COMPETENCY BASED CURRICULUM

DIPLOMA
IN
TEXTILE PROCESSING

(Duration 03 Years)
NSQF Level – 5

Under
Haryana State Board of Technical Education

Developed By

Curriculum Development Center

National Institute of Technical Teachers Training & Research

(Ministry of Education, Government of India)

Sector - 26, Chandigarh, UT, India

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PREFACE

Learning and learning experience are the foundation of any education system. Appropriateness of education and its useful implications stand on the platform of knowledge and skill. But the knowledge and skill cannot be quantified qualitatively without ensuring learning experience. Curriculum is the pathway to select and organise learning experience. It helps the teachers to provide tangible resources, goals and objectives to learners. Curriculum acts as a catalyst to stimulate creativity, innovation, ethics, values, responsibility and many human factors. Curriculum embodies rigour and high standards and creates coherence to empower learner to meet the industrial and societal needs. Curriculum is a central guide for a teacher to plan a standard based sequence for the instructional delivery.

The industrial revolution 4.0 has forced the technical education system to reinvent the curriculum to meet the human resource requirement of the industry. The data driven systems relying on the subjects like machine-learning, Artificial Intelligence, Data Science etc are literally forcing the technical education system to offer different subjects differently to address the emerging challenges. The non-linear way of learning now facilitates students to choose path of knowledge to skill or vice-versa. The bi-directional process requires innovative curriculum design and revision. Diploma programme is now more challenging than ever. The level of skill and knowledge demanded by industry from diploma holders are highly interdisciplinary at the same time address special need. Hence, there is a need to align the curriculum to National Skill Qualification Framework (NSQF).

National Education Policy, NEP-2020 has now opened up diversities for the education system to explore and exploit to make the education relevant. The policy emphasises to inculcate value, ethics, respect to culture and society etc along with industry ready knowledge and skill among the students. The interdisciplinary nature of curriculum, academic bank of credits and integration of technology in teaching-learning envisaged in NEP-2020 make it more challenging for curriculum development. NITTTR, Chandigarh has developed the art of curriculum development over 54 years of its existence. The expertise and experience available in the institute follow time-tested and acclaimed scientific methods to design/revise curriculum. The experienced faculty members entrusted with the curriculum development or revision activities are well-versed with NSQF, NEP and Outcome based education. I am happy to note that **Haryana State Board of Technical Education, Panchkula, Haryana** reposed their confidence on this expertise to develop **AICTE/NSQF/NEP 2020** aligned curriculum for the state. This documented curriculum is an outcome of meticulous planning and discussions among renowned experts of the subject through series of workshops. The effective implementation of this curriculum supported with quality instructional resources will go a long way in infusing the learning experience among learners to make them industry ready.

Director

National Institute of Technical Teachers Training & Research, Chandigarh

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Professor & Head
Curriculum Development Center
National Institute of Technical Teachers Training & Research, Chandigarh

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1. SALIENT FEATURES

1.	Name	:	**Diploma in Textile Processing**
2.	Duration	:	**03 Years**
3.	Hours per week	:	**35**
4.	Entry Qualification	:	**10th Pass**
5.	Student Intake	:	**As per sanctioned strength**
6.	Pattern	:	**Semester**
7.	Scheme	:	**Multi Point Entry and Exit**
8.	NSQF Level	:	**5**
9.	Theory Practical Ratio	:	**34 : 66**
10.	Project Work	:	**Minor and Major Project**
11.	In-house/Industrial Training	:	**Mandatory after First and Second Year**

2. NSQF GUIDELINES

National Skill Qualification Framework has defined total Ten Levels. Each level of the NSQF is associated with a set of descriptors made up of five outcome statements, which describe in general terms, the minimum knowledge, skills and attributes that a learner needs to acquire in order to be certified for that level.

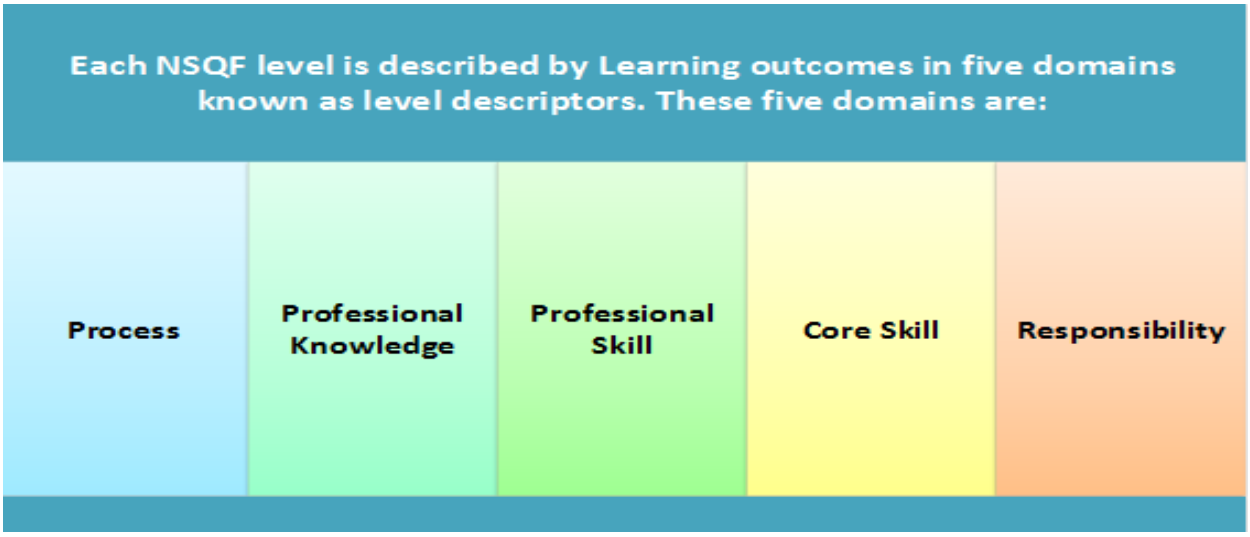

Fig1: NSQF Domains

NSQF LEVEL - 3 COMPLIANCE

The NSQF level - 3 descriptor is as follows:

Process	• Person may carry out a job which may require limited range of activities routine and predictable.
Professional Knowledge	• Basic facts, process and principle applied in trade of employment.
Professional Skill	• Recall and demonstrate practical skill, routine and repetitive in narrow range of application.
Core Skill	• Communication written and oral, with minimum required clarity, skill of basic arithmetic and algebraic principles, personal banking, basic understanding of social and natural environment.
Responsibility	• Under close supervision. Some responsibility for own work within defined limit.

Fig 2: NSQF Level – 3 Descriptor

Work requiring knowledge, skills and aptitudes at level 3 will be routine and predictable. Job holders will be responsible for carrying out a limited range of jobs under close supervision. Their work may require the completion of a number of related tasks. People carrying out these job roles may be described as “Semi skilled workers”. Individuals in jobs which require level 3 qualifications will normally be expected to be able to communicate clearly in speech and writing and may be required to use arithmetic and algebraic processes. They will be expected to have previous knowledge and skills in the occupation and should know the basic facts, processes and principles applied in the trade for which they are qualified and be able to apply the basic skills of the trade to a limited range of straightforward jobs in the occupation.

They will be expected to understand what constitutes quality in their job role and more widely in the sector or sub-sector and to distinguish between good and bad quality in the context of the jobs they are given. Job holders at this level will be expected to carry out the jobs they are given safely and securely. They will work hygienically and in ways which show an understanding of environmental issues. This means that they will be expected to take responsibility for their own health and safety and that of fellow workers and, where appropriate, customers and/or clients. In working with others, they will be expected to conduct themselves in ways which show a basic understanding of the social environment. They should be able to make a good contribution to team work.

NSQF LEVEL - 4 COMPLIANCE

The NSQF level-4 descriptor is given below:

Process	• Work in familiar, predictable, routine, situation of clear choice
Professional Knowledge	• Factual knowledge of field of knowledge or study.
Professional Skill	• Recall and demonstrate practical skill, routine and repetitive in narrow range of application, using appropriate rule and tool, using quality concepts.
Core Skill	• Communication written and oral, with required clarity, skill of basic arithmetic and algebraic principles, personal banking, basic understanding of social and natural environment.
Responsibility	• Responsibility for own work and learning.

Fig 3: NSQF Level – 4 Descriptor

Work requiring knowledge, skills and aptitudes at level 4 will be carried out in familiar, predictable and routine situations. Job holders will be responsible for carrying out a range of jobs, some of which will require them to make choices about the approaches they adopt. They will be expected to learn and improve their practice on the job. People carrying out these jobs may be described as "skilled workers". Individuals in jobs which require level 4 qualifications should be able to communicate clearly in speech and writing and may be required to use arithmetic and algebraic processes. They will be expected to have previous knowledge and skills in the occupation in which they are employed, to appreciate the nature of the occupation and to understand and apply the rules which govern good practice. They will be able to make choices about the best way to carry out routine jobs where the choices are clear.

They will be expected to understand what constitutes quality in the occupation and will distinguish between good and bad quality in the context of their job roles. Job holders at this level will be expected to carry out their work safely and securely and take full account of the health and safety on colleagues and customers. They will work hygienically and in ways which show an understanding of environmental issues. In working with others, they will be expected to conduct themselves in ways which show a basic understanding of the social and political environment. They should be able to guide or lead teams on work within their capability.

NSQF LEVEL - 5 COMPLIANCE

The NSQF level-5 description is given below:

Process	• Job that requires well developed skill, with clear choice of procedures in familiar context.
Professional Knowledge	• Knowledge of facts, principles, processes and general concepts, in a field of work or study.
Professional Skill	• A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information.
Core Skill	• Desired mathematical skill; understanding of social, political; and some skill of collecting and organising information, communication.
Responsibility	• Responsibility for own work and learning and some responsibility for others' works and learning

Fig 4: NSQF Level – 5 Descriptor

Work requiring knowledge, skills and aptitudes at level 5 will also be carried out in familiar situations, but also ones where problems may arise. Job holders will be able to make choices about the best procedures to adopt to address problems where the choices are clear. Individuals in jobs which require level 5 qualifications will normally be responsible for the completion of their own work and expected to learn and improve their performance on the job. They will require well developed practical and cognitive skills to complete their work. They may also have some responsibility for others' work and learning. People carrying out these jobs may be described as "fully skilled workers" or "supervisors".

Individuals employed to carry out these jobs will be expected to be able to communicate clearly in speech and writing and may be required to apply mathematical processes. They should also be able to collect and organise information to communicate about the work. They will solve problems by selecting and applying methods, tools, materials and information. They will be expected to have previous knowledge and skills in the occupation, and to know and apply facts, principles, processes and general concepts in the occupation. They will be expected to understand what constitutes quality in the occupation and will distinguish between good and bad quality in the context of their work. They will be expected to operate hygienically and in ways which show an understanding of environmental issues. They will take account of health and safety issues as they affect the work they carry out or supervise.

In working with others, they will be expected to conduct themselves in ways which show an understanding of the social and political environment.

3. NATIONAL EDUCATION POLICY (NEP) - 2020

NEP 2020 aims at a comprehensive holistic education to develop all capacities of human beings - intellectual, aesthetic, social, physical, emotional, and moral - in an integrated manner. A holistic arts education will help develop well-rounded individuals that possess: critical 21st century capacities in fields across the arts, humanities, languages, sciences, social sciences, and professional, technical, and vocational fields; an ethic of social engagement; soft skills, such as communication, discussion and debate; and rigorous specialization in a chosen field or fields. Such a holistic education shall be, in the long term, the approach of all undergraduate programmes, including those in professional, technical, and vocational disciplines.

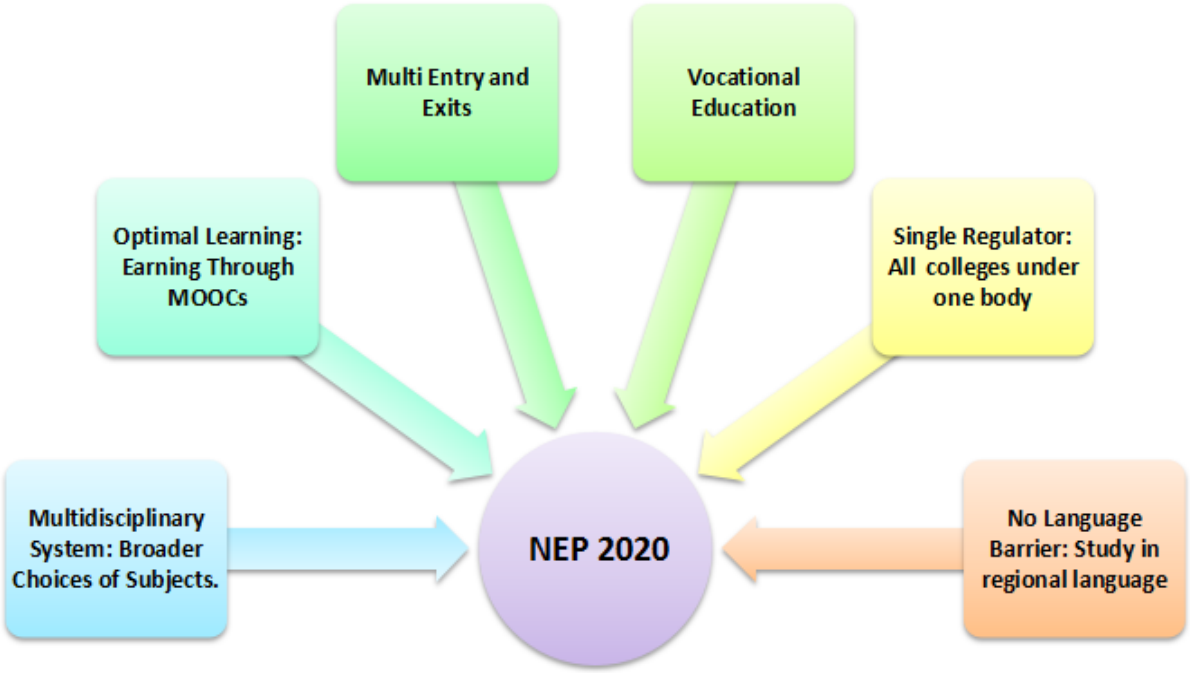

Fig 5: NEP 2020

Flexibility in curriculum and novel and engaging course options will be on offer to students, in addition to rigorous specialisation in a subject or subjects. Pedagogy for courses will strive for significantly less rote learning and an increased emphasis on communication, discussion, debate, research, and opportunities for cross-disciplinary and interdisciplinary thinking. The flexible and innovative curriculum shall emphasize on offering credit-based courses and projects in the areas of community engagement and service, environmental education and value-based education. as part of a holistic education, students will be provided with opportunities for internships with local industry, businesses, artists, crafts persons, villages and local communities, etc., as well as

research internships with faculty and researchers at their own or other HEIs or research institutions, so that students may actively engage with the practical side of their learning and, as a by-product, further improve their employability.

Effective learning requires relevant curriculum, engaging pedagogy, continuous formative assessment and adequate student support. The curriculum must be updated regularly aligning with the latest knowledge requirements and shall meet specified learning outcomes. High-quality pedagogy is then necessary to successfully impart the curricular material to students; pedagogical practices determine the learning experiences that are provided to students - thus directly influencing learning outcomes. The assessment methods have to be scientific and test the application of knowledge. Higher Education Institutes should move to a criterion-based grading system that assesses student achievement based on the learning goals for each programme, making the system fairer and outcomes more comparable. HEIs should also move away from high-stakes examinations towards more continuous and comprehensive evaluation.

4. DIPLOMA PROGRAMME OUTCOMES

The programme outcomes are derived from five domains of NSQF Level namely Process, Professional Knowledge, Professional Skill, Core Skill, Responsibility. After completing this programme, the student will be able to:

PO1: Perform tasks in limited range of activities, familiar situation with clear choice of procedures.

PO2: Acquire knowledge of principles and processes in the field of Textile Processing.

PO3: Develop skills to accomplish quality tasks and solve problems using methods, tools, materials and information**.**

PO4: Demonstrate skill of communication, basic mathematics, collecting and organizing information along with knowledge of social, political and natural environment.

PO5: Take the responsibility of own works and supervises others work.

PO6: Select multidisciplinary and open subjects of own interest and perform self learning through Massive Open Online Courses.

5. DERIVING CURRICULUM AREAS FROM DIPLOMA PROGRAMME OUTCOMES

The following curriculum areas have been derived from Programme outcomes:

Sr. No.	Programme Outcomes	Curriculum Subjects / Areas
1.	Perform tasks in limited range of activities, familiar situation with clear choice of procedures.	• Applied Physics • Applied Chemistry • Introduction to Textile Fibers • Design, Colour and CATD • Technology of Bleaching – I • Introduction to Textile Processes • Basics for Textile Chemistry • Dyestuff Chemistry • Technology of Bleaching - II • Dyeing of Natural Fibres • Technology of Printing - I • Technology of Finishing - I • Textile Physical Testing • Dyeing of Synthetic and Blended Textiles • Technology of Printing - II • Textile Chemical Testing • Denim Processing • Advancements in Textile Printing • Computer Colour Matching • Technology of Finishing – II • Technical Textiles • Fibre to Finished Fabric Practices
2.	Acquire knowledge of principles and processes in the field of Textile Processing.	• Applied Science • Introduction to Textile Fibers • Technology of Bleaching – I • Introduction to Textile Processes • Basics for Textile Chemistry • Textile Auxiliaries and Chemicals • Dyestuff Chemistry • Technology of Bleaching - II • Dyeing of Natural Fibres • Technology of Printing - I • Technology of Finishing - I

		• Textile Physical Testing • Dyeing of Synthetic and Blended Textiles • Technology of Printing – II • Textile Chemical Testing • Denim Processing • Advancements in Textile Printing • Technology of Finishing – II • Technical Textiles • Process Quality Control in Textile Wet Processing • Programme Elective-I • Programme Elective-II
3.	Develop skills to accomplish quality tasks and solve problems using methods, tools, materials and information**.**	• Introduction to Textile Fibers • Design, Colour and CATD • Technology of Bleaching – I • Introduction to Textile Processes • Basics for Textile Chemistry • Dyestuff Chemistry • Technology of Bleaching - II • Dyeing of Natural Fibres • Technology of Printing - I • Technology of Finishing - I • Textile Physical Testing • Dyeing of Synthetic and Blended Textiles • Technology of Printing - II • Textile Chemical Testing • Denim Processing • Advancements in Textile Printing • Computer Colour Matching • Technology of Finishing – II • Technical Textiles • Fibre to Finished Fabric Practices
4.	Demonstrate skill of communication, basic mathematics, collecting and organizing information along with knowledge of social, political and natural environment.	• English and Communication Skills I • Applied Mathematics • Fundamentals of IT • Environmental Studies & Disaster Management • Summer Industrial/In-house Training-I

		• English & Communication Skills II • Minor Project • Industrial Training-II • Entrepreneurship Development & Management • Major Project/ Industrial Internship
5.	Take the responsibility of own works and supervises others work.	• Summer Industrial/In-house Training-I • Minor Project • Major Project/ Industrial Internship
6.	Select multidisciplinary and open subjects of own interest and perform self learning through Massive Open Online Courses.	• Multidisciplinary Elective (MOOCs/Offline) • Open Elective

FIRST YEAR

NSQF LEVEL - 3

6. STUDY CUM EVALUATION SCHEME (FIRST YEAR)

FIRST SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week		Credits (C) (L + P = C)	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	P		Th	Pr	Total	Th	Pr	Total	
1.1	*English &Communication Skills– I	2	2	2 + 1 = 3	40	40	80	60	60	120	200
1.2	*Applied Mathematics - I	4	-	4 + 0 = 4	40	-	40	60	-	60	100
1.3	**Applied Physics	2	2	2 + 1 = 3	40	40	80	60	60	120	200
1.4	*Applied Chemistry	3	2	3 + 1 = 4	40	40	80	60	60	120	200
1.5	Introduction to Textile Fibers	3	6	3 + 3 = 6	40	40	80	60	60	120	200
1.6	Design, Colour and CATD	-	6	0 + 3 = 3	-	40	40	-	60	60	100
1.7	*Environmental Studies & Disaster Management	2	-	2 + 0 = 2	40	-	40	60	-	60	100
# Student Centered Activities(SCA)		-	1	-	-	-	-	-	-	-	-
Total		**16**	**19**	**25**	**240**	**200**	**440**	**360**	**300**	**660**	**1100**

* Common with other Diploma Courses.

