APO (Aziridinyl Phosphonium Oxide) to cellulosic materials for flame-proofing.

3. WEIGHING OF SILK:

Weighing of silk.

4. FINISHING OF WOOLEN FABRICS:

Decatising, Permanent Setting, Felting of Wool, London shrinking and Sponging, rincipleand working of rotary and Paper Press Machine.

5. FINISHING OF SYNTHETIC FIBRE FABRICS:

- Heat setting mechanism of heat setting,
- Antistatic finish, Agents used and their application.
- Soil release, Finish-agents used and their application.
- Pilling : Mechanism and methods for preventing pilling.

INSTRUCTIONAL STRATEGY

Teacher should take theory lecture, demonstration of concepts and prototype

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS

Technology of Finishing Volume 10 –V.A Shenai

Websites for Reference:
https://nptel.ac.in/

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	6
2	28	58
3	15	6
4	15	12
5	20	18
Total	**84**	**100**

6.3 ADVANCE WET PROCESSING & PROCESS CONTROL IN PROCESSING

L	T	P
6	1	-

RATIONALE

The paper deals with the new developments in the textile processing such as dyeing and printing. This knowledge is important for working in modern plants.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:
1-Learn different process control
2-Learn recent development in processing industry

DETAILED CONTENTS

1. PROCESS CONTROL :

Define quality, quality control and process control with its role, Scope and importance.

A. Importance of total Quality Control (TQC) and Total Quality Management (TQM) system.
B. Brief study of Six Sigma Concept.
C. Process Control in Preparatory Process
D. Process Control in dyeing, printing and finishing.
E. Faults found during inspection of desized, scoured, bleached, dyed, printed and finished fabrics their causes and remedial measures.
F. Computerizedcolor matching machine andComputer Application in Textile Wet Processing Industry.
G. Organizations for Standard Quality Certification ISO 9001 (Quality Product), ISO 14001(Environment), etc.

2. RECENT DEVELOPMENT :

A. Development in Eco-friendly dyes to satisfy the eco-parameters. Role of dyestuffmanufacturing companies to reduce impact on environment. Brief study of Toxicintermediates and banned azo dyes.
B. Environment friendly chemicals, application of enzymes.Bio desizing, Bio scouring, Bio Polishing of textiles.
C. Brief description of Continuous Bleaching Range,Continuous Dyeing Range.
D. Solvent dyeing techniques. Methods of Mercerization-Liquid ammonia.
E. Soft flowdyeing machine for woven and knitted fabrics.
F. Right First Time (RFT) concept in dyeing,
G. Kuster Dyeing Padding Mangle Technologyused in modern dyeing machine.
H. Energy conservation in wet processing.
I. Digital Printing

INSTRUCTIONAL STRATEGY

Teacher should take theory lecture, demonstration of concepts and prototype

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS

Websites for Reference:

https://t.me/joinchat/tLfFhN-HBj4wMTZI -TCP by S.B. Singh

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	44	50
2	44	50
Total	**84**	**100**

6.4 TECHNOLOGY OF TEXTILE PRINTING -II

L	T	P
6	-	4

RATIONALE

Printing of fabrics for making it attractive is an art and there is no end to development of technologies for the process. The paper is meant to give an insight of the means and methods used in printing process.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:
1-Learn the printing of protein fibers and synthetics
2-Learn printing of non woven, hosiery goods,camouflage and yarn

DETAILED CONTENTS

1.PRONTING OF WOOL AND SILK:

Printing of wool and silk with different dye classes such as reactive, acid, metal complex dyes using the direct, discharge and resist styles.

2.PRINTING OF SYNTHETIC AND BLENDS:

Printing in different styles on polyester, nylon, acrylic and their blends such as P/V, P/C, wool/acrylic, wool/nylon and different types of union fabrics- cotton/wool, cotton/silk etc with different dye classes.

3.OTHER TECHNIQUES OF PRINTING:

raised, metal and flock printing, foam printing, bubble printing etc. Spray printing, Tie and dye, Batik printing, Brasso printing.