** Same as Applied Mathematics-I and Applied Physics. Also common with other Diploma Courses

Student Centered Activities will comprise of co-curricular activities like extension lectures on Constitution of India, Games, Yoga, Human Ethics, Knowledge of Indian System, Hobby clubs e.g. Photography etc., Seminars, Declamation contests, Educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

SECOND SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week		Credits (C) (L + P = C)	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	P		Th	Pr	Total	Th	Pr	Total	
2.1	Technology of Bleaching - I	2	4	2 + 2 = 4	40	40	80	60	60	120	200
2.2	**Introduction to Textile Processes	3	4	3 + 2 = 5	40	40	80	60	60	120	200
2.3	Basics for Textile Chemistry	2	4	2 + 2 = 4	40	40	80	60	60	120	200
2.4	Textile Auxiliaries and Chemicals	2	-	2 + 0 = 2	40	-	40	60	-	60	100
2.5	Dyestuff Chemistry	2	4	2 + 2 = 4	40	40	80	60	60	120	200
2.6	*Fundamentals of IT	2	4	2 + 2 = 4	40	40	80	60	60	120	200
# Student Centered Activities (SCA)		-	2	-	-	-	-	-	-	-	-
Total		**13**	**22**	**23**	**240**	**200**	**440**	**360**	**300**	**660**	**1100**

* Common with other Diploma Courses

** Common with Textile Technology

Student Centered Activities will comprise of co-curricular activities like extension lectures on Constitution of India, Games, Yoga, Human Ethics, Knowledge of Indian System, Hobby clubs e.g. Photography etc., Seminars, Declamation contests, Educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

Summer Industrial/In-house Training: After 2nd semester, students shall undergo Summer Training of minimum 4 Weeks.

7. HORIZONTAL AND VERTICAL SUBJECTS ORGANISATION

Sr. No.	Subjects	Hours Per Week	
		First Semester	Second Semester
1.	English & Communication Skills – I	4	-
2.	Applied Mathematics - I	4	-
3.	Applied Physics	4	-
4.	Applied Chemistry	5	-
5.	Introduction to Textile Fibers	9	-
6.	Design, Colour and CATD	6	-
7.	Environmental Studies & Disaster Management	2	
8.	Technology of Bleaching - I	-	6
9.	Introduction to Textile Processes	-	7
10.	Basics for Textile Chemistry	-	6
11.	Textile Auxiliaries and Chemicals	-	2
12.	Dyestuff Chemistry		6
13.	Fundamentals of IT	-	6
14.	Student Centered Activities	1	2
	Total	**35**	**35**

8. COMPETENCY PROFILE & EMPLOYMENT OPPORTUNITIES

In government and private sectors related to **Textile Processing**, **"Semi Skilled workers"** are required to carry out a limited range of predictable tasks under close supervision. They are expected to communicate in written or oral with required clarity along with basic understanding of mathematics, social and natural environment. They should know the basic facts, limited processes and principles relevant to Textile Processing.

Textile Processing students after NSQF – Level 3 should know about the basic properties and end uses of different raw materials. They should have good understanding of various elements and concepts of colour and designing. Textile Processing students are expected demonstrate competency to create ideas for designing and enriching the aesthetic and color sense. They should be able to perform Computer Aided Colour Designing used in various textile industries.

Textile Processing students are expected to have good knowledge about processing of textiles in bleaching section. They are expected to have good exposure about principles of preparatory wet processing operations, materials, equipments and processes. Textile processing students are expected to use property of yarn for dyeing/finishing. They should be able to use basic textile processes for matching dye and print on that fabric. They should be Aware of qualitative and quantitative aspects of chemistry. They are expected to demonstrate skills in various aspects of physical and organic chemistry. They should have good knowledge about various auxiliaries and chemicals used in different sections of textile industry like bleaching, dyeing, printing & finishing. They should also have knowledge regarding chemistry of synthetic dyes, classification of dyes and synthesis of selected dyestuffs.

They are expected to recall and demonstrate practical routine and repetitive skills, in narrow range of Textile Processing applications. They have wide scope to work in textile mills, processing houses, garment export houses, weaving mills, textile testing houses, fabric quality control centers and production units in garment manufacturing industries. They can start their own small start ups in the area of marketing, sales, manufacturing and production etc.

9. PROGRAMME OUTCOMES

The programme outcomes are derived from five domains of NSQF Level – 3 namely Process, Professional Knowledge, Professional Skill, Core Skill, Responsibility. After completing this level, the student will be able to:

PO1: Carry out a task which may require limited range of predictable activities.

PO2: Acquire knowledge of Basic facts, process and principles related to textile processing for wage and self employment.

PO3: Demonstrate practical skill in narrow range of textile processing related applications.

PO4: Communicate in written and oral, with minimum required clarity along with basic understanding of mathematics, social and natural environment.

PO5: Perform task under close supervision with some responsibility for own work within defined limit.

10. ASSESSMENT OF PROGRAMME AND COURSE OUTCOMES

Programme Outcomes to be assessed	Assessment criteria for the Course Outcomes
PO1: Carry out a task which may require limited range of predictable activities.	• Identify physical quantities, select their units and make measurements with accuracy. • Represent physical quantities as scalar and vector and identify type of motions, various forms of energy, their conversion and applications. • Elaborate scientific work, energy and power, forms of friction and solve problems related to them. • Comprehend properties of matter and effect of temperature on various matter and phenomenon. • Demonstrate the use of physical principles and analysis in various technical fields. • Classify the elements into metals, non-metals and metalloids. • Explain the extraction of metals from ores, their mechanical properties and modification of properties by alloy formation. • Classify fuels and lubricants and apply them in different engineering applications. • Identify the polymeric materials, assess their properties and design suitable polymeric materials for current and future applications. • Apply effective methods for corrosion prevention • Identify different natural and manmade fibers. • Analyze the physical and chemical properties of natural and manmade fibers. • Demonstrate design concept and implement it by sketching different designs on paper. • Implement the concepts, theories, classification, measurement attributes of colour and in designs. • Analyze the use of tools, they should use the symbols to transform them, using the tools, and

	make designs. • Develop various hues, tints, tones, shades, broken-hues by mixing various colours in various ratio • Operate software like paint, coral, photo shop for textile designing. • Identify impurities of cotton and different methods of singeing. • Handle different washing and drying machines. • Calculate weight of yarn in different numbering systems. • Handle Organic Compounds used in textile Chemistry. • Identify and use various Sources of Fats and Oils, soaps and Detergents. • Handle dyes based on chemical point used in textile industry. • Separate different classes of dyes used for dyeing.
PO2: Acquire knowledge of Basic facts, process and principles related to textile technology for wage and self employment.	• Classify textile fibers according to their nature and origin. • Describe manufacturing process sequence of regenerated fibers. • Summarize the end uses of various textile fibers. • Study basics, functions of machines used in desizing and scouring. • Learn about various bleaching agents used for cotton and there advantages over one another. • Describe fundamentals of mercerization and different machines used for it. • Classify various processes for making of yarn. • Learn how a woven fabric is made and its preparatory processes. • Differentiate between woven and knitted garments. • Distinguish various methods of knitting.

	• Study about colloids and Kinetics of chemical Reaction. • Recall Characteristics, types of Catalysis. • Learn about Acids and bases and Chemical Equilibrium in chemical reactions. • Classify auxiliaries used in textile industry. • Define auxiliaries used in pre-treatment of textiles. • Learn about dyeing and printing auxiliaries. • Describe about finishing auxiliaries. • Study basics, role and classification of surface active agents. • Identify Coal Tar Distillation and Dyestuff intermediate Processes. • Learn about Witt's Theory and various forces responsible for dyestuff applications. • Study different Acid Reactions used in making dyestuff.
PO3: Demonstrate practical skill in narrow range of textile technology related applications.	• Comprehend heat and temperature scales and measurements and their modes of transfer. • Identify different natural and manmade fibers. • Analyze the physical and chemical properties of natural and manmade fibers. • Demonstrate design concept and implement it by sketching different designs on paper. • Implement the concepts, theories, classification, measurement attributes of colour and in designs. • Analyze the use of tools, they should use the symbols to transform them, using the tools, and make designs. • Develop various hues, tints, tones, shades, broken-hues by mixing various colours in various ratio • Operate software like paint, coral, photo shop for

	textile designing. • Identify impurities of cotton and different methods of singeing. • Handle different washing and drying machines. • Calculate weight of yarn in different numbering systems. • Handle Organic Compounds used in textile Chemistry. • Identify and use various Sources of Fats and Oils, soaps and Detergents. • Handle dyes based on chemical point used in textile industry. • Separate different classes of dyes used for dyeing.
PO4: Communicate in written and oral, with minimum required clarity along with basic understanding of social and natural environment.	• Identify the nuances of Communication, both Oral and Written. • Acquire knowledge of the meaning of communication, communication process and speaking skills. • Acquire enhanced vocabulary and in-depth understanding of Grammatical Structures and their usage in the communication. • Communicate effectively with an increased confidence to read, write and speak in English language fluently. • Understand the geometric shapes used in engineering problems by Co-ordinate Geometry and Trigonometry. • Formulate engineering problems into mathematical formats with the use matrices, co-ordinate geometry and trigonometry • Calculate the approximate value of roots of certain expressions in engineering problems by application of binomial theorem. • Explore the idea of location, graph, and linear relationships between two variables.

	• Learn about basic fundamentals about MATLAB/ SciLab and mathematical calculation with MATLAB/ SciLab software. • Comprehend the importance of sustainable ecosystem. • Clarify interdisciplinary nature of environmental issues. • Describe corrective measures for the abatement of pollution. • Identify the role of non-conventional energy resources in environmental protection. • Recognize various types of disasters. • Understand the basic components of Computers, Internet and issues of abuses/ attacks on information and computers. • Use comfortably Computer, Laptop, Mobiles, Internet Utilities and Install / Configure OS. • Assemble a PC and connect it to external devices. • Work with Office Practiced Automation Tools. • Create worksheets and Prepare presentations.
PO5: Perform task under close supervision with some responsibility for own work within defined limit.	• Demonstrate design concept and implement it by sketching different designs on paper. • Implement the concepts, theories, classification, measurement attributes of colour and in designs. • Analyze the use of tools, they should use the symbols to transform them, using the tools, and make designs. • Develop various hues, tints, tones, shades, broken-hues by mixing various colours in various ratio • Operate software like paint, coral, photo shop for textile designing.

11. SUBJECTS & CONTENTS

(FIRST YEAR)

FIRST SEMESTER

1.1 ENGLISH & COMMUNICATION SKILLS – I

L	P
2	2

RATIONALE

Language as the most commonly used medium of self-expression remains indispensable in all spheres of human life –personal, social and professional. This course is intended to break fresh ground in teaching of Communicative English as per the requirements of National Skill Quality Framework. This course is designed to help students to acquire the concept of communication and develop ability or skills to use them effectively to communicate with the individuals and community.

COURSE OUTCOMES

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

CO1: Identify the nuances of Communication, both Oral and Written.

CO2: Acquire knowledge of the meaning of communication, communication process and speaking skills.

CO3: Acquire enhanced vocabulary and in-depth understanding of Grammatical Structures and their usage in the communication.

CO4: Communicate effectively with an increased confidence to read, write and speak in English language fluently.

DETAILED CONTENTS

UNIT I

Reading

1.1 Techniques of reading: Skimming and Scanning

1.2 Extensive and Intensive Reading: Textual Study

1.3 Homecoming – R.N. Tagore

1.4 Life Sketch of Sir Mokshagundam Visvesvarayya

1.5 Life Sketch of Dr. Abdul Kalam

1.6 Narayan Murthy’s speech at LBSNA, Dehradun

UNIT II

Fundamentals of Communication

2.1 Concept and Process of Communication,

2.2 Types of Communication (Verbal Communication)

2.3 Barriers to Communication

2.4 Speaking Skill: Significance and essentials of Spoken Communication

2.5 Listening Skill: Significance and essentials of Listening

UNIT III

Grammar and Usage

3.1 Nouns

3.2 Pronouns

3.3 Articles

3.4 Verbs(Main and Auxiliary)

3.5 Tenses

UNIT IV

Writing Skills

4.1 Significance, essentials and effectiveness of Written Communication

4.2 Notice Writing

4.3 Official Letters and E-mails.

4.4 Frequently-used Abbreviations used in Letter-Writing

4.5 Paragraph Writing

4.6 Netiquettes

PRACTICAL EXERCISES

1 Reading

Reading Practice of lessons in the Lab Activity classes.

i. Comprehension exercises of unseen passages along with the lessons prescribed.

ii. Vocabulary enrichment and grammar exercises based on the selected readings.

iii. Reading aloud Newspaper headlines and important articles.

2 Fundamentals of Communication

i. Introducing oneself, others and leave- taking(talking about yourself)

ii. Just a minute (JAM) sessions: Speaking extempore for one minute on given topics

iii. Situational Conversation: Offering-Responding to offers; Congratulating; Apologising and Forgiving; Complaining; Talking about likes and dislikes, Self-introduction Mock Interviews.

3 Grammar and Usage

i. Written and Oral Drills will be undertaken in the class to facilitate holistic linguistic competency among learners.

ii. Exercises on the prescribed grammar topics.

4 Writing Skills

i. Students should be given Written Practice in groups so as to inculcate team-spirit and collaborative learning .

ii. Group exercises on writing paragraphs on given topics.

iii. Opening an e-mail account, receiving and sending emails

RECOMMENDED BOOKS

1. Alvinder Dhillon and Parmod Kumar Singla, "Text Book of English and Communication Skills Vol – 2", M/S Abhishek Publications, Chandigarh.
2. V Sasikumar & PV Dhamija, "Spoken English", Tata MC Graw Hills, New Delhi, Second Edition.
3. JK Gangal, "A Practical Course in Spoken English", PHI Learning Pvt. Ltd., New Delhi.
4. NK Aggarwal and FT Wood, "English Grammar, Composition and Usage", Macmillan Publishers India Ltd., New Delhi.
5. RC Sharma and Krishna Mohan, "Business Correspondence & Report writing", Tata MC Graw Hills, New Delhi, Fourth Edition.
6. Kavita Tyagi & Padma Misra, "Professional Communication", PHI Learning Pvt. Ltd., New Delhi.
7. Nira Konar, "Communication Skills for professionals", PHI Learning Pvt. Ltd., New Delhi.
8. Krishna Mohan & Meera Banerji, "Developing Communication Skills", Macmillan Publishers India Ltd., New Delhi, Second Edition
9. M. Ashraf Rizwi, "Effective Technical Communication", Tata MC Graw Hills, New Delhi.
10. Andrea J Rutherfoord, "Basic Communication Skills for Technology", Pearson Education, New Delhi.

INSTRUCTIONAL STRATEGY

This is practice based subject and topics taught in the class should be practiced in the Lab regularly for development of required communication skills in the students. This subject contains four units of equal weight age.

1.2 APPLIED MATHEMATICS – I

L	P
4	-

RATIONALE

Contents of this course provide fundamental base for understanding engineering problems and their solution algorithms. Contents of this course will enable students to use basic tools like logarithm, binomial theorem, matrices, t-ratios and co-ordinates for solving complex engineering problems with exact solutions in a way which involve less computational task. By understanding the logarithm, they will be able to make long calculations in short time and it is also a pre-requisite for understanding Calculus.

COURSE OUTCOMES

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

CO1: Understand the geometric shapes used in engineering problems by Co-ordinate Geometry and Trigonometry.

CO2: Formulate engineering problems into mathematical formats with the use matrices, co-ordinate geometry and trigonometry

CO3: Calculate the approximate value of roots of certain expressions in engineering problems by application of binomial theorem.

CO4: Explore the idea of location, graph, and linear relationships between two variables.

CO5: Learn about basic fundamentals about MATLAB/ SciLab and mathematical calculation with MATLAB/ SciLab software.

DETAILED CONTENTS

UNIT I

Algebra

1.1 Complex Numbers: definition of complex number, real and imaginary parts of a complex number, Polar and Cartesian Form and their inter conversion, Conjugate of a complex number, modulus and amplitude, addition subtraction, multiplication and division of complex numb

1.2 Logarithms and its basic properties

UNIT II

Binomial Theorem, Determinants and Matrices

2.1 Meaning of ${}^{n}p_{r}$ & ${}^{n}c_{r}$ (mathematical expression). Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion up to 3 terms - without proof), first binomial approximation with application to engineering problems.

2.2 Determinants and Matrices – Evaluation of determinants (upto 2^{nd}order), solution of equations (upto 2 unknowns) by Crammer's rule, definition of Matrices and its types, addition, subtraction and multiplication of matrices (upto 2^{nd} order).

UNIT III

Trigonometry

3.1 Concept of angle, measurement of angle in degrees, grades, radians and their conversions.

3.2 T-Ratios of Allied angles (without proof), Sum, Difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa

3.3 Applications of Trigonometric terms in engineering problems such as to find an angle of elevation, height, distance etc.

UNIT IV

Co-ordinate Geometry

4.1 Cartesian and Polar co-ordinates (two dimensional), Distance between two points, mid-point, centroid of vertices of a triangle.

4.2 Slope of a line, equation of straight line in various standards forms (without proof); (slope intercept form, intercept form, one-point form, two-point form, symmetric form, normal form, general form), intersection of two straight lines, concurrency of lines, angle between straight lines, parallel and perpendicular lines, perpendicular distance formula, conversion of general form of equation to the various forms.