4.TRANSFER PRINTING:

fundamental principles of transfer printing, Sublimation transferprinting of polyester, machines used. Digital printing - Inkjet printing, concept and practice.

5. Printing of non wovens, hosiery goods and bonded goods, camouflage printing, yarn printing.

TECHNOLOGY OF TEXTILE PRINTING -II

LIST OF PRACTICALS

1. Printing of cotton by spray printing.

2.Printing of wool and silk by acid dyes.

3.Printing of manmade fiber fabrics.

4. Printing of blends.

5. Printing of cotton by discharge style under various classes of dyes.

6. Printing of cotton by resist style under various classes of dyes.

    1. Digital printing of various fabrics.

INSTRUCTIONAL STRATEGY

Teacher should take theory lecture, demonstration of concepts and prototype

MEANS OF ASSESSMENT

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

RECOMMENDED BOOKS

1. Technology of Printing by V.A. Shenai
2. Technology of Printing by G.D. Kale
3. Chemical Processing of Synthetic Fibres& Blends by Datye&Vaidhya

Websites for Reference:
https://nptel.ac.in/

SUGGESTED DISTRIBUTION OF MARKS

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

6.5 INTRODUCTION TO KNITTING AND GARMENT TECHNOLOGY (COMMON TO TEXTILE TECHNOLOGY)

L	T	P
4	-	4

RATIONALE

This paper deals with new developments in knitting and garment technology. This knowledge is the need of the hour to pace with the time.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:
1-To understand the basic concept of knitting
2-To understand concept of loop formation with help of needles
3-To understand garment making

DETAILED CONTENTS

1. KNITTTING :

Introduction and general terms of knitting, Difference in woven and knitted fabrics, properties-knit Vs woven. Warp and weft knitting-mechanism and comparison.

2. LOOP FORMATION WITH NEEDLE :

Running position, clearing position, Feeding position, Knocking over positions, Knitting position.

3. KNITTING NEEDLES :

Beard, Latch, Compound type of knitting needles, Advantages and disadvantages of beard and latch type.

4. STITCHES :

Knit, tuck and floats and its comparison.

5. TYPES OF LOOPS :

Types of loops, Classification of weft knitted fabrics - single knit (single jersey), Double knit (double jersey), Factors responsible for production is weft knitting machine.

6. GARMENT CLASSIFICATION :

Garment classification for men and woven. Fabric selection for garment and properties. Measurement and its importance, Methods of taking important body measurements for gents and ladies garments.

7. PATTERNING AND GRADING :

Patterning, importance of paper patterns, Types of patterns, Study of pattern drafting, Identification offitting problems and its remedy.

8. TYPES OF SLEEVES, COLLARS, POCKETS, ETC.

9. SPREADING, CUTTING AND SORTING :

Objectives of spreading, Methods of spreading, cutting and sorting.

10. SEWING TECHNOLOGY :

Classification of stich, Types of seams sewing tools and part of sewing machine.

11. STITCHING DEFECTS & THEIR REMEDIES.

6.4 INTRODUCTION TO KNITTING AND GARMENT TECHNOLOGY (COMMON TO TEXTILE TECHNOLOGY)

LIST OF PRACTICALS

1. Standard measurement for children.

2. Bodies block for

i. 3 Years child
ii. Grown up woman
iii. Grown up man

3. Application of the principle and technique of pattern making for design and construction of -

i. Blouse
ii. Ladies suit
iii. Gents shirts
iv. Pant.

4. Drafting of different types of sleeves and collars.

5. Study of construction and working of knitting machine Parts.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centered 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.Knitting Technology by Ajgaonkar
2.Fundamentals and advances in knitting technology by H C Ray
3. Garment manufacturing process practices and technology by Prasanta Sarkar

Websites for Reference:

https://nptel.ac.in/

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	3	6
2	3	6
3	7	13
4	5	9
5	5	9
6	7	13
7	5	9
8	5	6
9	6	11
10	6	11
11	4	7
Total	**56**	**100**

6.6 PROJECT

L	T	P
-	-	8

Two periods per week are allotted for project work in the final year of the course. In classroom students (i) be encouraged and helped for developing new designs in yarn/weave (ii) be given clear idea of establishing a spinning/weaving unit of given size beginning from selection of site, deciding type of building construction/shed, units of machinery required, their layout. Fundamental requirements of spinning and weaving mill organization. Deciding number of workers and their type. Process control in spinning and weaving departments, elements of costing and costing procedures in various sections, Factors affecting productivity and efficiency of men and machines, sources of finance and development of resources. For general awareness students be introduced to organizations involved in certification, standardization, research and development of textile products Viz. BIS, Centre Silk Board, Textile Committee, Textile Commission, Jute Commission, ATIRA, NITRA, BTRA, etc.

The project paper will be of two parts. Part-A will contain the problems to evaluate students learning. The Part-B will be regarding students awareness of the plans and programmes running for rural development, ecological balance and environmental pollution control, entreprenurship development and agencies involved in these works.

PART-A:

Part-A
will contain two types of problems (i) relating to development of designs in yarn/weave and preparing their samples. (ii) relating to establishment of a spinning/weaving unit of given size. The student will be allowed to choose one either kind of the problem to solve.

PART-B:

The student Will survey a village and prepare a report giving details of population, means of lively hood, Health and hygenic conditions, Education facilities and various programmes/projects running for the development and the personnels and agencies involved in the work. He will also make observation on environmental pollution and ecological disturbunces and will make a mention of these in his report with their reasons, suggesting remedies. Without it the project will not be taken as complete. The student will also do some constructive work for pollution control as advised by the guiding teacher

Student will choose any one of the problems from Part(A) and Part(B) is compulsary for all students. The students can be divided into groups of threes to do one problem. The students will be examined for 100 marks by an examiner appointed by B.T.E, U.P.

1. Examination Marks **100**

Part A:-

Project Work	70	
Viva Voce	25	
Part B:-		
Project Work	15	
Viva Voce	10	
Sessional Marks	50	50
Total	150	150

10. RESOURCE REQUIREMENT

10.1 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 Textile Chemistry

- Communication Laboratory
- Applied Physics Laboratory
- Applied Chemistry Laboratory
- Engineering Drawing
- Genera; Mechanical Engineering
- Basics of Information Technology/Computer Laboratory
- Carpentry Shop
- Painting and Polishing Shop
- Electrical Shop
- Smithy Shop
- Fitting and Plumbing Shop
- Sheet Metal Shop
- Welding Shop
- Foundry Shop
- Machine Shop
- Textile Fibers Laboratory
- Preparatory Chemical Processing Laboratory
- Physical Chemistry Laboratory
- Technology of Dyeing Laboratory
- Textile Texting Laboratory
- Technology of Printing Laboratory
- Introduction to Knitting and Garment Laboratory
- Environmental Engineering Lab
- Energy Conservation Lab

EQUIPMENT REQUIREMENT FOR TEXTILE CHEMISTRY

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

Sr. No.	Description	Qty	Total Price (Rs)
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)	2,000

		2 (big)	
Sr. No.	**Description**	**Qty**	**Total Price (Rs)**
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) - Charcoal (as per requirement) - Kerosene- 1 ltr	LS	20,000
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
APPLIED MECHANICS LABORATORY			
1.	Polygon law of forces apparatus	1	2,000
2.	Jib crane	1	4,000
3.	Apparatus for reaction at supports	1	5,000
4.	Inclined plane and friction apparatus	1	2,500
5.	Screw jack	1	1,000
6.	Worm and worm wheel	1	3,500
7.	Single Purchase Winch Crab	1	4,000
8.	Miscellaneous	LS	1,000
BASICS OF IT LABORATORY/COMPUTER 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
Sr. No.	**Description**	**Qty**	**Total Price (Rs)**
7.	Internet Facility on Computers	LS	2,00,000
8.	AutoCAD/Solid Works/Unigraphics/Pro-C (any one software)	30 user	5,00, 000
9.	LCD Projector	1	35,000
10.	UPS	60	1,20,000
11.	Software (latest windows, latest MS Office)	1	1,00,000
12.	Scanner	1	10,000
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*
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, Srew driver, Knife, Steel rule, hammer, sciber, 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