UNIT V

Geometry of Circle and Software

Circle

5.1 General equation of a circle and its characteristics. To find the equation of a circle, given:

I. Centre and radius
II. Three points lying on it
III. Coordinates of end points of a diameter

Software

5.2 **MATLAB Or SciLab software –** Theoretical Introduction, MATLAB or Scilab as Simple Calculator (Addition and subtraction of values –Trigonometric and Inverse Trigonometric functions) – General Practice

RECOMMENDED BOOKS

1. R. D. Sharma, "Applied Mathematics – I & II for Diploma Courses", Dhanpat Rai Publications.
2. "Mathematics for Class XI", NCERT Publication, New Delhi.
3. "Mathematics for Class XII", NCERT Publication, New Delhi.
4. H. K Dass, "Applied Mathematics for Polytechnics", CBS Publishers & Distributers.
5. A Ganesh and G Balasubramanian, "Textbook of Engineering Mathematics – I", CBS Publisher, New Delhi.
6. A Ganesh and G Balasubramanian, "Textbook of Engineering Mathematics –II", CBS Publisher, New Delhi.
7. G. B. Thomas, R. L. Finney, "Calculus and Analytic Geometry", Addison Wesley, Ninth Edition.
8. B S Grewal, "Elementary Engineering Mathematics", Khanna Publishers, Delhi, Thirty-fifth edition.
9. R.K. Jain and S.R.K. Iyengar, "Advanced Engineering Mathematics", Narosa Publishing House, New Delhi, Second Edition, 2003.
10. SS Sabharwal & Dr Sunita Jain, "Applied Mathematics Vol. I & II", Eagle Parkashan, Jalandhar.
11. S Kohli, "Engineering Mathematics Vol. I & II", IPH, Jalandhar.
12. Reena Garg & Chandrika Prasad, "Advanced Engineering Mathematics", Khanna Publishing House, New Delhi
13. R. Pratap, "Getting Started with MATLAB 7", Oxford University Press, Seventh Edition.
14. E-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

SUGGESTED WEBSITES

1. http://swayam.gov.in
2. https://www.scilab.org

INSTRUCTIONAL STATREGY

This is theoretical subject and contains five units of equal weight age. Basic elements of algebra, trigonometry and co-ordinate geometry can be taught in the light of their applications in the field of engineering and technology. By laying more emphasis on applied part, teacher can also help in providing a good continuing education base to the students. Students need to be taught the skills needed to use software tools built by experts through multiple problem solving based on the topics related to Algebra, Trigonometry and Coordinate Geometry that the industry requires. Examples to be used should be related to engineering. Useful software MATLAB or open source software SciLab can be taught theoretically by books/online literatures and basic operations can be shown practically with practical software laboratory or small mobile apps of these software or authentic Trial version of MATLAB/ SciLab software. Students should be able to relate to the actual use of these examples and the way mathematical calculations will help them in doing their job.

1.3 APLIED PHYSICS

L	P
2	2

RATIONALE

Applied physics includes the study of a large number of diverse topics all related to things that go on in 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 will behave. Concrete use of physical principles and analysis in various technical fields are given prominence in the course content.

COURSE OUTCOMES

After completing this subject, student should be able to:

CO1: Identify physical quantities, select their units and make measurements with accuracy.

CO2: Represent physical quantities as scalar and vector and identify type of motions, various forms of energy, their conversion and applications.

CO3: Elaborate scientific work, energy and power, forms of friction and solve problems related to them.

CO4: Comprehend properties of matter and effect of temperature on various matter and phenomenon.

CO5: Demonstrate the use of physical principles and analysis in various technical fields.

DETAILED CONTENTS

UNIT I

Unit and Dimensions

1.1 Definition of Physics, physical quantities- fundamental and derived

1.2 Units: fundamental and derived

1.3 System of units: CGS, FPS, MKS, SI

1.4 Dimension, dimensional formulae and SI units of physical quantities-distance, displacement, area, volume, density, velocity, acceleration, linear momentum, force, impulse, work, power, energy, pressure, surface tension, stress, strain)

1.5 Dimensional equations, principle of homogeneity of dimensional equation

1.6 Application of dimensional analysis: checking the correctness of physical equation, conversion of system of unit (force, work, acceleration)

UNIT II

Force and Motion

2.1 Scalar and vector quantities– definition and examples, representation of vector, types of vector (unit vector, position vector, co-initial vector, collinear vector, co-planar vector)

2.2 Vector algebra- addition of vectors, Triangle & Parallelogram law (statement and formula only),

2.3 Scalar and vector product (statement and formula only)

2.4 Force and its units, resolution of force (statement and formula only)

2.5 Newton's laws of motion (statement and examples)

2.6 Linear momentum, Law of conservation of linear momentum (statement and examples), Impulse

2.7 Circular motion: definition of angular displacement, angular velocity, angular acceleration, frequency, time period; Relation between linear and angular velocity, centripetal and centrifugal forces (definition and formula only), application of centripetal force in banking of road

2.8 Rotational motion: definition with examples

2.9 Definition of torque, angular momentum, moment of inertia and its physical significance

UNIT III

Work, Power and Energy

3.1 Work- definition, symbol, formula and SI unit, types of work (zero work, positive work and negative work) with example

3.2 Friction– definition and its simple daily life applications

3.3 Power- definition, formula and units

3.4 Energy- definition and its SI unit, examples of transformation of energy.

3.5 Kinetic energy- definition, examples, formula and its derivation

3.6 Potential energy- definition, examples, formula and its derivation

3.7 Law of conservation of mechanical energy for freely falling bodies (with derivation)

3.8 Simple numerical problems based on formula of Power and Energy

UNIT IV

Properties of Matter

4.1 Elasticity and plasticity- definition, deforming force, restoring force, example of elastic and plastic body

4.2 Definition of stress and strain, Hooke's law, modulus of elasticity

4.3 Pressure- definition, atmospheric pressure, gauge pressure, absolute pressure, Pascal's law

4.4 Surface tension- definition, SI unit, applications of surface tension, effect of temperature on surface tension

4.5 Viscosity: definition, unit, examples, effect of temperature on viscosity

UNIT V

Heat and Temperature

5.1 Definition of heat and temperature (on the basis of kinetic theory)

5.2 Difference between heat and temperature

5.3 Principle and working of mercury thermometer

5.4 Modes of transfer of heat- conduction, convection and radiation with examples.

5.5 Properties of heat radiation

5.6 Different scales of temperature and their relationship

PRACTICAL EXERCISES

1. Familiarization of measurement instruments and their parts (for example - vernier calliper, screw gauge, spherometer, travelling microscope etc.), and taking a reading. (compulsory to all students)
2. To find diameter of solid cylinder using a vernier calliper
3. To find internal diameter and depth of a beaker using a vernier calliper and hence find its volume.
4. To find the diameter of wire using screw gauge
5. To find thickness of paper using screw gauge.
6. To determine the thickness of glass strip using a spherometer
7. To determine radius of curvature of a given spherical surface by a spherometer.
8. To verify parallelogram law of force
9. To determine the atmospheric pressure at a place using Fortin's Barometer
10. To determine force constant of spring using Hooke's law
11. Measuring room temperature with the help of thermometer and its conversion in different scale.

RECOMMENDED BOOKS

1. "Text Book of Physics for Class XI (Part-I, Part-II)", N.C.E.R.T., Delhi.
2. Dr. HH Lal, "Applied Physics, Vol. I and Vol. II", TTTI Publications, Tata McGraw

Hill, Delhi.
3. AS Vasudeva, "Applied Physics – I", Modern Publishers, Jalandhar.
4. R A Banwait, "Applied Physics – I", Eagle Prakashan, Jalandhar.
5. E-books/e-tools/relevant software to be used as recommended by AICTE/ HSBTE/ NITTTR.
6. C. L. Arora, "Practical Physics", S Chand Publication.

SUGGESTED WEBSITES

1. http://swayam.gov.in
2. The Physics Classroom
3. https://www.khanacademy.org/science/physics

INSTRUCTIONAL STATREGY

This is hands-on practice based subject and topics taught in the class should be practiced in the Lab regularly for development of required skills in the students. This subject contains five units of equal weight age. Teacher may use various teaching aids like models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. Students need to be exposed to use of different sets of units and conversion from one unit type to another. Software may be used to solve problems involving conversion of units. The teacher should explain about field applications before teaching the basics of mechanics, work, power and energy, rotational motion, properties of matter etc. to develop proper understanding of the physical phenomenon. Use of demonstration can make the subject interesting and develop scientific temper in the students. Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles. In all contents, SI units should be followed. Working in different sets of units can be taught through relevant software.

1.4 APPLIED CHEMISTRY

L	P
3	2

RATIONALE

The regular use of a variety of chemistry based materials and processes in diverse technical and engineering fields have repeatedly proven the importance of Applied Chemistry and its role in current and future technological advancements. Ever increasing use of chemical materials in the emerging engineering applications demands engineers and technocrats to acquire an in-depth knowledge of Applied Chemistry to be able to choose the best suited materials to meet their needs while maintaining the environment sustainability. An understanding of the principles of Applied Chemistry will develop scientific attitude in the budding engineers to understand the physical and chemical properties of the available materials for engineering applications as well as an ability to design new and effective materials.

COURSE OUTCOMES

After studying this course, students will be able to:

CO1: Classify the elements into metals, non-metals and metalloids.

CO2: Explain the extraction of metals from ores, their mechanical properties and modification of properties by alloy formation.

CO3: Classify fuels and lubricants and apply them in different engineering applications.

CO4: Identify the polymeric materials, assess their properties and design suitable polymeric materials for current and future applications.

CO5: Apply effective methods for corrosion prevention

DETAILED CONTENTS

UNIT 1

Atomic Structure, Periodic Table and Chemical Bonding.

1.1 Bohr's model of atom (qualitative treatment only), dual character of matter: derivation of de-Broglie's equation, Heisenberg's Principle of Uncertainty, modern concept of atomic structure: definition of orbitals, shapes of s, p and d-orbitals, quantum numbers and their significance. Electronic configuration: Aufbau and Pauli's exclusion principles and Hund's rule, electronic configuration of elements up to atomic number 30.

1.2 Modern Periodic law and Periodic table, classification of elements into s, p, d and f-blocks, metals, non-metals and metalloids (periodicity in properties excluded).

1.3 Chemical bonding: cause of bonding, ionic bond, covalent bond, and metallic bond (electron sea or gas model), Physical properties of ionic, covalent and metallic substances.

UNIT II

Metals and Alloys

2.1 Metals: mechanical properties of metals such as conductivity, elasticity, strength and stiffness, luster, hardness, toughness, ductility, malleability, brittleness, and impact resistance and their uses.

2.2 Definition of a mineral, ore, gangue, flux and slag. Metallurgy of iron from haematite using a blast furnace. Commercial varieties of iron.

2.3 Alloys: definition, necessity of making alloys, composition, properties and uses of duralumin and steel. Heat treatment of steel- normalizing, annealing, quenching, tempering.

UNIT III

Water, Solutions, Acids and Bases

3.1 Solutions: definition, expression of the concentration of a solution in percentage (w/w, w/v and v/v), normality, molarity and molality and ppm. Simple problems on solution preparation.

3.2 Arrhenius concept of acids and bases, strong and weak acids and bases, pH value of a solution and its significance, pH scale. Simple numerical problems on pH of acids and bases.

3.4 Hard and soft water, causes of hardness of water, types of hardness – temporary and permanent hardness, expression of hardness of water, ppm unit of hardness; disadvantages of hard water; removal of hardness: removal of temporary hardness by boiling and Clark's method; removal of permanent hardness of water by Ion-Exchange method; boiler problems caused by hard water: scale and sludge formation, priming and foaming, caustic embrittlement; water sterilization by chlorine, UV radiation and RO.

UNIT IV

Fuels and Lubricants

4.1 Fuels: definition and classification of higher and lower calorific values, units of calorific value, characteristics of an ideal fuel. Petroleum: composition and refining of petroleum; gaseous fuels: composition, properties and uses of CNG, PNG, LNG, LPG; relative advantages of liquid and gaseous fuels over solid fuels. Scope of hydrogen as future fuel.

4.2 Lubricants- Functions and qualities of a good lubricant, classification of lubricants with examples; lubrication mechanism (brief idea only); physical properties (brief idea only) of a

lubricant: oiliness, viscosity, viscosity index, flash and fire point, ignition temperature, pour point.

UNIT V

Polymers and Electrochemistry

5.1 Polymers and Plastics: definition of polymer, classification, addition and condensation polymerization; preparation properties and uses of polythene, PVC, Nylon-66, Bakelite; definition of plastic, thermoplastics and thermosetting polymers; natural rubber and neoprene, other synthetic rubbers (names only).

5.2 Corrosion: definition, dry and wet corrosion, factors affecting rate of corrosion, methods of prevention of corrosion—hot dipping, metal cladding, cementation, quenching, cathodic protection methods

5.3 Introduction and application of nanotechnology: nano-materials and their classification, applications of nanotechnology in various engineering applications (brief).

PRACTICAL EXERCISES

1. To prepare standard solution of oxalic acid.
2. To dilute the given $KMnO_4$ solution
3. To find out the strength in grams per litre of an unknown solution of sodium hydroxide using a standard (N/10) oxalic acid solution.
4. To find out the total alkalinity in parts per million (ppm) of a water sample with the help of a standard sulphuric acid solution.
5. To determine the total hardness of given water sample by EDTA method
6. To determine the amount of total dissolved solids(TDS) in ppm in a given sample of water gravimetrically
7. To determine the pH of different solutions using a digital pH meter.
8. To determine the calorific value of a solid/liquid fuel using a Bomb calorimeter.
9. To determine the viscosity of a lubricating oil using a Redwood viscometer
10. To prepare a sample of Phenol-formaldehyde resin (Bakelite)/Nylon-66 in the lab.

RECOMMENDED BOOKS

1. Textbook of Chemistry for class XI and XII (part I & II) NCERT, Delhi, 2017-18.
2. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd, 2011.
3. Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.

4. Dr. G. H. Hugar& Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTR, Chandigarh, Publications, 2013-14.
5. Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt. Ltd, 2014.
6. Applied Chemistry by Usha Raju.

SUGGESTED WEBSITES

1.www.chemguide.co.uk/atommenu.html (Atomic structure and chemical bonding)
2.www.visionlearning.com (Atomic structure and chemical bonding)
3. www.cheml.com (Atomic structure and chemical bonding)
4. https://www.wastewaterelearning.com/elearning/ (Water treatment)
5. www.capital-refractories.com (Metals, Alloys, Cement, and Refractory Materials) 6.www.em-ea.org/guide%20books/book-2/2.1%20fuels%20and%20combustion.pdf(Fuel and combustion)

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. This subject contains five units of equal weightage.

1.4 INTRODUCTION TO TEXTILE FIBRES

L	P
3	6

RATIONALE

The students of Textile Processing have to work in textile industries and testing houses. Textile fibres are the basic raw material for making yarn from fibers. So knowledge of the basic properties and end uses of different raw materials is very important. Hence this subject emphasizes on the various aspects of natural, regenerated and manmade fibers used in textile industry.

COURSE OUTCOMES

After undergoing the subject, students will be able to:

CO1: Classify textile fibers according to their nature and origin.
CO2: Identify different natural and manmade fibers.
CO3: Analyze the physical and chemical properties of natural and manmade fibers.
CO4: Describe manufacturing process sequence of regenerated fibers.
CO5: Summarize the end uses of various textile fibers.

DETAILED CONTENTS

UNIT I

Introduction

Definition of Textile fiber and filament. Classification of Textile fibers according to nature and origin. General physical properties and chemical properties of Textile Fibers.

Unit II

Natural Fibers-Cellulosic Fibers

Origin, Chemical Composition, Appearance (Morphological and chemical structure), physical & chemical properties, and end use of Cotton.

Origin, Chemical Composition, physical & chemical properties, and end use of Jute, Flax, Ramie and Hemp.

Unit III

Natural Fibers- Protein fibers and other fibers

Origin, Chemical Composition, Appearance (Morphological and chemical structure), physical & chemical properties, and end use of Wool, Silk.

Origin, Chemical Composition, physical & chemical properties, and end use of Sisal, Manila and Coir.

Unit IV

Regenerated Fibers

Monomers and sequence of steps for making fibre, formula, physical & chemical properties, and end use of Viscose rayon.

Monomers and sequence of steps for making fibre, formula, physical & chemical properties and end use of Acetate rayon.

Unit V

Synthetic Fibers

Monomers, formula, physical properties, chemical properties, and end use of Acrylic and modified Acrylic fibre. Monomers, formula, physical properties, chemical properties, and end use of Polyester, nylon6 and nylon 66. Monomers, physical properties, chemical properties, and end use of Spandex and Lycra.

PRACTICAL EXERCISES

1. Microscopic view, physical and chemical identification of cotton.
2. Microscopic view, physical and chemical identification of jute.
3. Microscopic view, physical and chemical identification of Flax.
4. Microscopic view, physical and chemical identification of wool.
5. Microscopic view, physical and chemical identification of silk.
6. Microscopic view, physical and chemical identification of Viscose rayon.
7. Microscopic view, physical and chemical identification of Acetate rayon.
8. Microscopic view, physical and chemical identification of acrylic
9. Microscopic view, physical and chemical identification of nylon.
10. Microscopic view, physical and chemical identification of polyester.
11. Microscopic view, physical and chemical identification of Spandex.
12. Microscopic view, physical and chemical identification of Lycra.

RECOMENDED BOOKS

1. Gohl and Vilensky “Textile Science”, CBS Publishers and Distributors, Delhi Edition 5th, 2005.
2. V.A. Shenai “Introduction to Textile Fibers”, Sevak Publications Mumbai, Edition 3rd, 1991.
3. Tata Mc “From Fibre to Fabric”, Graw hill publication Edition 6th, 1983.
4. Jindal & Jindal “Textile Raw Materials”, Abhishek Publishers Chandigarh, Edition 1st 2007.

SUGGESTED WEBSITES

1. https://www.masterclass.com/articles/what-is-cotton#fabric-care-guide-how-do-you-care-for-cotton
2. https://www.textileschool.com/162/wool-fiber-basics-characteristics-properties/
3. https://www.fibre2fashion.com/industry-article/7105/silk-fiber-production-to-application
4. https://textilestudycenter.com/viscose-rayon-production/

INSTRUCTIONAL STRATEGY

This is a skill based subject and topics taught in the class should be practiced in the Lab regularly for development of required skills in students. This subject contains five units of 20 % equal weight age with hands on practice for skill development.

1.5 DESIGN, COLOUR & CATD

L	P
-	6

RATIONALE

An understanding of various elements and concepts of colour and designing which develop competency to create ideas for designing and enriching the aesthetic and color sense required in Textile Processing students. The emphasis of this subject will be on various designs, colour, Computer Aided Colour Designing used in textile industry.

COURSE OUTCOMES

After undergoing the subject, students will be able to:

CO1: Demonstrate design concept and implement it by sketching different designs on paper.

CO2: Implement the concepts, theories, classification, measurement attributes of colour and in designs.

CO3: Analyze the use of tools, they should use the symbols to transform them, using the tools, and make designs.

CO4: Develop various hues, tints, tones, shades, broken-hues by mixing various colours in various ratio

CO5: Operate software like paint, coral, photo shop for textile designing.

PRACTICAL EXERCISES

UNIT I

Design Concepts

1. To construct a design using replicas, motifs from pictures, paintings, designs keeping in view texture, colour, colour combination, balance and harmony.
2. To construct a design unit or repeat from various samples keeping in view unit and repeat of design.
3. To construct a design with at least three motifs based on each different style by using various colour schemes by using various styles of designs –Natural (realistic), Conventional (Oriental), Geometrical.

4. To construct a design with at least three motifs based on each different style by using various colour schemes by using various styles of designs - Abstract, Traditional, Folk, Symbolic, and Contemporary.

UNIT II

1. To construct designs on various basis by using Construction and arrangement of designs on Drop base, Half drop base,
2. To construct designs on various basis by using Construction and arrangement of designs on Drop reverse base, Sateen base.
3. To make a sheet on Enlargement of design by suitable technique.
4. To make a sheet on reduction of design by suitable technique.