Sr. No.	Description	Qty	Total Price (Rs)
SMITHY SHOP			
1.	Black smithy forge (with open hearths, accessories to match the forge)	20	40,000
2.	Wrought iron anvils	20	20,000
3.	Swage blocks	4	8,000
4.	Blower with accessories, motor switch etc	1	6,000
5.	Work benches with vices	2	6,000
6.	Power hammer	1	20,000
7.	Tools and accessories – hammers, swages, tongs, pokers, pullers etc	20	10,000
8.	Miscellaneous	LS	1,500
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			
1.	Hammers	8	3,000
2.	Mallets (Hard & Soft)	5	2,000
3.	Sheet and wire Ganges	LS	8,00

Sr. No.	Description	Qty	Total Price (Rs)
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*
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*

Sr. No.	Description	Qty	Total Price (Rs)
FOUNDRY SHOP			
1.	Moulding boxes	40	8,000
2.	Ladles	5	2,000
3.	Tool Kits	10 set	5,000
4.	Quenching tanks	2	5,000
5.	Portable grinder	1	3,000
6.	Pit furnace with blower	1	10,000
7.	Miscellaneous	LS	1,000
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
ENVIRONMENT ENGINEERING LABORATORY			
1.	pH Meter	01	500
2.	Turbidity Meter	01	5000
3.	Oven with Temperature Controller and Forced Air Circulation Type	01	20000
4.	B.O.D. Incubator	01	25000
5.	Water Analysis Kit	01	5000
6.	High Volume Sampler	01	40000
7.	Electrical Balance for weighing upto 1/10 of milligram	01	1000

	(capacity)		
ENERGY CONSERVATION LABORATORY			
1	Clamp meter	02	5000
2	Multimeter	02	2000
3	Power Analyser	01	20000
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	500
5	Lux meter	02	5000
6	Centrifugal pump, 1 kW	1	15,000
7	Standard window A.C.	01	20000
8	Anemometer	02	5000
9	Thermometer	03	2000
10	Flow meter	02	10000
11	Pumping set with at least two pumps of different capacity.	1 set	10000
12	Pressure gauge fitted on discharge lines	1 set	2000
13	Variable Frequency Drive	02	50000
14	A small compressor with a small network of pipe line fitted with suitable pipeline, pressure gauge, safety valve and loading / unloading pressure switch.	1	3000
15	Stop watch	2	1000
16	Small blower (1.5 kW motor) with inlet and outlet ducts of approximately one meter length on both sides	1	10000
17	Black Box (for checking lamp efficacy including stand and luxmeter)	1	25000

GENERAL MECHANICAL ENGINEERING LAB

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	Biogas Plant	1		
2.	Windmill	1		
3.	Experimental Solar Cooker Box Type Instrumented To Measure Temperature its Performance & Temperature At Various Location.	1	500	500
4.	Photo Voltage Solar Cell	1	10000	10000
5.	Throttling & Separating Colorimeter. (Thermal Engg. Lab)	1	10000	10000
6.	Jib Head Key, Flat Key, Saddle Key, Wood Ruff Key, Feather Key Pinkey& A piece of splined shaft.	1 Set	L.S.	500
7.	Pins- Split Pin, Taper Cottor Type Split Pin, Cottor or Cottor Pin, Cottor Bolts; Lewis or Rag Foundation Bolt, Fish Tail & Square Head Foundation Bolts.	1 Set	L.S.	500
8.	Friction Clutches & Couplings-Cone Clutch, Single Plate Muff Coupling, Flange Coupling Universal Coupling or Hooks Joint. Flexible Coupling-Belt & Pin Type, Coil Spring Type.	1 Set	L.S.	2500
9.	Bearings- Plane, Bushed, Split Step, Ball, Rollar Bearings, Thrust Bearings.	1 Set	L.S.	1000
10.	Spur gear Single & Double Helical Gears, Bevel Gears.	1 Set	L.S.	1000
11.	Simple Spur Gear train	1	1500	1500
12.	Compound Gear Train	1	1500	1500
13.	Epicyclic Gear Train	1	2000	2000
14.	Compression & Tension Each Helical Springs.	1	200	200
15.	Four Bar Mechanism Fitted on a board.	1	1000	1000
16.	Slider Crank Mechanism	1	1000	1000
17.	Whitworth Quick Return Mechanism Fitted on a board.	1	1000	1000

ELECTRICAL TECHNOLOGY & ELCETRONICS LAB

S.No	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	D.C. Shunt Motor3 Kw. 1500 RPM with 3 Point Starter	2	10000	20000
2.	D.C. Compound Motor3 Kw. 1500 RPM	2	10000	20000
3.	Single Phase Transformer1 KVA 50 Hz. Primary Voltage 230 with tapping at 50%, 86.6 % Facility	2	6000	12000
4.	3 Phase Induction Motor 415 V., 50 Hz, 440 RPM, 3 KVA Star/Delta/Autotransformer Starter	2	5000	10000
5.	Loading Drum Spring Balance& Belt Arrnagement.	2 Set	1000	2000
6.	Tachometer (Analog/Digital)	1	2000	2000
7.	3 Phase Inductive Loading of Variable Nature	1	8000	8000
8.	Single Phase Inductive Loading Variable 0-10 Amp., 50 Hz.	1	8000	8000
9.	Moving Coil Ammeter 0-10 Amp.	8	1000	1000
10.	Moving Coil Voltmeter 0-300 V.	8	1000	8000
11.	Moving Iron Ammeter 0-10 Amp.	8	1000	8000
12.	Moving Iron Voltmeter 0-300 V.	8	1000	8000
13.	Wattmeter Single Phase Dynamo Type 75/300/600 V. 2.5/5 Amp.	4	2500	10000
14.	Three Phase Variable Inductive Loading.	1	8000	8000
15.	Single Phase Variable Inductive Loading with Rheostat	1	8000	8000
16.	Megger 0-20 Mega Ohm, 500 RPM .	1	8000	8000
17.	Flouroscent Tube With Choke.	1	100	100
18.	SCR Bread Board	1	1000	1000
19.	Power Supply 230 V.	1	1000	1000
20.	Moving Coil Ammeter 0-500 M.A.	1	1000	1000
21.	Moving Coil Voltmeter 0-250 V.	1	1000	1000
22.	Energy Meter Single Phase 230 V., 5 Amp	1	2000	2000
	Misc.		LS	1500

TEXTILE TESTING LAB

S.No	Name of Equipment	No.	@Rs.	Amt.in Rs.
1.	Baer Sorter (For Fibre Length) Acrylic Transparent Sheet - 6"X8"X2 pices, 3"X8"X2 pcs Fibre Mounting Templest 6"X8"X2 pices, 3"X8"X2 pcs with tweezers, velvet pad, scales, planchass with all complete accessories or Latest Configuration	2	20000	40000
2.	MicroscopeDigitalMocroscope - Microscope & Ends Counting Equipments-Magnifying Power 5X,10X,20X,40X,100X lenses Trinocular biological microscope with fibre cross section kit, high resolution CCD camera and imaging software with measurement facilities, Scope of use section of fibre or yarn, analysis of any fibre, yarn and fibre Range : 5X,10X,20X,450X,100X / as per requirements, Focus : Adjustable, Lights - White, Blue,Yellow, Upper & Lower, Supply -220 V AC supply Single Phase with all complete accessories Or Latest Configuration	2	65000	
3.	Moisture Meter	1	16000	16000
4.	Wrapreel	2	30000	60000
5.	Wrap Block	2	6000	12000
6.	Beesley Balance	4	7000	28000
7.	Quadrant Balance	2	4000	8000
8.	Lea Strength Tester	1	50000	50000
9.	Single Thread Tester (Digital)	1	100000	100000
10.	R. B. Twist Tester	2	25000	50000
11.	One Inch Twist Tester	2	8000	16000