UNIT III

1. To make a colour scheme based on the basic concepts of 'Colour Vision Theory' with the help of diagrams and charts
2. To make a colour scheme based on the basic concepts of 'Pigment Theory' with the help of diagrams and charts.
3. To make a chart of classification of colour using poster colors on drawing sheet.
4. To make a chart of chromatic circle on drawing sheet by using poster colours.
5. To draw various attributes of primary and secondary colours.
6. To practice to produce various hues, tints, tones by mixing various colours in various ratio.

UNIT IV

1. To practice to produce various shades, broken-hues by mixing various colours in various ratios
2. To practice the concepts of cool colours, warm colours, analogous and contrasting colours.
3. To practice the concepts of complementary colours, advancing and receding colours through different practices.
4. To practice different colour schemes while preparing the various motifs of Designs by using Colour in combination:-COLOUR HARMONIES: Monochromatic, polychromatic and Achromatic colour schemes.
5. To practice different colour schemes while preparing the various motifs of Designs by using Colour in combination :-Analogous and Contrast colour schemes, Complementary colour scheme , Cool & warm colour scheme.

UNIT V

1. To practice to do free hand drawing with computer keeping in view utility of software like 'paint' to do freehand drawing.
2. To Practice to use different tools & designing in layers using Coral using of different tools in layering of design (Coral Draw).
3. To Practice to use the tools, they should use the symbols to transform them, using the tools, and make designs from Part-I (Design)(The specific designs made should be filled with colour& texture taking advantage of layering techniques) using of symbol transferring with the help of tools (Coral Draw)
4. To Practice to do scanning of their hand-made designs, editing, stylization and change of colour-schemes, etc. (using Adobe Photo Shop) using Capturing a picture/design in computer using scanner, editing and stylization.

RECOMMENDED BOOKS

1. Hideaki Chijiiiwa, "Colour Harmony (A guide to creative colour combination)", Rockport Publishers Inc, Edition 12th 1994.
2. Jeanne Allen, "Designer's Guide to Colour-II", Chronicle Books Edition 2 1986.
3. Jeanne Allen, "Designer's Guide to Colour-III", Chronicle Books Edition 3 1986.
4. Shibukawa and Takahashi, "Designer's Guide to Colour-IV", Chronicle Books Edition 4th, 1990.
5. Shibukawa and Takahashi, "Designer's Guide to Colour-V", Chronicle Books Edition 5th, 2006.
6. Ralph M Evans, "An introduction to Colour", John Wiley & Sons Publications, Edition 9th 1974.
7. K Parkash, "Traditional Indian Motifs" Bombay Publication, Edition 1st, 1995.
8. Paul Bhatnagar, "Costumes and Textile Designs of India", Abhishek Publication Chandigarh, Edition 1st, 2011.

SUGGESTED WEBSITES

1. https://www.colormatters.com/color-and-design/basic-color-theory
2. https://learn.corel.com/tutorials/coreldraw-shaping-tools/
3. https://helpx.adobe.com/in/photoshop/how-to/photo-editor.html

INSTRUCTIONAL STRATEGY

This is hands on practice based subject for development of required skills in the students. This subject contains five units of equal weight age.

1.6 ENVIRONMENTAL STUDIES AND DISASTER MANAGEMENT

L	P
2	-

RATIONALE

A diploma holder must have knowledge of different types of pollution caused due to industrial and construction activities so that he/she may help in balancing the ecosystem and controlling pollution by various control measures. The course is intended to provide a general concept in the dimensions of environmental pollution and disasters caused by nature beyond the human control as well as the disasters and environmental hazards induced by human activities with emphasis on disaster preparedness, response and recovery.

COURSE OUTCOMES

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

CO1: Comprehend the importance of sustainable ecosystem.
CO2: Clarify interdisciplinary nature of environmental issues.
CO3: Describe corrective measures for the abatement of pollution.
CO4: Identify the role of non-conventional energy resources in environmental protection.
CO5: Recognize various types of disasters.

DETAILED CONTENTS

UNIT I

Introduction

1.1 Basics of ecology, eco system- concept, and sustainable development, Sources, advantages, disadvantages of renewable and nonrenewable energy.
1.2 Rain water harvesting
1.3 Deforestation – its effects & control measures

UNIT II

Air and Noise Pollution

2.1 Air Pollution: Source of air pollution. Effect of air pollution on human health, economy, Air pollution control methods.

2.2 Noise Pollution: Source of noise pollution, Unit of noise, Effect of noise pollution, Acceptable noise level, Different method of minimizing noise pollution.

UNIT III

Water and Soil Pollution

3.1 Water Pollution: Impurities in water, Cause of water pollution, Source of water pollution. Effect of water pollution on human health, Concept of DO, BOD, COD. Prevention of water pollution- Water treatment processes, Sewage treatment. Water quality standard.

3.2 Soil Pollution :Sources of soil pollution, Effects and Control of soil pollution, Types of Solid waste- House hold, Industrial, Agricultural, Biomedical, Disposal of solid waste, Solid waste management E-waste, E – waste management

UNIT IV

Impact of Energy Usage on Environment

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

UNIT V

Disaster Management

A. Different Types of Disaster:

Natural Disaster: such as Flood, Cyclone, Earthquakes and Landslides etc.

Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea Rail & Road), Structural failures(Building and Bridge), War & Terrorism etc.

B. Disaster Preparedness:

Disaster Preparedness Plan

Prediction, Early Warnings and Safety Measures of Disaster

Psychological response and Management (Trauma, Stress, Rumour and Panic)

RECOMMENDED BOOKS

1. Environmental Studies by S.C. Sharma & M.P. Poonia, Khanna Publishing House, New Delhi
2. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
3. Environmental Pollution by Dr. RK Khitoliya; S Chand Publishing, New Delhi
4. Environmental Studies by Erach Bharucha; University Press (India) Private Ltd., Hyderabad.

5. Environmental Engineering and Management by Suresh K Dhamija; S K KatariaandSons, New Delhi.
6. E-books/e-tools/relevant software to be used as recommended by AICTE/BTE/NITTTR, Chandigarh.
7. Disaster Management by Dr. Mrinalini Pandey, Wiley India Pvt. Ltd.
8. Disaster Science and Management by Tushar Bhattacharya, McGraw Hill Education (India) Pvt. Ltd.

INSTRUCTIONAL STRATEGY

In addition to theoretical instructions, different activities pertaining to Environmental Studies and Disaster Management like expert lectures, seminars, visits etc. may also be organized This subject contains five units of equal weightage.

SECOND SEMESTER

SECOND SEMESTER

2.1 TECHNOLOGY OF BLEACHING – I

L	P
2	4

RATIONALE

To effectively supervise the processing of textiles in bleaching section, a textile processing student must know about principles of preparatory wet processing operations, materials, equipments and processes. This subject basically deals with preparatory processes like desizing, scouring, bleaching, mercerization of cotton.

COURSE OUTCOMES

After undergoing the subject, students will be able to:

CO1: Identify impurities of cotton and different methods of singeing.
CO2: Study basics, functions of machines used in desizing and scouring.
CO3: Learn about various bleaching agents used for cotton and there advantages over one another.
CO4: Handle different washing and drying machines.
CO5: Describe fundamentals of mercerization and different machines used for it.

DETAILED CONTENTS

UNIT- I

Natural and added impurities in cotton
Objectives of singeing
Working of shearing, singeing machines.

UNIT- II

Purpose of desizing, desizing agents and desizing methods
Principles and process of scouring of cotton and coloured woven goods.
Description and working of high pressure kiers, J.Box and vapour lock machines.

UNIT- III

Process of bleaching of cotton with bleaching powder, sodium hypochlorite, hydrogen peroxides
Effect of pH on bleaching. Advantage of one over other.

UNIT- IV

Purpose of washing and souring

Counter current washing, tight and slack rope washing machines.

Purpose of drying

Cylinder drying, stenter drying and chamber drying

UNIT- V

Purpose, fundamentals, physical and chemical changes.

Mercerisation of yarn and fabric.

Mercerising machines- pad chain, pad chainless machines.

PRACTICAL EXERCISES

1. Desizing of cotton by rot steep method
2. Desizing of cotton by acid steeping method.
3. Desizing of cotton by enzyme steeping method.
4. To scour given cotton sample.
5. To scour given cotton coloured woven sample.
6. To bleach cotton with bleaching powder.
7. To bleach cotton with sodium hypochlorite.
8. To bleach cotton with hydrogen peroxide.
9. To Study effect of pH of H2O2 on cotton.
10. To bleach cotton with sodium chlorite.
11. To mercerize given cotton sample.
12. Study of drying machines through industrial visit.

RECOMMENDED BOOKS

1. V.A. Shenai, " Technology of Bleaching" Sevak Publication, Mumbai, Edition 3rd ,1984
2. E.R. Trotman, "Scouring Bleaching and Mercerizing-I Publication, New Delhi, Edition 6th, 1986.
3. E.R. Trotman, "Dyeing and Chemical Technology of Textile Fibres", B-I Publication New Delhi, Edition 6th, 1985.

SUGGESTED WEBSITES

1. https://www.textilesphere.com/2021/05/desizing-textile.html

2. https://textileapex.blogspot.com/2015/01/textile-bleaching.html
3. https://www.textiletoday.com.bd/mercerizing-cellulosic-fibres-its-effects/

INSTRUCTIONAL STRATEGY

Yarn / fabric can be used to conduct practical exercises. This is a skill based subject and topics taught in the class should be practiced in the Lab regularly for development of required skills in the students. This subject contains five units of equal weight age with hands on practice.

2.2 INTRODUCTION TO TEXTILE PROCESSES

L	P
3	4

RATIONALE

Knowledge of basic processes is very important for textile students. The process of making yarn helps both Textile Technology/Processing students' separately. A Textile Technology student use it for detailed study while a Textile processing student use property of yarn for help in dyeing/finishing. In case of fabric, technologist uses the knowledge of this subject further for specialized subjects, or to check the requirement of yarn accordingly. A Processing student uses it for matching dye and print on that fabric. This subject provides a brief introduction to various processes.

COURSE OUTCOMES

After undergoing the subject, students will be able to:

CO1: Classify various processes for making of yarn.
CO2: Learn how a woven fabric is made and its preparatory processes.
CO3: Differentiate between woven and knitted garments.
CO4: Distinguish various methods of knitting.
CO5: Calculate weight of yarn in different numbering systems.

DETAILED CONTENTS

UNIT I

Flow Chart of Textile Processes

Flow chart of raw material, machines, process and end product for conversion of fibre into yarn. Flow chart of raw material, machines, process and end product for conversion of yarn into woven or knitted fabric, and finished fabrics.

Opening and cleaning

Objects of mixing and blending. Comparison of mixing with blending. Objects of Blow room. Sequence of modern blow room line. Objects of Carding. Main parts of carding machine.

UNIT II

Fibre to Yarn

Objects of Draw frame. Draft and its type. Breaker and finisher draw frame. Objects of Lap former. Objects of Comber. Linking of lap former and comber. Objects of Speed frame and Ring frame. Main parts of Ring frame. Objects of Winding. Parts of Winding machine.

UNIT III

Yarn to Woven Fabric

Objects of Warping. Objects of Sizing. Different Sizing ingredients and their functions. Main parts of sizing machines. Objects of Threading and Drawing-in.

UNIT IV

Weaving

Terminology of Weaving, warp, weft. Passage of material through Loom. Parts of loom. Classifications of loom. Types of motions in loom. Primary. Secondary and auxiliary motions and its definitions.

Comparing knitted with woven fabrics. Comparing knitted with woven processes

UNIT V

Knitting

Definitions of Knitting, weft knitting, warp knitting, stitch, course, and wale. Passage of material through flat bed knitting machine. Passage of material through circular bed knitting machine. Discussing various type of Warp v/ s weft knitting.

Numbering System

Definition of numbering system. Defining direct system with reference to tex, denier. Defining indirect system with reference to English count. Relationship between tex, denier and English count.

PRACTICAL EXERCISES

1. Process flow chart of conversion of cotton fibre into yarn.
2. Drawing of a modern blow room line.
3. Give main parts of carding machine.
4. Give object of comber machine. Also name a few parts.
5. Give Drafting zone of Speed and Ring Frame.
6. Write sequence of conversion of yarn to woven fabric.
7. Passage of material through loom.

8. Passage of material through sizing machine.
9. Passage of material through flat bed knitting machine.
10. Passage of material through circular bed knitting machine.
11. Give different type of knitted fabric and their end use.
12. Discuss the numbering system.
13. Calculate the tex for a 1 km yarn weighing 50 gm.
14. Calculate the Denier of a 1 km yarn weighing 50 gm.
15. Calculate the English count of a 1 km yarn weighing 50 gm.

RECOMENDED BOOKS

1. Gohl and Vilensky, “Textile Science” by CBS Publishers and Distributors Delhi.
2. V.A. Shanai, “Introduction to Textile Fibers” by Sevak Publications Mumbai.
3. “From Fibre to Fabric” Tata Mc-Graw hill.
4. Jindal & Jindal, “Textile Raw Materials” by Abhishek Publishers Chandigarh.

SUGGESTED WEBSITES

1. https://www.youtube.com/channel/UCnPu8vcBvMdV5wtPTxC4uLA
2. https://textilelearner.net/what-is-textile-basic-textiles/

INSTRUCTIONAL STRATEGY

This is a skill based subject and topics taught in the class should be practiced in the Lab regularly for development of required skills in the students. This subject contains five units equal weight age with hands on practice.

2.3 BASICS FOR TEXTILE CHEMISTRY

L	P
2	4

RATIONALE

A textile processing student is required to supervise the processing of textiles in various sections. Awareness of qualitative and quantitative aspects of chemistry is required. Hence this subject gives emphasis on development of skills in various aspects of physical and organic chemistry topics.

COURSE OUTCOMES

After undergoing the subject, students will be able to:

CO1: Study about colloids and Kinetics of chemical Reaction.
CO2: Recall Characteristics, types of Catalysis.
CO3: Learn about Acids and bases and Chemical Equilibrium in chemical reactions.
CO4: Handle Organic Compounds used in textile Chemistry.
CO5: Identify and use various Sources of Fats and Oils, soaps and Detergents.

DETAILED CONTENTS

UNIT I

Colloids:-Introduction, types of colloidal solutions, characteristics of colloidal solutions (Mechanical, optical, electrical) coagulation of solution, Schulze-Hardy law, Protective colloids. Gold number, Emulsions and Gels, application of colloids.

Kinetics of chemical reaction:- Definition, Factors affecting rate of reaction, difference between order and molecularity of reaction. Application of kinetics in textile processing.

UNIT II

Catalysis: Introduction, types of catalysis, characteristics of catalytic reaction, Promoters, Auto catalysis, Theory of catalysis, Acid-base catalysis, Enzyme catalysis.

Chemical Equilibrium: Concept of reversible reactions, chemical equilibrium and its characteristics, law of mass action, equilibrium constant, Le-chatelier's Principle-effect of change in concentration, Pressure and temperature. Application of Le-chatelier's Principle in industry.

UNIT III

Acids and Bases: Concept of acid and bases- (1) Arrhenius concept (2) Bronsted Lowry (3) Lewis concept: Concept of pH and pH scale. Its measurement by pH paper and pH meter. Concept of buffers and mechanism of bufferaction.

UNIT IV

Organic Chemistry: Organic compounds: Definition, sources and classification.

(A)Aliphatic compounds: Definition of aliphatic compound. General formula and uses of: alkanes, alkenes, alkynes, halogens derivatives, alcohols, amines, aldehydes, ketones, carboxylic acids, urea.

(B)Aromatic compounds: Definition of aromatic compound. General formula and uses of: benzene and toluene, halogen derivatives, hydroxyl compound, nitro compounds, sulphonic acids, amino compounds.

UNIT V

Fats, oils, soaps and detergents: Definition of fats and oils, their sources, chemical structure and composition, physical and chemical properties and their analysis. Introduction to soap and detergents, their chemical composition, mechanism of cleaning action of soaps and their limitations. Types of detergents, difference between soap and detergent. Biodegradability of detergent.

PRACTICAL EXERCISES

1. Detection of Nitrogen in organic compounds.
2. Detection of Sulphur in organic compounds.
3. Detection of Halogens (Chlorine, Bromine, and iodine) in organic compounds.
4. Determination of functional groups in organic compounds by any chemical test.
5. To measure pH of a solution by pH paper.
6. To measure pH of a solution by digital pH meter.
7. To measure the viscosity of an oil by viscometer.
8. To study the effect of temperature on viscosity in printing paste.
9. To check the effect of different alkalis on different fat/oils in fabrics.
10. To make soap using fats and oils.
11. To study the effect of oxidizing and reducing agents on fats/oils.
12. To analyze the effect of Catalyst in the chemical reactions.

RECOMMENDED BOOKS

1. B.S. Bahl and Arun Bahl “A text book of organic chemistry”, S.Chand and Company Ltd., Delhi, Edition 2016.
2. Morrison and Boyd “Organic chemistry”, Pearson Education India, Delhi, Edition 2010.
3. Jain and Jain “Engineering Chemistry” Dhanpat Rai and Sons, New Delhi, edition 2015.

SUGGESTED WEBSITES

1. https://www.sciencedirect.com/topics/chemistry/colloid
2. https://www.thepharmajournal.com/archives/2018/vol7issue9/PartC/7-9-40-353.pdf
3. https://www.britannica.com/science/soap

INSTRUCTIONAL STRATEGY

This is a skill based subject and topics taught in the class should be practiced in the Lab regularly for development of required skills in the students. This subject contains five units of equal weight age with hands on practice for skill development.

2.4 TEXTILE AUXILIARIES AND CHEMICALS

L	P
2	-

RATIONALE

Textile processing students are required to do job in production department, quality control section in the process house. In order to perform these job responsibilities, knowledge about various auxiliaries and chemicals used in different sections like bleaching, dyeing, printing & finishing, their nature, structure and uses are essential. Hence this subject emphasizes on imparting knowledge about various textile auxiliaries used in textile processing.

COURSE OUTCOMES

After undergoing the subject, students will be able to:

CO1: Classify auxiliaries used in textile industry.
CO2: Define auxiliaries used in pre-treatment of textiles.
CO3: Learn about dyeing and printing auxiliaries.
CO4: Describe about finishing auxiliaries.
CO5: Study basics, role and classification of surface active agents.

DETAILED CONTENTS

UNIT I

Overview of Textile Auxiliaries:-Definition & advantages of textile auxiliaries, Selection of Textile auxiliaries and Classification of Textile auxiliaries

UNIT II

Pre-Treatment Auxiliaries:- General properties and uses of various textile auxiliaries used in spinning, weaving, sizing, desizing, scouring, mercerization and bleaching.

UNIT III

Dyeing and Printing Auxiliaries- General properties and uses of wetting agents, dispersing agents, levelling agents, sequestering agents, antifoaming agents, carriers, migration inhibitors, dye fixing agents, after washing agents, stripping agents-types and uses.

UNIT IV

Finishing Auxiliaries - General properties and uses of stiffening agents, cross linking agents, optical brighteners, softeners, water repellents, flame retarding agents, anti-static agents, soil release agents, anti-pilling agents, mothproofing agents.

UNIT V

Role of surface active agents, Essential requirement of surfactant, Classification of surface active agents- Anionic, Cationic and Non-ionic surfactants.

RECOMMENDED BOOKS

1. A.A. Vaidya, "Textile Auxiliaries & Chemicals", ATIRA Publication, edition 1975.
2. Dr. VA Shenai , "Technology of Finishing", Sevak Publication, edition 2nd, .1990
3. Dr. VA Shenai , "Textile Auxiliaries", Sevak Publication,3rd Edition,1976.
4. J.T Marsh "Textile finishing", Published by Chapman & Hall, United Kingdom, edition1948.
5. Murphy "Textile Finishing", Abhishek Publication, Chandigarh, Edition 2007.

SUGGESTED WEBSITES

1. https://www.slideshare.net/SaminulHaque/chemicals-and-auxiliaries-used-in-textile-wet Processing
2. https://textiletutorials.com/list-of-chemical-used-in-textile-auxiliaries/
3. https://www.fibre2fashion.com/industry-article/4589/an-introduction-to-textile-processing-auxiliaries

INSTRUCTIONAL STRATEGY

This is theoretical subject for basic fundamental concepts and contains five units of equal weight age.

2.5 DYESTUFF CHEMISTRY

L	P
2	4

RATIONALE

It is essential for a textile processing students to have knowledge regarding chemistry of synthetic dyes, classification of dyes and synthesis of selected dyestuffs. This subject gives emphasis on development of skills in analysis of various Dyestuffs in powder form and on the fiber.

COURSE OUTCOMES

After undergoing the subject, students will be able to:

CO1: Handle dyes based on chemical point used in textile industry.
CO2: Identify Coal Tar Distillation and Dyestuff intermediate Processes.
CO3: Learn about Witt's Theory and various forces responsible for dyestuff applications.
CO4: Study different Acid Reactions used in making dyestuff.
CO5: Separate different classes of dyes used for dyeing.

DETAILED CONTENTS

UNIT I

Introduction to the chemistry of synthetic dyes, Historical development of dyestuff industry Classification of dyes based on chemical constitution group.

UNIT II

Coal tar distillation and products related to synthesis of dyes,
Intermediate processes – sulphonation, nitration, halogenations, Reduction and amination

UNIT III

Colour and chemical constitutions (Witts Theory), various forces responsible for dyestuff applications.

UNIT IV

Acid – Bon acid, chicago acid, knoch acid, H-acid, tobias acid, K-acid, M-acid, gamma acid.

UNIT V

Discussion on the chemistry of different classes of synthetic dyes (Reactive, Sulphur, Vat, Disperse) used for dyeing of textiles. Discussion on banned dyes.

Concept of natural dyes and its importance. Introduction to different natural dyes, their sources, method of extraction and general procedures of application on different textile fibres

PRACTICAL EXERCISES

1. Testing of direct dyes in powder/paste form and on dyed yarn/fabric/blends.
2. Testing of basic/modified basic dyes in powder/paste form and on dyed yarn/fabric/blends.
3. Testing of vat dyes in powder/paste form and on dyes yarn/fabric/blends.
4. Testing of acid dyes in powder/paste form and on dyed yarn/fabric/blends
5. Testing of metal complex dyes in powder/paste form and on dyed yarn/fabric/blends.
6. Testing of disperse dyes in powder/paste form and on dyed yarn/fabric/blends.
7. Testing of reactive dyes in powder/paste form and on dyed yarn/fabric/blends.
8. Testing of sulpher dyes in powder/paste form and on dyed yarn/fabric/blends.
9. Testing of Natural Indigo dye in powder/paste form and on dyed yarn/fabric/blends.
10. Testing of Natural Coffee dye in powder/paste form and on dyed yarn/fabric/blends.
11. Testing of Natural Leaves dye in powder/paste form and on dyed yarn/fabric/blends.
12. Testing of Natural Turmeric dye in powder/paste form and on dyed yarn/fabric/blends.

RECOMMENDED BOOKS

1. Abrahart, " Dyes and their Intermediates", Hodder Arnold Publications, edition ,1977
2. Chatwal, "Dyes and their Intermediates", Himalaya Publishing house, New Delhi edition, 2009.
3. V.A. Shenai, "Introduction to the Chemistry of Dyestuffs", Sevak Publishers, Mumbai, Edition 4th, 1974.
4. E.R Trotman, "Dyeing and Chemical Technology of Fibrous material"B.I. Publishers, New Delhi, Edition 1994.
5. Charles E. Pellow, "Dyes and Dyeing " Robert M. McBride & Co Publishers, Chandigarh, Edition 7th,1918
6. Fierz-David "Fundamental Processes of Dye Chemistry", BiblioLife Publisher Edition 2008.

SUGGESTED WEBSITES

1. https://www.ispatguru.com/coal-tar-and-its-distillation-processes/

2. https://texpedia.org/textile-universities-world/top-ten-textile-university/
3. https://www.intechopen.com/chapters/70564

INSTRUCTIONAL STRATEGY

This is hands on practice based subject and topics taught in the class should be practiced in the lab regularly for development of required skills in the students. This workshop contains five units of equal weight age.

2.6 FUNDAMENTALS OF IT

L	P
2	4

RATIONALE

Information technology has great influence on all aspects of life. Almost all work places and living environment are being computerized. 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 concepts of information technology and its scope, operating a computer: use of various office management tools, using internet and mobile applications etc. This course is intended to make new students comfortable with computing environment - Learning basic computer skills, learning basic application software tools, Understanding Computer Hardware and Cyber security awareness.

COURSE OUTCOMES

At the end of the course student will be able to

- Understand the basic components of Computers, Internet and issues of abuses/ attacks on information and computers.
- Use comfortably Computer, Laptop, Mobiles, Internet Utilities and Install / Configure OS.
- Assemble a PC and connect it to external devices.
- Work with Office Practiced Automation Tools.
- Create worksheets and Prepare presentations.

DETAILED CONTENTS

UNIT I

Basics of Computer

Brief history of development of computers, Definition of Computer, Block diagram of a Computer, Hardware, Software, Booting: Cold and Hot Booting, Interaction between the CPU and Memory with Input/Output devices, Function of CPU and major functional parts of CPU.

Memory, Bit, Nibble, Byte, KB, MB, GB, TB, PB, Functions of memory, Use of storage devices in a Computer, List types of memory used in a Computer, Importance of cache memory, CPU speed and CPU word length

UNIT II

Basic Internet Skills

Understanding browser, Introduction to WWW, efficient use of search engines, awareness about Digital India portals (state and national portals) and college portals. Advantages of Email, Various email service providers, Creation of email id, sending and receiving emails, attaching documents with email and drive.

Effective use of Gmail, G-Drive, Google Calendar, Google Sites, Google Sheets, Online mode of communication using Google Meet & WebEx.

UNIT III

Basic Logic building

Introduction to Programming, Steps involved in problem solving, Definition of Algorithm, Definition of Flowchart, Steps involved in algorithm development, differentiate algorithm and flowchart, symbols used in flowcharts, algorithms for simple problems, flowcharts for simple problems, Practice logic building using flowchart/algorithms

UNIT IV

Office Tools

Office Tools like LibreOffice/OpenOffice/MSOffice.

OpenOffice Writer – Typesetting Text and Basic Formatting, Inserting Images, Hyperlinks, Bookmarks, Tables and Table Properties in Writer.

Introducing LibreOffice/OpenOffice *Calc*, Working .with Cells, Sheets, data, tables, using formulae and functions, using charts and graphics.

OpenOffice Impress – Creating and Viewing Presentations, Inserting Pictures and Tables, Slide Master and Slide Design, Custom Animation.

UNIT V

Use of Social Media

Introduction to Digital Marketing – Why Digital Marketing, Characteristics of Digital Marketing, Tools for Digital Marketing, , Effective use of Social Media like LinkedIn, Google+, Facebook, Twitter, etc.: Features of Social media, Advantages and Disadvantages of Social Media.

PRACTICAL EXERCISES

This Lab course is intended to practice whatever is taught in theory class of ‘Fundamentals of Information Technology’ and become proficient in using computing environment - basic

computer skills, basic application software tools, Computer Hardware, basic logic building exercise, basic use of emails in daily life etc.

1. Browser features, browsing, using various search engines, writing search queries
2. Visit various e-governance/Digital India portals, understand their features, services offered
3. Read Wikipedia pages on computer hardware components, look at those components in lab, identify them, recognize various ports/interfaces and related cables, etc.
4. Using Administrative Tools/Control Panel Settings of Operating Systems
5. Connect various peripherals (printer, scanner, etc.) to computer, explore various features of peripheral and their device driver software.
6. Explore features of Open Office tools and MS-Office, create documents, create presentation, create spread sheet, using these features, do it multiple times
7. Working with Conversion Software like pdfToWord, WordToPPT, etc.
8. Working with Mobile Applications – Searching for Authentic Mobile app, Installation and Settings, Govt. of India Mobile Applications
9. Creating email id, sending and receiving mails with attachments.
10. Using Google drive, Google calendar
11. Create Flow chart and Algorithm for the following

i. Addition of n numbers and display result
ii. To convert temperature from Celsius to Fahrenheit
iii. To find Area and Perimeter of Square
iv. Swap Two Numbers
v. find the smallest of two numbers
vi. Find whether given number is Even or Odd
vii. To print first n even Numbers
viii. find sum of series 1+2+3+…..+N
ix. print multiplication Table of a number
x. generate first n Fibonacci terms 0,1,1,2,3,5…n (n>2)
xi. sum and average of given series of numbers
xii. Factorial of number n (n!=1x2x3x…n)
xiii. Armstrong Number
xiv. Find whether given number is Prime or not

RECOMMENDED BOOKS

1. R.S. Salaria, Computer Fundamentals, Khanna Publishing House
2. Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House

3. Online Resources, Linux man pages, Wikipedia
4. Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett
5. Vikas Gupta (2008), Comdex Hardware and Networking Course Kit, DreamTech press, New Delhi, India.
6. Sumitabha Das (2008), UNIX concepts and applications, 4th Edition, Tata McGraw Hill, New Delhi, India.

SUGGESTED WEBSITES/SOFTWARES

1. https://nptel.ac.in/courses/106/106/106106222/ - NPTEL Course on Modern Application Development
2. https://onlinecourses.swayam2.ac.in/aic19_de01/preview -
3. https://spoken-tutorial.org/ - Tutorials on Introduction to Computers, HTML, LibreOffice Tools, etc.
4. NOTEPAD++
5. https://tms-outsource.com/blog/posts/web-development-ide/

INSTRUCTIONAL STRATEGY

This is hands on practice based subject and topics taught in the class should be practiced in the lab regularly for development of required skills in the students. This subject contains five units of equal weight age.

SECOND YEAR

NSQF LEVEL - 4

12. STUDY AND EVALUATION SCHEME

THIRD SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week		Credits L+P= C	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	P		Th	Pr	Total	Th	Pr	Total	
3.1	Industrial/In-House Training - I	-	2	0+1=1	-	40	40	-	60	60	100
3.2	Technology of Bleaching - II	2	4	2+2=4	40	40	80	60	60	120	200
3.3	Dyeing of Natural Fibres	2	4	2+2=4	40	40	80	60	60	120	200
3.4	Technology of Printing - I	2	4	2+2=4	40	40	80	60	60	120	200
3.5	Technology of Finishing - I	2	4	2+2=4	40	40	80	60	60	120	200
3.6	Textile Physical Testing	2	4	2+2=4	40	40	80	60	60	120	200
	# SCA	-	3	-	-	-	-	-	-	-	-
	Total	**10**	**25**	**21**	**200**	**240**	**440**	**300**	**360**	**660**	**1100**

Student Centered Activities will comprise of co-curricular activities like extension lectures on Constitution of India, Electoral Literacy, Motor Vehicles (Driving) Regulations 2017 etc., games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self-study etc.

FOURTH SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week		Credits (C) L + P = C	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	P		Th	Pr	Total	Th	Pr	Total	
4.1	*English and Communication Skills - II	2	2	**2+1=3**	40	40	80	60	60	120	200
4.2	Dyeing of Synthetic and Blended Textiles	2	4	**2+2=4**	40	40	80	60	60	120	200
4.3	Technology of Printing - II	2	4	**2+2=4**	40	40	80	60	60	120	200
4.4	Textile Chemical Testing	2	4	**2+2=4**	40	40	80	60	60	120	200
4.5	Multidisciplinary Elective (MOOCs^{+}/Offline)	2	-	**2+0=2**	40	-	40	60	-	60	100
4.6	Minor Project	-	8	**0+4=4**	-	40	40	-	60	60	100
# Student Centered Activities (SCA)		-	3	**-**	-	-	-	-	-	-	-
Total		**10**	**25**	**21**	**200**	**200**	**400**	**300**	**300**	**600**	**1000**

* Common with other Diploma Courses.

\+ Assessment of Multidisciplinary Elective through MOOCs shall be based on assignments out of 100 marks.

\# Student Centered Activities will comprise of co-curricular activities like extension lectures on Constitution of India, Electoral Literacy, Motor Vehicles (Driving) Regulations 2017 etc., games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self-study etc.

Industrial Training: After 4th Semester, students shall undergo Industrial Training of 4 Weeks.

13. HORIZONTAL AND VERTICAL SUBJECTS ORGANISATION

Sr. No.	Subjects/Areas	Hours Per Week	
		Third Semester	Fourth Semester
1.	Industrial/In-House Training - I	2	-
2.	Technology of Bleaching - II	6	-
3.	Dyeing of Natural Fibres	6	-
4.	Technology of Printing - I	6	-
5.	Technology of Finishing - I	6	-
6.	Textile Physical Testing	6	-
7.	English and Communication Skills - II	-	4
8.	Dyeing of Synthetic and Blended Textiles	-	6
9.	Technology of Printing - II	-	6
10.	Textile Chemical Testing	-	6
11.	Multidisciplinary Elective (MOOCs/Offline)	-	2
12.	Minor Project	-	8
13.	Student Centered Activities	3	3
	Total	**35**	**35**

14. COMPETENCY PROFILE & EMPLOYMENT OPPORTUNITIES

Government and private sectors related to **Textile Processing** require **skilled employees** to work in familiar, predictable, routine situations of clear choice. They are expected to have factual knowledge of textile processing field. They are expected to communicate with required clarity. Students after completing level 4 shall have knowledge of basic arithmetic, algebraic principles and basic understanding of social and natural environment. They are expected to recall and demonstrate skills in narrow range of applications using appropriate rules and tools to maintain quality.

Skilled workers will be responsible for carrying out a range of jobs, some of which will require them to make choices about the approaches they adopt. They will be expected to learn and improve their practice on the job. They should know what constitutes quality in the occupation and should distinguish between good and bad quality in the context of their job roles. Skilled employee at this level will be expected to carry out their work safely and securely and take full account of the health and safety on colleagues and customers. They should work hygienically and in ways which show an understanding of environmental issues. In working with others, they will be expected to conduct themselves in ways which show a basic understanding of the social and political environment.

Textile Processing NSQF Level – 4 pass out students are expected have good theoretical and practical exposure of bleaching technology and natural fibers dyeing for its effective utilization in garment industries. They should also have good knowledge and hands-on experience in printing technology, finishing technology and textile physical testing and should be able to apply it in textile industries. They are also expected to demonstrate their skills in synthetic and blended textiles dyeing and textile chemical testing. Students at this level are also expected to handle small projects related to garment industries.

Textile Processing students have wide scope to work in textile mills, processing houses, garment export houses, weaving mills, textile testing houses, fabric quality control centers and production units in garment manufacturing industries. They can start their own small startups in the area of marketing, sales, manufacturing and production etc.

15. PROGRAMME OUTCOMES

The programme outcomes are derived from five domains of NSQF Level – 4 namely Process, Professional Knowledge, Professional Skill, Core Skill, Responsibility. After completing this level, the student will be able to:

PO1: Work in familiar, predictable, routine situation of clear choice.

PO2: Acquire factual knowledge in the field of textile processing for employment.

PO3: Demonstrate routine and repetitive skills in narrow range of applications using appropriate rules and tools for quality.

PO4: Communicate with required clarity along with social and natural environment understanding.

PO5: Perform tasks with responsibility for own work and learning.

PO6: Select multidisciplinary elective of own interest to develop self-learning habit through online courses.

16. ASSESSMENT OF PROGRAMME AND COURSE OUTCOMES

Programme Outcomes to be assessed	Assessment criteria for the Course Outcomes
PO1: Work in familiar, predictable, routine situation of clear choice.	• Perform degumming and bleaching of silk. • Differentiate various bleaching agents used for wool and their faults. • Make scoured and bleached samples of man-made fibers. • Formulate different bast fiber samples and compare them. • Classify the colouring matter on basis of application. • Differentiate between behaviors of dyes w.r.t. different textile fibres. • Apply specific dye on specific textile material. • Prepare printed samples by different method of textile printing. • Discover various faults of the prints and their remedies. • Apply the knowledge of various permanent finishes used for ingrain properties. • Interpret and compare of results of different textile finishes applied on textiles. • Demonstrate the necessary skill for measurement of various physical properties of fibre, yarn and fabric on testing instruments. • Interpret and compare the results of textile testing. • Formulate recipes of dyeing of various synthetic fibers. • Identify various faults/problems in dyeing and their solutions. • Apply the paste to print samples.

	• Interpret and compare various styles of printing. • Identify and analyze the blend percentage in unknown yarn/fabric. • Determine the extent of chemical damage during pre-treatments. • Evaluate the scouring & mercerization efficiency. • Handle equipments and conduct various fastness tests on textile substrate. • Study and interpret fastness results.
PO2: Acquire factual knowledge in the field of textile processing for employment	• Learn about impurities of wool and different methods of scouring and machines. • Learn the terms and concept of dyeing w.r.t. different textile fibers. • Explain dyeing of cotton with water soluble, water insoluble and ingrain dyes. • Describe dyeing of wool, silk and jute with Acid and Basic dyes. • Describe different method and styles of textile printing. • List various ingredients of a good printing paste and their purpose. • Explain the working of different machine and equipment used for making different prints • Learn the concept of textile finishing, various types of finishes used on fabrics. • Acquire the knowledge of various temporary surface finishes used for special purposes. • Study the working and principle of different textile finishing equipments/machines used in textile industry. • Learn the concept of textile testing, sampling techniques and various physical properties related to testing of fibre, yarn and fabric. • Acquire the knowledge of various yarn count system and practice their conversion.

	• Study the working and principle of different textile testing equipments used in textile industry. • Learn about the terminology & techniques of dyeing of polyester, nylon, acrylic fiber materials. • Describe about the various machines used for dyeing of synthetic materials. • Acquire knowledge about eco-friendly dyeing processes. • Study the terminology & techniques of printing of cotton by various styles. • Learn the formation of recipes of different dyes for printing. • Acquire knowledge of novel techniques of printing. • Identify and analyze the blend percentage in unknown yarn/fabric. • Learn and interpret fastness results.
PO3: Demonstrate routine and repetitive skills in narrow range of applications using appropriate rules and tools for quality.	• Perform degumming and bleaching of silk. • Differentiate various bleaching agents used for wool and their faults. • Make scoured and bleached samples of man-made fibers. • Formulate different bast fiber samples and compare them. • Classify the colouring matter on basis of application. • Differentiate between behaviors of dyes w.r.t. different textile fibres. • Apply specific dye on specific textile material. • Prepare printed samples by different method of textile printing. • Discover various faults of the prints and their remedies. • Apply the knowledge of various permanent finishes used for ingrain properties.