12.	Take Up Twist Tester Yarn test length : 25 mm to 500 mm adjustable (Metric unit) Or 1" to 20" Maximum adjustable (imperial unit), The test lengthis automatically taken into account for calculation and finalreading is displayed directly in TPM/TPL Range :Upto 60TPL Resolution :1 TPM or 0.01 TPI Motor Speed: Upto 1500 RPM Clamps : Spring loaded clamps at motor end for easy clamping of Yarn Averaging : Reading of at least 10 samples can be stored and average TPM/TPI value is calculated and digital display with pre set device. Supply : 220 V AC, single phase Suitable for S/Z type of twisted yarn with reset device. Tension weight upto 100 gm adjustable. Yarn spool mounting arrangement at one end of the twist tester with all complete accessories or Latest Configuration	2	28500	57000
13.	Fabric Strength Tester (Tensile Strength)	1	50000	50000
14.	Tearing Strength Tester	1	20000	20000
15.	Bursting Strength Tester	1	35000	35000
16.	Abrasion Resistance Tester(Martindle Type)	1	50000	50000
17.	Laundrometer (For washing fastness testing)	1	50000	50000
18.	Crocko Meter	1	10000	10000
19.	Digital FibrographMeasuring Principle-Optical Measuring Range-12.0 to 45.0 mm Measuring Accuracy - +/- 0.1 mm Result Output-2.5% SL,50% SL & UR % Front End Language-English Applicable Standard-ASTM D5332,ISO2648 & IS233 Power Supply-Single Phase 220V AC	1	320000	320000
20.	Uster Evenness Tester	1	2000000	2000000
21.	Trash Analyser	1	150000	150000

22.	Conditioning Oven 220 V With capability of maintaining temperature up to 100oC and facility for smoth variation of temperature inside 27 liter.	1	98500	98500
23.	Stelometer (For bundle Strength)	2	70000	140000
24.	Crease Recovery Tester Size of the Test Specimen - 40mm X 15mm, Crease Load : 1Kg.(Stainless Steel), Angle measurement : On an Engraved circular scale graduated in 1 deg., Scale measurement : 0-180 with all complete accessories or Latest Configuration	2	15000	30000
25.	Water Repellancy Tester	1	80000	80000
26.	Pilling Tester	1	30000	30000
27.	Crimp Regidity Tester Minor Load - 2 Gr. to 10Gr. in a step of one grams Major Load - 100 Gr. to 500 Gr. in step of 50 Grams Digital display 220 V, with all complete accessories or Latest Configuration	1	20000	20000
28.	Air Permeability Tester	1	35000	35000
29.	Sheffield Micronair (For Fibre Fineness)	1		
30.	Uster Stapler for fibre length	1		
31.	A.N. staplling apparatus for fibre fineness Tester	1		
32.	Miscellaneous Items-Thermameters, L.S. Heating Devices, Thermohydrograph, Whirling Hydrometer, Dry & Wet bulb thermometer, Physical Balance, etc.			
33.	Classimate (Yarn faults finding equipments)	1		900000
33.	H.V.I. (High Volume Instrument) for various parameter of fibre	1		3500000
34.	Sublimation fastness tester	1		15000
35.	Round Sample of GSM with Electronic balance	1	35000	35000
36.	Stiffness Tester	1	15000	15000
37.	Drapemeter	1	25000	25000
38.	Fabric Thickness Tester	1	8000	8000
39.	A.S.T.M. Cards For Threads/Inch	1		

NOTE:

1. Item No. 17,18,25 and 26 are not required for Textile Technology course.
2. Indian make working laboratory models for costly equipment be purchased if available.

PROCESS HOUSE

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	Lab Model of Jigger Machine	1	600000	600000
2.	Electronic weighing scale (min 0.01gm to 300 gm)	1	7000	7000
3.	Dye Bath For Experimental Work	10	10000	100000
4.	Spray, Block and Screen Systems of Printing	10 Set	700	7000
5.	Spray Printing Machine With Compressor	1	150000	150000
6.	Lab Model of High Temperature Beaker Dyeing Machine	1	400000	400000
7.	Lab Model of Padding Mangle Machine.	1	400000	400000
8.	Electrically Operated Lab Stirrers			
	A. Fixed Type	1	7000	7000
9.	Colour Cabinet(Shade matching box)	1	40000	40000
10.	Stenter (Electrically heat setting and Curing Machine)	1	600000	600000
11.	Lab model of Infra Red beaker Dyeing Machine (Beaker -12/18)	1	500000	500000
12.	Wrap reel	1	20000	20000
13.	Lab Model of Winch Dyeing Machine(Open and Closed)	1	250000	75000
14.	HTHP Package Dyeing or Beam Dyeing Machine with compressor	1	600000	600000
15.	Induction Heater	1	4000	4000
16.	Hot Air Oven	1	250000	250000
17.	Vaccum Cleaner For Spray Printing	1	45000	45000

NOTE:

1. Indian make working laboratory models for the costly equipment be purchased if available.

Note:

1. The specifications and price of equipment mentioned above used as broad guidelines for purchase of equipment.
2. Any other items not mentioned in the lit of equipment can be purchased as provision has been made for purchase under the item miscellaneous for each lab/shop.
3. Any additional equipment, already available in the institute, may be used for demonstration to the students.

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.

10.2 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.

ANNEXURE - I

PROPOSED GUIDE
FOR
SECOND YEAR STUDENTS TO PREPARE THEIR INDUSTRIAL VISIT REPORT

1. Name & Address of the unit

2. Date of

i. Joining.
ii. Leaving.

3. Nature of Industry

i. Product & Capacity.
ii. Services.
iii. Working Hrs.

4. Sections of the unit visited and activities there in.

5. Details of machines/Tools & instruments used in working in the section of the unit visited and its layout.

6. Work procedure in the section visited.

7. Specifications of the product of the section and materials used.

8. Work of repair and maintenance cell.

9. Details of the shops (welding,Foundry, Machines shop etc) related to repair and maintenance work.

10. Name of checking and Inspecting Instruments and their details. Quality controls measures taken.
11. Details of hydraulics/pneumatic/thermal units or appliances used. Material Handling Equipment.

12. Description of any breakdown and its restoring.

13. Use of computer - if any.

14. Visit of units store, Manner of keeping store items, Their receiving & distribution.

15. Safety measures on work place & working conditions in general -comfortable, convenient & hygienic.

ANNEXURE - II

TRAINEES ASSESSMENT

The Institute invites the comments on the work &behavior of student during his stay in the industry from his immediate supervisors on the following points.

1. Name of the trainee
2. Date of
   i. Joining.
   ii. Leaving.
3. i. Regularity & Punctuality

   ii. Sense of responsibility

   iii. Readiness to work/learn

   iv. Obedience

   v. Skill aquired
4. Name of the sections of the unit he attended during his stay.

   His activities/worth of being there.
5. Any thing specific

Signature of the professor

Date :- Designation

11. EVALUATION STRATEGY

11.1 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.

11.2 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 students 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 studentsbehaviour 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 asemester, 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.
14. 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.

13. LIST OF PARTICIPANTS

List of experts who contributed in the development of the curriculum in Review and Revision for the Three year (Six Semester) Diploma Textile Technology (First and Second Semester) at I.R.D.T., U.P., Kanpur on 24 & 25 August 2022 are honorable named below :

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LIST OF EXPERTS

List of experts who contributed in the development of the curriculum in Semester System for the Three year (Six Semester) Diploma in Textile Chemistry(Third, Fourth, Fifth and Six Semester) at I.R.D.T., U.P., Kanpur on 07.06.2023 & 08.06.2023 are honorable named below :.

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