	• Interpret and compare of results of different textile finishes applied on textiles. • Demonstrate the necessary skill for measurement of various physical properties of fibre, yarn and fabric on testing instruments. • Interpret and compare the results of textile testing. • Formulate recipes of dyeing of various synthetic fibers. • Identify various faults/problems in dyeing and their solutions. • Apply the paste to print samples. • Interpret and compare various styles of printing. • Identify and analyze the blend percentage in unknown yarn/fabric. • Determine the extent of chemical damage during pre-treatments. • Evaluate the scouring & mercerization efficiency. • Handle equipments and conduct various fastness tests on textile substrate. • Study and interpret fastness results.
PO4: Communicate with required clarity along with social and natural environment understanding.	• Develop required competencies for effective communication and presentation. • Communicate effectively with an increased confidence; read, write and speak in English language fluently. • Comprehend special features of format and style of formal communication through various modes. • Write a Report, Resume, make a Presentation, Participate in GDs and Face Interviews • Illustrate use of communication to build a positive self-image through self-expression and develop more productive interpersonal relationships. • Write the minor project report effectively. • Present the minor project report using PPT.
PO5: Perform tasks with responsibility	• Understand the working environment of

for own work and learning.	industries. • Take necessary safety precautions and measures. • Learn about present and future requirement of industries. • Work in team for solving industrial problems • Develop required competencies and skills for relevant industries. • Select the minor project according to the need of relevant industries. • Work as a team member for successful completion of minor project. • Acquire Life Long Learning skills.
PO6: Select multidisciplinary elective of own interest to develop self-learning habit through online courses.	• Apply critical thinking problem solving. • Demonstrate self and time management. • Display analytical and research abilities. • Integrate multiple knowledge domains. • Enhance the scope and depth of learning.

17. SUBJECTS & CONTENTS

(SECOND YEAR)

THIRD SEMESTER

3.1 INDUSTRIAL / IN – HOUSE TRAINING - I

L	P
-	2

RATIONALE

Industrial training / In – house training will help the students to understand the working environment of relevant industries. The student will learn to work in team to solve the industrial problems. It will also give exposure about the present and future requirements of the relevant industries. This training is very important for development of required competencies and skills for employment and start– ups.

COURSE OUTCOMES

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

CO1: Understand the working environment of industries
CO2: Take necessary safety precautions and measures.
CO3: Learn about present and future requirement of industries.
CO4: Work in team for solving industrial problems
CO5: Develop competencies and skills required by relevant industries.
CO6: Develop writing, speaking and presentations skills.

PRACTICAL EXERCISES

1. Report writing based on industrial training.
2. Preparation of Power Point Slides based on industrial training and presentation by the candidate.
3. Internal Evaluation based on quality of Report, PPT preparation, PPT presentation and answer to queries.
4. External Evaluation based on quality of Report, PPT preparation, PPT presentation and answer to queries.

GUIDELINES

Students will be evaluated based on Industrial training / In – house training report and their presentation using Power Point about the knowledge and skills gained during the training. The Head of the Department will depute faculty coordinators by assigning a group of students to each. The coordinators will mentor and guide the students in preparing the PPTs for final presentation. The following performance parameters are to be considered for assessment of the students out of 100 marks:

	Parameter	**Weightage**
i	Industrial / In-house assessment of the candidate by the trainer	40%
ii	Report Writing	20%
iii	Power Point Presentation	20%
iv	Viva-voce	20%

3.2 TECHNOLOGY OF BLEACHING - II

L	P
2	4

RATIONALE

Textile processing students after this level have to work in bleaching preparatory section. To effectively supervise the processing of textiles in bleaching section, they must know about principles of preparatory wet processing operations, materials, equipment's and processes. This subject basically deals with preparatory processes for wool, silk, synthetic and their blends.

COURSE OUTCOMES

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

CO1: Learn about impurities of wool and different methods of scouring and machines.
CO2: Perform degumming and bleaching of silk.
CO3: Differentiate various bleaching agents used for wool and their faults.
CO4: Make scoured and bleached samples of man-made fibers.
CO5: Formulate different bast fiber samples and compare them.

DETAILED CONTENTS

UNIT I

Preparatory processes of bast fibres- flax, jute, coir, hemp, sisal, ramie.
Preparatory processes of regenerated cellulosic fibres such as viscose rayon, cellulose acetate, Polynosic.

UNIT II

Impurities in wool.
Carbonizing processes for raw wool and woolen fabrics.
Scouring of wool in loose form, yarn scouring& piece scouring. Methods of scouring- Emulsion& solvent scouring. Machines for scouring raw wool and fabric-description & mechanism.
Bleaching of wool with hydrogen peroxide, sodium hydrosulphite and sulfur dioxide. Faults in woolen and worsted goods-llistedness, vertical creases, weathering or drifting.

UNIT III

Silk- Degumming of raw silk, degumming of raw silk in blends with wool or acetate rayon. Bleaching of natural silk with hydrogen peroxide, sodium hydrosulphite. Bleaching of tussar silk (wild silk)

UNIT IV

Scouring and bleaching of man-made fibers-Polyester, Nylon 6 & Nylon6,6, Acrylic.
Scouring bleaching of elastane fibre materials (spandex, lycra)

UNIT V

Scouring & bleaching blended textiles such as Polyester/Viscose, Polyester/cotton, Acrylic/Wool, Polyester/Cotton/Wool. Cotton /Wool blends.

PRACTICAL EXERCISES

1. To degum the given raw silk.
2. To bleach the given sample of silk with hydrogen peroxide.
3. To bleach the given sample of silk with sodium hydrosulphite.
4. To carbonize the given wool sample.
5. To scour the given wool sample (loose form, yarn& fabric).
6. To bleach the given scoured wool sample with hydrogen peroxide.
7. To bleach the given scoured wool sample with sodium hydrosulphite.
8. To scour and bleach given sample of nylon.
9. To scour& bleach given sample of acrylic.
10. To scour& bleach given sample of polyester.
11. To scour& bleach given sample of P/C blend.
12. To scour& bleach given sample of Jute
13. To scour& bleach given sample of Coir

RECOMMENDED BOOKS

1. Dr. V.A Shenai, “Technology of bleaching & mercerization vol. III”, Sevak Publication Bombay Edition.
2. E.R Trotmon, “Scouring, Bleaching & Mercerisation”, BI Publication, New Delhi.
3. E.R. Trotman, “Dyeing & Chemical Technology of Textile Fibre”, BI Publication, New Delhi.

4. R.R.Chakravorty, “A Glimpse on the Chemical Technology of Textile Fibres”, Caxton Press, New Delhi.
5. Louis Tailfer, “Bleaching of Linen, Cotton Yarn and Fabrics”, Forgotten Books.
6. R S Prayag, “Bleaching, Mercerizing and Dyeing of Cotton Materials” Dharwar, Karnatka Edition.

SUGGESTED WEBSITES

1. https://www.woolwise.com/wp-content/uploads/2017/05/03.4-Bleaching-Presentation.pdf
2. http://dyeingworld1.blogspot.com/2009/12/bleaching-of-wool.html
3. https://www.textiletoday.com.bd/silk-and-its-degumming-process/#:~:text=Degumming%20is%20the%20process%20of,when%20the%20gum%20is%20removed.
4. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

This is a skill based subject and topics taught in the class should be practiced in the Lab regularly for development of required skills in students. This subject contains five units of equal weightage with hands on practice for skill development.

3.3 DYEING OF NATURAL FIBERS

L	P
2	4

RATIONALE

Dyeing is an important process in textile processing department and students must have thorough knowledge and skills of principles of dyeing, operations, materials, equipment and processes. They should be able to execute various recipes for dyeing of cotton with direct, reactive, Solubilized vat, vat, sulphur, azoic etc. and wool, silk by acid and basic dyes. Hence in this subject aims on development of skills in Technology of dyeing of Natural Fibers.

COURSE OUTCOMES

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

CO1: Learn the terms and concept of dyeing w.r.t. different textile fibers
CO2: Classify the colouring matter on basis of application.
CO3: Explain dyeing of cotton with water soluble, water insoluble and ingrain dyes.
CO4: Describe dyeing of wool, silk and jute with Acid and Basic dyes
CO5: Differentiate between behaviors of dyes w.r.t. different textile fibres.
CO6: Apply specific dye on specific textile material.

DETAILED CONTENTS

UNIT I

Brief history of dyeing of textile.
Definition and general terms related to dyeing- M:L ratio, %age exhaustion, mangle expression, %age shade and its classification, stock solution, substantively, fixation.
Classification of dyestuffs on the basis of methods of applications.
Dyeing processes – Concept of Exhaust dyeing, Pad batch and continuous process.

UNIT II

Dyeing of cotton by Direct Dyestuff- Properties and application, aftertreatments of direct dyes, dyed material to improve fastness properties.

Dyeing of cotton by Reactive dyestuff- Properties and application. Cold brand and hot brand dyes.

UNIT III

Dyeing of cotton by Sulphur dyes- Properties, application, defects like Bronziness, Tendering and remedies.

Dyeing of cotton by Vat Dyes- Properties, classification, application to cotton.

Dyeing of cotton by Solubilised vat dyes Properties and application to cotton.

UNIT IV

Dyeing of cotton by ingrain dyes:-

Azoic- Principal of dyeing and application to cotton.

Brief introduction of mineral colors, oxidation colors, pthalocynine colors

UNIT V

Dyeing of wool, silk and other natural fibres.

Acid dyes- Properties, method of application to wool and silk.

Acid mordant and metal complex –. Properties, method of application to wool and silk

Basic dyes- Properties and method of application to wool, silk, and jute.

PRACTICAL EXERCISES

1. Dyeing of cotton with direct dyes.
2. After-treatments of direct dyed material.
3. Dyeing of cotton with sulphur dyes and after treatment.
4. Dyeing of cotton with vat dyes.
5. Dyeing of cotton with solublized vat dyes.
6. Dyeing of cotton with azoic class.
7. Dyeing of cotton with Reactive (hot brand / cold brand) dyes.
8. To study effect of temperature in direct dyes.
9. To study effect of salt in direct dyes.
10. Dyeing of wool with basic dyes.
11. Dyeing of wool with acid dyes.
12. Dyeing of silk with basic dyes.
13. Dyeing of silk with Acid dyes.

RECOMMENDED BOOKS

1. Dr. V.A Shenai, “Technology of Dyeing”, Sevak Publication, Mumbai, Edition.
2. E.R Trotman, “Dyeing and Chemical Technology of Textile Fibres”, B.I Publication, New Delhi, Edition.
3. James, “Printing and Dyeing of Fabric”, Edition.
4. V.A Shenai, “Chemistry and Principles of Dyeing”, Sevak Publication, Mumbai, Edition.
5. R.S Paryag, “Dyeing of Wool and Silk”, Dharwar, Karnatka Edition.

SUGGESTED WEBSITES

1. https://textiletuts.com/types-of-dyes/
2. https://www.science.gov/topicpages/w/water+insoluble+dyes
3. http://www.pburch.net/dyeing/proteindyes.shtml
4. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

This is a skill based subject and topics taught in the class should be practiced in the Lab regularly for development of required skills in students. This subject contains five units of equal weightage with hands on practice for skill development.

3.4 TECHNOLOGY OF PRINTING - I

L	P
2	4

RATIONALE

Textile processing students after this level are expected to have thorough knowledge about principles and practices employed for textile printing. They must be fully aware of various methods, materials, equipment and processes used for printing of textiles. Hence this subject lays emphasis on various printing techniques done on textile materials.

COURSE OUTCOMES

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

CO1: Describe different method and styles of textile printing.
CO2: List various ingredients of a good printing paste and their purpose.
CO3: Explain the working of different machine and equipment used for making different prints
CO4: Prepare printed samples by different method of textile printing.
CO5: Discover various faults of the prints and their remedies.

DETAILED CONTENTS

UNIT I

Introduction to Textile Printing: Objectives, brief historical background, methods and styles. Difference between- Dyeing and printing, discharge and resist style.

Printing Paste: Various ingredients of a printing paste and their purpose. Classification of thickeners used for printing. Essential qualities of a thickener used in printing of textiles. Precautions to be taken during making of a printing paste.

UNIT II

Preparation of cloth for printing: Outline of the different wet processes for preparation of different kind of fabrics to be printed.

Fixation and After Treatments: Objectives of ageing, steaming, curing, washing, soaping. Construction and working of rapid ager, high pressure steamer, continuous steamer. Principle

and Mechanism of High Temperature steaming (superheated steaming) and its advantages. Study of washing & soaping machines.

UNIT III

Block Printing Method: Importance of Block Printing. Equipment used and steps of block printing , Steps of making different types of Blocks -wooden blocks, metal blocks, pin blocks, casting blocks, colour blocks and their end use. Advantages and limitations of block printing.

UNIT IV

Stencils and Screen Printing (Manual): Concepts of stencils printing and its advantages. Photo chemical method of making screen for hand screen printing. Screen printing operation. Equipments used in hand screen Printing. Various faults in screen printing, their causes and remedies.

UNIT V

Roller Printing: Concept of Roller Printing. Study of various parts of roller printing machines and their objective, Methods of engraving of copper roller: Mill Engraving, Pantograph Engraving, Photo Engraving. Defects of Roller Printing machine, their causes and remedies. Advantages and limitations of Roller Printing.

PRACTICAL EXERCISES

1. To make a chart of different thickeners in respect of their source, properties, general method of preparing stock thickening and their suitability for different fibers.
2. To prepare a thickening paste of sodium alginate, and study the effect of acid and alkali on it.
3. To prepare a thickening paste of Starch, and study the effect of acid and alkali on it.
4. To prepare a thickening paste of Guar Gum and study the effect of acid and alkali on it.
5. To make fabric sample on cotton using film stencils on the theme of flowers and leafs.
6. To make fabric sample on cotton using film stencils on the theme of geometric pattern.
7. To Print cotton fabric sample by Block Printing in single colors.
8. To Print cotton fabric sample by Block Printing in double colours.
9. To print cotton fabric sample by pin blocks
10. To print cotton fabric sample by screen printing in single colour.
11. To print cotton fabric sample by screen printing in double color.
12. To make a line diagram of the curing chamber and study its working (may be done by mill visit.)

13. To make a line diagram of the roller printing machine and study its working (may be done by mill visit.)

RECOMMENDED BOOKS

1. Dr. V.A. Shanai, "Technology of Printing", Sewak Publications, Mumbai, Edition.
2. I.W.C. Miles, "Textile Printing", Society of Dyers & Colourists.
3. Joyci Storey, "Textile Printing", Thames & Hudson Ltd., London, Edition.
4. Pam Stall Ebrans, "The Creative Guide to Fabric Screen Printing", New Holland Publishers Ltd., 37, Connaught street, London.
5. D.G. Kale, "Principles of cotton printing", Publication Committee for Prof. D.G. Kale's Book on Cotton Printing AITRA.
6. Knecht, E and Fothergill, "The Principles and Practice of Textile Printing", London, C. Griffin & Company, Limited.
7. "Printed Textile Students Handbook + Practical Manual", The Secretary, Central Board of Secondary Education, Shiksha Kendra, 2, Community Centre, Preet Vihar, Delhi.

SUGGESTED WEBSITES

1. https://textilestudycenter.com/textile-printing/
2. https://www.cibitex.it/pre-treatment-drying-fixation-digitally-printed-fabrics/
3. http://imprimerie-sanjose.com/what-are-the-different-types-of-printing/
4. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

This is a skill based subject and topics taught in the class should be practiced in the Lab regularly for development of required skills in students. This subject contains five units of equal weight age with hands on practice for skill development.

3.5 TECHNOLOGY OF FINISHING - I

L	P
2	4

RATIONALE

Textile processing students are expected to have necessary knowledge and skills regarding various finishing principles and procedures used for application on textiles. They should be acquainted with different types of machines used for finishing. In addition, relevant skills also need to be developed in them through lab practice.

COURSE OUTCOMES

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

CO1: Learn the concept of textile finishing, various types of finishes used on fabrics.
CO2: Acquire the knowledge of various temporary surface finishes used for special purposes.
CO3: Study the working and principle of different textile finishing equipments/machines used in textile industry.
CO4: Apply the knowledge of various permanent finishes used for ingrain properties.
CO5: Interpret and compare of results of different textile finishes applied on textiles.

DETAILED CONTENTS

UNIT I

Introduction, aims, and importance of textile finishing. Classification of various types of finishes.
Study of finishes with respect to purpose, fabrics, chemicals and machine used.
Damping– Purpose, Damping machines and their working. Softening and stiffening
Temporary and Permanent stiffening. Soft and stiff finishes on cottons.
Description and working of Back filling machine.

UNIT II

Calendaring- Principle, purpose & description of the following calendaring machines.
Chasing& Swiss calendaring
Friction calendaring
Scheriener calendaring

Embossing calendaring
Felt calendaring.

UNIT III

Textural Processes: - Purpose, principle and machines used in:
Raising, Glazing (sheen& effect), Moireing (water effect)
Beetling, Cireing, Gigging and Shearing.

UNIT IV

Detailed description on various methods of producing Crepe effects.
Shrink proofing of cotton; Purpose, Principles and working of sanforising machine: Zero-zero finish.
Principles, Construction and working of drying machines-Stenter, flat dryer, Hydro extractor, Festoon Dryer, Drum Dryer (Buti).

UNIT V

Semi-permanent and permanent finishes:-Purpose, principles and method for following finishes:
Wash and wear
Crease resistance
Durable press
Rot and mildew proof finishing

PRACTICAL EXERCISES

1. To study the efficiency of anionic softener at varying concentrations on cotton.
2. To study the efficiency of cationic softener at varying concentrations on cotton.
3. To study the efficiency of nonionic softener at varying concentrations on cotton.
4. To study the efficiency of reactive softener at varying concentrations on cotton.
5. Preparation of natural starches and its applications at various concentrations on cotton.
6. Applications of modified starch at various concentrations on cotton.
7. To provide soft and stiff finishes using softeners, starch and poly vinyl alcohol.
8. To draw line diagrams of different finishing machines.
9. To compare various types of finishes on their textural effects produced.
10. To apply rot and mildew proofing finish to cotton in lab.
11. To apply wash and wear finish to cotton and analyze it.
12. To apply durable press finish to cotton and analyze it.

RECOMMENDED BOOKS

1. J.T. Marsh, “Textile Finishing”, B-I, Publications, New Delhi.
2. A.J. Hall, “Technology of Finishing”, National Trade Press Publisher.
3. Bernard P. Corbman, “Textile finishing to fabric”, McGraw Hill International.
4. Dr. V. A. Shenai, “Technology of Finishing”, Sevak Publishers, Mumbai.
5. Murphy, “Textile Finishing”, Abhishek Publishers, Chandigarh.

SUGGESTED WEBSITES

1. https://nptel.ac.in/courses/116/102/116102054/
2. https://www.textileproperty.com/types-of-calendering-process/
3. http://mytextilenotes.blogspot.com/2012/08/textile-drying.html
4. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

This is a skill based subject and topics taught in the class should be practiced in the Lab regularly for development of required skills in students. This subject contains five units of equal weight age with hands on practice for skill development.

3.6 TEXTILE PHYSICAL TESTING

L	P
2	4

RATIONALE

Textile Processing students after this level are responsible for controlling the quality of the final finished product; for which they are supposed to know about physical testing of textiles. For this purpose, knowledge and skills about physical testing of fibre, yarn and fabric is required. Hence this subject aims on development of skills in Textile Physical Testing.

COURSE OUTCOMES

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

CO1: Learn the concept of textile testing, sampling techniques and various physical properties related to testing of fibre, yarn and fabric.

CO2: Acquire the knowledge of various yarn count system and practice their conversion.

CO3: Study the working and principle of different textile testing equipments used in textile industry.

CO4: Demonstrate the necessary skill for measurement of various physical properties of fibre, yarn and fabric on testing instruments.

CO5: Interpret and compare the results of textile testing.

DETAILED CONTENTS

UNIT I

Introduction and objectives of textile testing. Sampling techniques General requirement. Sampling techniques for yarn and fabrics for specific tests.

Relative humidity & methods of its determination. Moisture content and Moisture regain in textile materials and its determination. Standard moisture regains of different textile materials.

UNIT II

Different yarn counts systems, their conversion and count calculations. Determination of count of yarn in different systems with the help of wrap reel, Beesley's balance & Quadrant balance.

UNIT III

Definition of Twist and T.P.I. Types of twist. Measurement of twist in single & ply yarns.
Methods of tests for fabric dimensions & other physical properties, viz thickness, weight, crimp.
Concept of pilling and its testing.

UNIT IV

Wettability, water proofness and water resistance. Measurement of water resistance of fabric.
Flammability, flame resistance & its measurement.
Fabric strength: Definition and principle of tensile, tearing and bursting strength of fabric.

UNIT V

Fabric handle, stiffness & draping properties – Terminology and experimental methods. Serviceability and wear of fabric. Fabric Abrasion and its types.
Fabric crease and crease recovery testing.

PRACTICAL EXERCISES

1. To find out the relative humidity of atmosphere by dry & wet bulb thermometer.
2. To find out moisture content and moisture regain of the given textile material by conditioning oven.
3. To find count of given yarn using analytical method.
4. To find out the count of warp and weft yarn of a given fabric with Beesley's balance.
5. To find out Wt/sqm (GSM) of fabric using Quadrant balance.
6. Twist in yarn: To find out the number of folds/twist per inch of single yarn using single yarn twist tester.
7. To find physical dimensions of fabric viz length, width of the fabric with measuring scale.
8. To find thickness of given fabric with fabric thickness tester.
9. To find Ends per Inch (E.P.I.) and Picks per Inch (P.P.I.) of given fabric.
10. To find stiffness of given fabric using Shirley stiffness tester.
11. To find water resistance rating of fabric using Spray tester.
12. To find crease recovery angle of given fabric using crease recovery tester.

RECOMMENDED BOOKS

1. J.E. Booth, "Textile Testing", CBS Publication, New Delhi.

2. P. Angappan, “Textile Testing”, S.S.M. Polytechnic College Publication.
3. Grover and Hamby, “Textile Testing”, Wiley India Pvt. Ltd.
4. R. Kadiyan and M. Nagpal, “Quality Evaluation of Textiles”, AG Publication, Ambala.

SUGGESTED WEBSITES

1. https://www.slideshare.net/errangari/textile-testing-44287642
2. https://textilestudycenter.com/yarn-count-measurement/
3. https://www.textileschool.com/199/physical-properties-and-characteristics-of-fabrics/
4. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

This is a skill based subject and topics taught in the class should be practiced in the Lab regularly for development of required skills in students. This subject contains five units of equal weight age with hands on practice for skill development.

FOURTH SEMESTER

4.1 ENGLISH AND COMMUNICATION SKILL - II

L	P
2	2

RATIONALE

Communication II moves a step further from Communication Skills I and is aimed at enhancing the linguistic competency of the students. Language as the most commonly used medium of self-expression remains indispensable in all spheres of human life – personal, social and professional. This course is intended to make fresh ground in teaching of Communicative English as per the requirements of National Skill Quality Framework.

COURSE OUTCOMES

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

CO1: Communicate effectively with an increased confidence; read, write and speak in English language fluently.

CO2: Comprehend special features of format and style of formal communication through various modes.

CO3: Write a Report, Resume, make a Presentation, Participate in GDs and Face Interviews

CO4: Illustrate use of communication to build a positive self-image through self-expression and develop more productive interpersonal relationships.

DETAILED CONTENTS

UNIT I

Reading

1.1 Portrait of a Lady - Khushwant Singh

1.2 The Doctor's Word by R K Narayan

1.3 Speech by Dr Kiran Bedi at IIM Indore2007 Leadership Concepts

1.4 The Bet - by Anton Chekov

UNIT II

Effective Communication Skills

2.1 Modern means of Communication (Video Conferencing, e- mail, Teleconferencing)

2.2 Effective Communication Skills: 7 C's of Communication
2.3 Non-verbal Communication – Significance, Types and Techniques for Effective Communication
2.4 Barriers and Effectiveness in Listening Skills
2.5 Barriers and Effectiveness in Speaking Skills

Unit III

Professional Writing

3.1 Correspondence: Enquiry letters, placing orders, complaint letters
3.2 Report Writing
3.3 Memos
3.4 Circulars
3.5 Press Release
3.6 Inspection Notes and tips for Note-taking
3.7 Corrigendum writing
3.8 Cover Letter

UNIT IV

Grammar and Vocabulary

4.1 Prepositions
4.2 Conjunctions
4.3 Punctuation
4.4 Idioms and Phrases: A bird of ill omen, A bird's eye view, A burning question, A child's play, A cat and dog life, A feather in one's cap, A fish out of water, A shark, A snail's pace, A snake in the grass, A wild goose chase, As busy as a bee, As faithful as dog, Apple of One's eye, Behind one's back, Breath one's last, Below the belt, Beat about the bush, Birds of a feather flock together, Black Sheep, Blue blood, By hook or crook, Chicken hearted, Cut a sorry figure ,Hand in glove, In black and white, In the twinkling, In full swing ,Is blind as a bat, No rose without a thorn, Once in a blue moon, Out of the frying pan in to the fire, know no bounds ,To back out, To bell the cat, To blow one's trumpet, To call a spade a spade, To cut one's coat according to one's cloth, To eat humble pie, To give ear to, To have a thing on one's finger tips, To have one's foot in the grave, To hold one's tongue, To kill two birds with one stone, To make an ass of oneself, To put two and two together, To the back bone, Turn coat, ups and downs.
4.5 Pairs of words commonly misused and confused: Accept-except, Access-excess, Affect-effect, Artificial- artful, Aspire-expire, Bail-bale, Bare-bear, Berth-birth, Beside-besides, Break-brake, Canvas-canvass, Course- coarse, Casual-causal, Council-counsel,

Continual-continuous, Coma-comma, Cue- queue, Corpse- corps-core, Dairy-diary, Desert-dessert, Dual-duel, Dew- due, Die-dye, Draft- draught-drought, Device-devise, Doze-dose, Eligible-illegible, Emigrant- immigrant, Envelop-envelope, Farther-further, Gate-gait, Goal-goal, Human-humane, Honorable-honorary, Hail-hale, Hair-heir-hare, Industrial-industrious, Impossible- impassable, Idle-idol-ideal, Lose-loose, Later-latter, Lesson-lessen, Main-Mane, Mental-mantle, Metal-mettle, Meter-metre, Oar-ore, Pray-prey, Plain-plan, Principal - principle, Personal- personnel, Roll- role, Route-rout- roote, Stationary-stationery, Union- unity, Urban- urbane, Vocation- vacation, Vain- vein-vane, Vary- very.

4.6 Translation of Administrative and Technical Terms in Hindi or Mother tongue: Academy, Abandon, Acting in official capacity, Administrator, Admission, Aforesaid, Affidavit, Agenda, Alma Master, Ambiguous, Appointing Authority, Apprentice, Additional, Advertisement, Assistant, Assumption of charge, Assurance, Attested copy, Bonafide, Bond, Cashier, Chief Minister, Chief Justice Clerical error, Commanding ,Officer, Consent, Contractor, corruption, Craftsman, Compensation, Code, Compensatory allowance, Compile, Confidential letter, Daily Wager, Data, Dearness allowance, Death - Cum Retirement, Dispatch, Dispatch Register, Disciplinary, Disciplinary Action, Disparity Department, Dictionary, Director, Director of Technical Education, Earned Leave, Efficiency Bar, Estate, Exemption, Executive Engineer, Extraordinary, Employment Exchange, Flying Squad, General Body, Head Clerk, Head Office, High Commission, Inconvenience, Income Tax, Indian Assembly Service, Justify, Legislative Assembly, Negligence, Officiating ,Office Record, Office Discipline, On Probation, Part Time, Performance, Polytechnic, Proof Reader Precautionary, Provisional, Qualified, Regret, Responsibility, Self-Sufficient, Senior, Simultaneous ,Staff, Stenography ,Superior, Slate, Takeover, Target Data Technical Approval, Tenure, Temporary, Timely Compliance, Under Investigation, Under Consideration, Verification, Viva-voce, Write off, Working Committee, Warning, Yours Faithfully , Zero Hour.

UNIT V

Employability Skills

5.1 Presentation Skills: How to prepare and deliver a good presentation

5.2 Telephone Etiquettes

5.3 Importance of developing employable and soft skills

5.4 Resume Writing: Definition, Kinds of Resume, Difference between Bio-data and Curriculum Vitae and Preparing a Resume for Job/ Internship

5.5 Group discussions: Concept and fundamentals of GD, and learning Group Dynamics.

5.6 Case Studies and Role Plays

PRACTICAL EXERCISES

1. Reading Practice of the above lessons in the Lab Activity classes.
2. Comprehension exercises of unseen passages along with the given lessons.
3. Vocabulary enrichment and grammar exercises based on the above selective readings.
4. Situational Conversation: Requesting and responding to requests; Expressing sympathy and condolence.
5. Warning; Asking and giving information.
6. Getting and giving permission.
7. Asking for and giving opinions.
8. A small formal and informal speech.
9. Seminar.
10. Debate.
11. Interview Skills: Preparing for the Interview and guidelines for success in the Interview and significance of acceptable body-language during the Interview.
12. Written Drills will be undertaken in the class to facilitate a holistic linguistic competency among learners.
13. Participation in a GD, Functional and Non-functional roles in GD, Case Studies and Role Plays
14. Presentations, using audio-visual aids (including power-point).
15. Telephonic interviews, face to face interviews.
16. Presentations as Mode of Communication: Persuasive Presentations using multi-media aids.
17. Practice of idioms and phrases on: Above board , Apple of One's eye , At sea, At random, At large, A burning question, A child's play, A wolf in sheep's clothing, A deal, Breath one's last, Bid fair to, Beat about the bush, Blue Blood, Big Gun, Bring to Book, Cut a sorry figure, Call names, Carry weight, Dark Horse, Eat Humble pie, Feel small, French leave, Grease the palm, Go against the grains, Get One's nerves, Hard and Fast, Hue and Cry, Head and ears, In full swing, Jack of all trades, know no bounds, kiss the dust, Keep an eye on, Lion's share, learn by rote, Null and void, on the cards, Pull a long face, Run amuck, Right and Left, Rain on Shine, Small talk, Take to one's heels, Tooth and nail, to take by storm, , Wet blanket, Yearn for.

RECOMMENDED BOOKS

1. Alvinder Dhillon and Parmod Kumar Singla, "Text Book of English and Communication Skills Vol – 1, 2", M/s Abhishek Publications, Chandigarh.

2. J Sethi, Kamlesh Sadanand & DV Jindal, "Course in English Pronunciation", PHI Learning Pvt. Ltd., New Delhi.
3. Wren and Martin, "High School English Grammar and Composition" .
4. NK Aggarwal and FT Wood, "English Grammar, Composition and Usage", Macmillan Publishers India Ltd., New Delhi.
5. RC Sharma, and Krishna Mohan, "Business Correspondence & Report Writing", (4th Edition), by Tata MC Graw Hills, New Delhi.
6. Varinder Kumar, Bodh Raj & NP Manocha, "Business Communication Skills", Kalyani Publisher, New Delhi.
7. Kavita Tyagi & Padma Misra, "Professional Communication", PHI Learning Pvt. Ltd., New Delhi.
8. Nira Konar, "Communication Skills for Professionals", PHI Learning Pvt. Ltd., New Delhi.
9. Krishna Mohan & Meera Banerji, "Developing Communication Skills", (2nd Edition), Macmillan Publishers India Ltd., New Delhi.
10. M. Ashraf Rizwi, "Effective Technical Communication", Tata MC Graw Hills, New Delhi.
11. Andrea J Rutherford, "Basic Communication Skills for Technology", Pearson Education, New Delhi.

INSTRUCTIONAL STRATEGY

This is practice based subject and topics taught in the class should be practiced in the Lab regularly for development of required communication skills in the students. Emphasis should be given on practicing of communication skills. This subject contains five unit of equal weight age.

4.2 DYEING OF SYNTHETIC AND BLENDED TEXTILES

L	P
2	4

RATIONALE

Textile processing students after this level are expected to have sufficient knowledge and skills bout principles of dyeing, operations, materials, equipment and process. They should be able to formulate recipes for dyeing of different types of material. Hence in this subject is included in the curriculum for the development of skills in dyeing of synthetics.

COURSE OUTCOMES

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

CO1: Learn about the terminology & techniques of dyeing of polyester, nylon, acrylic fiber materials.
CO2: Describe about the various machines used for dyeing of synthetic materials.
CO3: Formulate recipes of dyeing of various synthetic fibers.
CO4: Identify various faults/problems in dyeing and their solutions.
CO5: Acquire knowledge about eco-friendly dyeing processes.

DETAILED CONTENTS

UNIT I

Concept of dyeing of synthetic fibres and dyes used, Role of Glass Transition Temperature in dyeing.

Polyester dyeing- Preparation of fabric for dyeing. Different methods of polyester dyeing with disperse dyes - Carrier dyeing, HTHP, Thermofixation process. Advantages and limitations of Carrier, High temperature high pressure and Thermo fixation Process.

UNIT II

Acrylic dyeing- Types of acrylic fibres. Preparation of acrylic for dyeing, mechanism of dyeing of acrylic with cationic dyes, Different terms used in dyeing of acrylic. (Compatibility, saturation limit, saturation factor, compatibility value) Types of retarders in dyeing. Different techniques

for level dyeing of acrylic.(Rapid dyeing, Defitherm process). Dyeing of acrylic with disperse dyes.

Nylon Dyeing- Dyeing with acid, metal complex dyes, disperse and reactive dyes.

UNIT III

Concept of blending and its advantages. Brief introduction and dyeing of following blends Poly/ Cellulose blends, Poly / Wool, Acrylic /Wool, Acrylic / Silk, Cotton / Wool by different dyes combination- Disperse/ Reactive, Disperse / Vat, Disperse / Sol.Vat, Disperse / Acid, Disperse / Basic , Direct / Acid etc. Major problem/defects encountered in dyeing of synthetics and its blends with other fibres and their remedies.

UNIT IV

Machinery: Brief discussion on following dyeing machines, its principle and working:

(a) Fibre dyeing: Hand dyeing machine, loose cotton dyeing machine.

(b) Yarn Dyeing: Hank dyeing, Cone dyeing, Cheese dyeing machine & Warp dyeing machine.

(c) Fabric dyeing: Jigger, padding mangle, winch, HT/HP Beam dyeing m/c, Jet dyeing m/c, soft flow dyeing m/c, dyeing machines for semi continuous and continuous processes.

UNIT V

Recent Developments: Concept of sustainable textile wet processing and its importance. Brief introduction to following techniques of dyeing - solvent dyeing, supercritical dyeing, plasma technology, foam dyeing and Kuster Roll Mangle Technology for energy and water conservation in processing.

PRACTICAL EXERCISES

1. Dyeing of polyester with disperse dyes by carrier method.
2. Dyeing of polyester with HTHP method.
3. Dyeing of nylon with disperse dyes.
4. Dyeing of nylon with acid dyes.
5. Dyeing of acrylic with basic dyes
6. Dyeing of acrylic with disperse dyes.
7. Dyeing of Terry/cotton blend with suitable dyes
8. Dyeing of Terry /wool blend with suitable dyes.
9. Dyeing of cots /wool blend with suitable dyes
10. Dyeing of Acrylic/wool blend with suitable dyes.

11. Industrial visit for demonstration of dyeing of blends.

RECOMMENDED BOOKS

1. V.A. Shenai, “Technology of Dyeing”, Sevak Publishers Mumabi.
2. E.R Trotman, “Dyeing and Chemical Technology of Fibrous Material”, B.I. Production, New Delhi.
3. Arora, “A Text Book of Dyes”.
4. R.S. Paryag, “Dyeing and Synthetic Fabrics”.
5. James, “Printing and Dyeing of Fabrics”.
6. Charlese Pellow, “Dyes and Dyeing”, Abhishek Publishers, Chandigarh.

SUGGESTED WEBSITES

1. https://textilelearner.net/dyeing-of-polyester-fabric-with-disperse-dyes/
2. https://textiletuts.com/how-to-dye-acrylic-yarn-and-fabric/
3. https://diutestudents.blogspot.com/2016/09/dyeing-of-100-nylon-fabric-with-acid-dye.html
4. https://textilelearner.net/dyeing-of-polyester-cotton-blended-fabric/
5. https://www.fibre2fashion.com/industry-article/7111/soft-flow-dyeing-machine#:~:text=In%20soft%20flow%20dyeing%20machines,on%20conventional%20jet%20dyeing%20machines.
6. https://www.fibre2fashion.com/industry-article/3377/energy-conservation-in-textile-industriessavings#:~:text=The%20wet%20processing%20of%20textiles,running%20the%20various%20processing%20machinery's.
7. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

This is a skill based subject and topics taught in the class should be practiced in the lab regularly for development of required skills in the students. This subject contains five units of equal weight age with hands on practice for skill development.

4.3 TECHNOLOGY OF PRINTING - II

L	P
2	4

RATIONALE

Textile processing students after this level must have through knowledge of principles and practices employed for printing. They must be aware of various operations, materials, equipment and processes used for printing. Hence in this subject the emphasis is made on development of skills in textile printing.

COURSE OUTCOMES

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

CO1: Study the terminology & techniques of printing of cotton by various styles.
CO2: Learn the formation of recipes of different dyes for printing.
CO3: Apply the paste to print samples.
CO4: Interpret and compare various styles of printing.
CO5: Acquire knowledge of novel techniques of printing.

DETAILED CONTENTS

UNIT I

Direct printing styles on cotton: Study of Printing by direct style with Direct, Reactive, Vat, Solublised vat Pigments colours, Napthol Colours, rapidozen and Rapidfast colour, Aniline Black, Concept of Illuminating colours.

UNIT II

Discharge printing style on cotton: Principles of Discharging, White and coloured discharge printing on Direct, Reactive, Vat, Napthol & Indigosol dyed cotton fabrics.

UNIT III

Resist Style of Printing on Cotton: Principles of Resisting, White and coloured Resist Printing under Napthol, Reactive, Vat, Solublised vat, Aniline Black colours as ground colours.Concept of Khadi Printing, white &coloured Khadi Printings.

UNIT IV

Special Styles of Printing: Study of following special styles of printing with reference to process, materials& equipment used.

- Dyed style–Tie and Dye or Bandhani Print
- Batik style of Printing
- Crimp style or crepon style of printing
- Burn out style
- Polychromatic printing

Introduction to Puff Print, High density print, Glitter print, Metallic print, Sand Print, Crackle print, Flock print (Powder and sheet form) Foil print, Rubber print, Gloss Print.

UNIT V

Transfer Printing: Introduction to transfer printing-principle, process, and conditions required. Flat, Continuous and Vacuum transfer printing machines. Brief study of transfer paper printing methods. Advantages & Disadvantage of Transfer Printing

PRACTICAL EXERCISES

1. To print cotton fabric sample using direct dyes by direct style.
2. To print cotton fabric sample by hot brand reactive dyes by direct style.
3. To print cotton fabric sample by cold brand reactive dyes by direct style.
4. To print cotton fabric sample by pigment colours.
5. To print cotton fabric sample by Naphthal colour by base printing method.
6. To print cotton fabric sample by white discharge style of printing
7. To print cotton fabric sample by colour discharge style of printing
8. To print cotton fabric sample by dye weave technique of printing.
9 To print a cotton fabric sample by crimp style of printing
10 To print cotton fabric sample by Tie and Dye styles.
11 To print cotton fabric sample by batik style
12 To print polyester fabric by transfer printing method.
13 To create glitter effect on fabric.
14 To create crack print effect on fabric.

RECOMMENDED BOOKS

1. Dr. V.A. Shanai, “Technology of Printing”, Sewak Publication, Mumbai Textile Printing.
2. Joyci Storey, “Textile Printing”, Thames& Hudson, London.

3. Pamand Stallebras, “The Creative Guide to Fabric Screen Printing”, New Holland Publishers Ltd., London.
4. D.G. Kale, “Principles of Cotton Printing”, ATIRA Ahmedabad
5. Knecht, & Eand Fothergill, “The Principles and Practical of Textile Printing”, J.B. London.

SUGGESTED WEBSITES

1. https://www.textilepad.com/2021/09/printing-of-cotton-with-direct-dye.html
2. https://www.saree.com/10-printing-and-dyeing-techniques-from-india
3. https://textilestudycenter.com/printing-of-cotton-fabric-with-reactive-dyes/
4. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=113844
5. https://textilelearner.net/discharge-printing-process/
6. https://textilelearner.net/resist-printing-techniques-in-textile/
7. https://www.hollyflower.com/sublimation-digital-printing
8. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

This is a skill based subject and topics taught in the class should be practiced in the lab regularly for development of required skills in the students. This subject contains five units of equal weight age with hands on practice for skill development.

4.4 TEXTILE CHEMICAL TESTING

L	P
2	4

RATIONALE

Textile Processing students are responsible for controlling the quality of finished product. They are also required to supervise chemical testing of textiles. For this purpose, knowledge and skills about various chemical tests carried out to test material is required. Hence this subject gives emphasis on development of skills in various aspects of textile chemical testing.

COURSE OUTCOMES

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

CO1: Identify and analyze the blend percentage in unknown yarn/fabric.
CO2: Determine the extent of chemical damage during pre-treatments.
CO3: Evaluate the scouring & mercerization efficiency.
CO4: Handle equipments and conduct various fastness tests on textile substrate.
CO5: Learn and interpret fastness results.

DETAILED CONTENTS

UNIT I

Aim and scope of textile chemical testing
Quantitative Analysis of Fibres in a blended Yarn/Fabric: Cots wool, Terry wool, Polyester cotton, Polyester Viscose, Acrylic wool, Nylon& wool.

UNIT II

Mechanical and chemical damages occurring to various textile materials during preparatory processes. Degradation of cotton and wool- oxycellulose and hydrocellulose. A brief introduction of various tests to assess degradation like-
Copper Number Test
Methylene Blue Test
Critical Dissolution Time
Cuprammonium fluidity Test

UNIT III

Scouring Efficiency- Weight loss percentage, Drop absorbency, Sink test. Determination off fat/wax content in textile material. Assessment of degree of mercerization process- Barium Activity number, Axial Ratio and Deconvolution Count. Procedure of testing of bleaching agents- Hydrogen per oxide and sodium hypochlorite, Testing of formaldehyde content in textiles and its limit.

UNIT IV

Colour fastness- objectives and importance. International standards for testing. Grey scales and Blue wool standards. Method of evaluation of colour fastness by grey scale. Methods of determination of colour fastness to Washing and Rubbing (Dry and wet).

UNIT V

Methods of determination of colour fatnesses to Light, Perspiration, Sea water, Bleaching, Hot Pressing and Sublimation. Principle, construction and working of different equipment/ instruments to test various fastnesses- Laundrometer, perspirometer, crockmeter, exposure rack and light fastness tester.

PRACTICAL EXERCISES

1. Identification of blend percentage in following blends:
   Polyester/ Cotton blend
   Polyester / Viscose Blend
   Polyester/ Wool/ Viscose Blend
2. To evaluate the desizing efficiency.
3. To measure the pH of the fabric and tap water.
4. To measure scouring loss of a cotton fabric.
5. To evaluate wetability of finished fabric.
6. To measure the washing fastness of different dyed sample by different international standards test method and to grade them.
7. To determine the dry rubbing fastness of different given dyed sample and to grade them.
8. To determine the wet rubbing fastness of given dyed sample and to grade them.
9. To determine the residual shrinkage in a finished fabric.
10. To assess the changes in colour on hot pressing.
11. To determine the colour fastness to bleaching for a given dyed sample.
12. To determine light fastness of given sample using exposure rack.
13. To determine the light fastness of a given sample using light fastness tester.

14. To check the perspiration fastness of a given dyed sample.

RECOMMENDED BOOKS

1. A. A Vaidya, “Textile Auxiliaries & Chemicals”, Nitra Publication.
2. Dr. V. A Shenai, “Textile Auxiliaries”, Sevak Publication, Bombay.
3. Dr. V. A Shenai, “Technology of Bleaching”, Sevek Publication.
4. D. K. Sinha, “Quality Control in Textile Wet Processing”, BIRA Paper.
5. Hall, “Chemical Testing of Textile”, Mahajan Publication, Ahemdabad.
6. Grover, “Handbook of Testing and Quality Control”, Mahajan Publication, Ahemdabad.
7. Shirley Institute, “Quality Control of Cloth Dimensions and the Shrinkage of Yarn and Fabrics”.
8. R. Kadian & M. Nagpal, “Quality Evaluation of Textiles”.

SUGGESTED WEBSITES

1. http://mytextilenotes.blogspot.com/2009/06/how-to-identify-constituent-fibres.html
2. https://www.dspattextile.com/2022/06/mercerization-efficiency-test.html
3. https://www.testextextile.com/what-is-the-light-fastness-test-for-textiles/
4. https://textileapex.blogspot.com/2015/03/colourfastness-to washing.html#:~:text=The%20test%20procedure%20for%20washing%20fastness&text=The%20sample%20will%20be%20rinsed,0C%20at%20tumble%20dryer
5. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

This is a skill based subject and topics taught in the class should be practiced in the lab regularly for development of required skills in the students. This subject contains five units of equal weightage with hands on practice for skill development.

4.5 MULTIDISCIPLINARY ELECTIVE

L	P
2	-

RATIONALE

Multidisciplinary electives are very important and play major role in implementation of National Education Policy. Multidisciplinary is a subject which is useful for two or more disciplines in which students are asked to understand the concept of multidisciplinary or interdisciplinary. It will help the students to gain an arsenal of skills that are easily transferable across work environments.

COURSE OUTCOMES

At the end of the open elective, the students will be able to:

CO1: Apply critical thinking problem solving.
CO2: Demonstrate self and time management.
CO3: Display analytical and research abilities.
CO4: Integrate multiple knowledge domains.
CO5: Enhance the scope and depth of learning.

LIST OF MULTIDISCIPLINARY ELECTIVES

(The list is indicative and not exhaustive)

1. Introduction to Internet of Things
2. Introduction to Robotics
3. Introduction to Embedded System Design
4. Fundamentals of Artificial Intelligence
5. Digital Image Processing
6. Introduction to Machine Learning
7. Fundamentals of Artificial Intelligence
8. The Joy of Computing Using Python
9. Cloud Computing
10. Introduction to Industry 4.0

11. Industrial Internet of Things

12. Object Oriented System Development using UML, Java and Patterns

GUIDELINES

Multidisciplinary Elective shall be offered preferably in online mode. Online mode multidisciplinary elective shall preferably be through Massive Open Online Courses (MOOCs) from Swayam, NPTEL, Upgrad, Udemy, KhanAcademy or any other online portal to promote self-learning. A flexible basket of large number of multidisciplinary electives is suggested which can be modified depending upon the availability of courses at suggested portals and requirements. For online multidisciplinary electives, department coordinators shall be assigned to monitor and guide the group of students for selection of minimum 20 hours duration online course of their choice. For offline multidisciplinary electives, a suitable relevant subject shall be offered by the respective department to the students with minimum 40% of the total class strength as per present and future requirements.

Assessment of MOOCs multidisciplinary elective shall be based on continuous evaluation by the respective coordinator. The coordinator shall consider the submitted assignments by the students from time to time during the conduct of MOOCs. The MOOCs assessment shall be conducted by the coordinator along with one external expert by considering submitted assignments out of 100 marks.

In case, no suitable multidisciplinary elective is available online, only then the course may be conducted in offline mode. The assessment of offline multidisciplinary elective shall be internal and external. The offline multidisciplinary elective internal assessment of 40 marks shall be based on internal sessional tests, assignments etc. and external assessment of 60 marks shall be based on external examination at institute level.

SUGGESTED WEBSITES

1. https://swayam.gov.in/
2. https://www.udemy.com/
3. https://www.upgrad.com/
4. https://www.khanacademy.org/

4.6 MINOR PROJECT

L	P
-	8

RATIONALE

Minor project work will help in developing the relevant skills among the students as per National Skill Qualification Framework. It aims at exposing the students to the present and future needs of various relevant industries. It is expected from the students to get acquainted with desired attributes for industrial environment. For this purpose, students are required to be involved in Minor Project Work in different establishments.

COURSE OUTCOMES

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

CO1: Define the problem statement of the minor project according to the need of industry.

CO2: Work as a team member for successful completion of minor project.

CO3: Write the minor project report effectively.

CO4: Present the minor project report using PPT.

GUIDELINES

Depending upon the interest of the students, they can develop minor projects as per present and future demand of the industry. The supervisors may guide the students to identify their minor project work and chalk out their plan of action well in advance. As a minor project activity each student is supposed to study the operations at site and prepare a detailed project report of the observations/processes/activities. The supervisor may create a group of 4-5 students as per their interest to work as a team for successful completion of the minor project.

The supervisor shall evaluate the students along with one external expert by considering the following parameters:

	Parameter	**Weightage**
I	Defining problem statement, focus and approach	20%
ii	Innovation / creativity	20%
iii	Report Writing	20%
iv	Power Point Presentation	20%
v	Viva - voce	20%

THIRD YEAR

NSQF LEVEL - 5

12. STUDY AND EVALUATION SCHEME

FIFTH SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week		Credits L+P= C	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	P		Th	Pr	Total	Th	Pr	Total	
5.1	Industrial Training-II	-	2	0+1 =1	-	40	40	-	60	60	100
5.2	Denim Processing	2	4	2+2=4	40	40	80	60	60	120	200
5.3	Advancements in Textile Printing	2	4	2+2 =4	40	40	80	60	60	120	200
5.4	Computer Colour Matching	-	4	0+2=2	-	40	40	-	60	60	100
5.5	Technology of Finishing – II	2	4	2+2=4	40	40	80	60	60	120	200
5.6	Introduction to Technical Textiles	2	4	2+2=4	40	40	80	60	60	120	200
5.7	Open Elective (MOOCs+/Offline	2	-	2+0=2	40	-	40	60	-	60	100
# Student Centred Activities (SCA)		-	3	-	-	-	-	-	-	-	-
Total		**10**	**25**	**21**	**200**	**240**	**440**	**300**	**360**	**660**	**1100**

\+ Assessment of Multidisciplinary Elective through MOOCs shall be based on assignments out of 100 marks.

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

SIXTH SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week		Credits (C) L + P = C	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	P		Th	Pr	Total	Th	Pr	Total	
6.1	Process Quality Control in Textile Wet Processing	3	-	3+0=3	40	-	40	60	-	60	100
6.2	*Entrepreneurship Development & Management	3	-	3+0=3	40	-	40	60	-	60	100
6.3	Programme Elective-I	3	-	3+0=3	40	-	40	60	-	60	100
6.4	Programme Elective-II	3	-	3+0=3	40	-	40	60	-	60	100
6.5	Fiber to Finished Fabric Practices	-	4	0+2=2	-	40	40	-	60	60	100
6.6	Major Project/ Industrial Training	-	16	0+8+8	-	40	40	-	60	60	100
# Student Centered Activities (SCA)		-	3	-	-	-	-	-	-	-	-
Total		**12**	**23**	**22**	**160**	**80**	**240**	**240**	**120**	**360**	**600**

* Common with other Diploma Courses.

Programme Elective I: 6.3.1 Process House Management 6.3.2 Science of Clothing Comfort

Programme Elective II: 6.4.1 Knit & other Fabric Processing 6.4.2 Sustainable Textile Wet Processing

Student Centered Activities will comprise of co-curricular activities like extension lectures on Constitution of India, Electoral Literacy, Motor Vehicles (Driving) Regulations 2017 etc., games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self-study etc.

19. HORIZONTAL AND VERTICAL SUBJECTS ORGANISATION

Sr. No.	Subjects/Areas	Hours Per Week	
		Fifth Semester	Sixth Semester
1.	Industrial Training - II	2	-
2.	Denim Processing	6	-
3.	Advancements in Textile Printing	6	-
4.	Computer Colour Matching	4	-
5.	Technology of Finishing – II	6	
6.	Introduction to Technical Textiles	6	-
7.	Open Elective (MOOCs/Offline)	2	
8.	Process Quality Control in Textile Wet Processing		3
9.	Entrepreneurship Development & Management	-	3
10.	Programme Elective - I	-	3
11.	Programme Elective - II	-	3
12.	Fibre to Finished Fabric Practices	-	4
13.	Major Project/Industrial Training	-	16
14.	Student Centered Activities	3	3
	Total	**35**	**35**

20. COMPETENCY PROFILE & EMPLOYMENT OPPORTUNITIES

Government and private sectors related to **Textile Processing** require **supervisors** having well developed skills with clear choice of procedures. They are expected to have complete knowledge and practical skills related to textile processing field. They shall be able to communicate clearly with others. Diploma holders after passing level 5 shall have understanding of desired mathematical skills and understanding of social and natural environment. They are expected to collect, organize and communicate information effectively.

Work requiring knowledge, skills and aptitudes at level 5 will also be carried out in familiar situations, but also ones where problems may arise. Job holders will be able to make choices about the best procedures to adopt to address problems where the choices are clear. Individuals in jobs which require level 5 qualifications will normally be responsible for the completion of their own work and expected to learn and improve their performance on the job. They will require well developed practical and cognitive skills to complete their work. They may also have some responsibility for others' work and learning.

Textile processing diploma pass out students will be expected to understand what constitutes quality in the occupation and will distinguish between good and bad quality in the context of their work. They will be expected to operate hygienically and in ways which show an understanding of environmental issues. They will take account of health and safety issues as they affect the work they carry out or supervise. They are expected have the good theoretical and practical knowledge of denim processing, textile printing advancements, finishing technology technical textiles for working efficiently in industries related to textile processing. They are also expected to have good practical knowledge computer based color matching and fibre to finished fabric.

Textile processing diploma students are expected to have wide scope to work in textile mills, processing houses, garment export houses, weaving mills, textile testing houses, fabric quality control centers and production units in garment manufacturing industries. They can start their own small start-ups in the area of marketing, sales, manufacturing and production etc.

21. PROGRAMME OUTCOMES

The programme outcomes are derived from five domains of NSQF Level – 5 namely Process, Professional Knowledge, Professional Skill, Core Skill, Responsibility. After completing this level, the student will be able to:

PO1: Perform task that require well developed skills with clear choice of procedures.

PO2: Acquire knowledge of facts, principles and processes related to textile processing.

PO3: Demonstrate cognitive and practical skills to complete tasks and solve problems.

PO4: Develop skills to collect, organize and communicate information.

PO5: Accomplish own work and supervise others work.

PO6: Select online open elective of own interest to promote self-learning.

22. ASSESSMENT OF PROGRAMME AND COURSE OUTCOMES

Programme Outcomes to be assessed	Assessment criteria for the Course Outcomes
PO1: Perform task that require well developed skills with clear choice of procedures.	• Handle various weave effects on denim fabrics. • Carry out various wash effects on denim fabric • Demonstrate the working of automatic printing machines. • Differentiate between manual and automatic methods of printing. • Describe the role of various chemicals used in printing of synthetic material. • Explore basic concepts and use terminology related to computer colour matching. • Perform colour matching tasks using hardware and software. • Practice recipe formulation on different textile material with varying classes of dyes. • Analyze shade differences reflectance values of white and dyed substrates. • Interpret processing sequence for popular verities of fabrics. • Apply the knowledge of advanced finishing on various substrates. • Handle various treatments used on woolen material. • Identify various techniques / processes for making different types of technical textiles. • Describe general utility of different technical textiles. • Identify the constituent fibers present in various types of textiles. • Apply different techniques of preparation and dyeing of different textile material. • Perform finish effects on textile material. • Evaluate the different fastness properties of different dyed materials.

	• Analyze effect of different chemicals on different fibers.
PO2: Acquire knowledge of facts, principles and processes related to textile processing.	• Learn the chemistry involved in indigo dyeing. • Understand processing sequence, methods of dyeing Denim fabric. • Acquire knowledge of the various machines / equipment used in denim processing. • Learn the new technology of digital printing. • Understand various methods of woolen printing. • Differentiate between manual and automatic methods of printing. • Describe the role of various chemicals used in printing of synthetic material. • Learn the effects of different stabilization finishes. • Explain the principle, process and chemicals used in various special finishes. • Learn the theory of technical textiles. • Study about application of technical textiles in different industrial areas. • Acquire the knowledge of different technical fields. • Learn about necessary actions and precautions during the process to maintain quality. • Acquire knowledge of various textile processing techniques. • Understand the control parameters for different processes. • Explain the working of various machinery used for textile processing. • Study different quality standards for textile wet processes. • Understand the concept of plant layout. • Acquire the knowledge of plant maintenance and material handling. • Study the role of safety in process house.

	• Explain role of pollution boards in controlling pollution • Learn about energy audit of process house. • Learn various elements and factors of comfort in clothing. • Acquire knowledge about the right clothing for a particular end use. • Understand the cooling science of human body. • Study the comfort in different scales. • Explore factors expressing human comfort. • Learn the concept of carpet processing. • Study the processing of jute, linen and spandex containing material. • Understand the processing sequence, methods, finishing of Denim fabric and. • Acquire knowledge about the processing sequence, method and precautions. • Explain the processing of terry towel products. • Learn the existing chemical processes and new techniques for sustainability. • Study green chemistry for textile chemical Processing. • Acquire knowledge about the sustainable approaches in Textile dyeing and printing. • Explore the alternative application techniques to reduce water pollution load. • Explain the role of enzymes in textile wet processing.
PO3: Demonstrate cognitive and practical skills to complete tasks and solve problems.	• Handle various weave effects on denim fabrics. • Carry out various wash effects on denim fabric • Demonstrate the working of automatic printing machines. • Differentiate between manual and automatic methods of printing. • Describe the role of various chemicals used in printing of synthetic material.

	• Explore basic concepts and use terminology related to computer colour matching. • Perform colour matching tasks using hardware and software. • Practice recipe formulation on different textile material with varying classes of dyes. • Analyze shade differences reflectance values of white and dyed substrates. • Interpret processing sequence for popular verities of fabrics. • Apply the knowledge of advanced finishing on various substrates. • Handle various treatments used on woolen material. • Identify various techniques / processes for making different types of technical textiles. • Describe general utility of different technical textiles. • Identify the constituent fibers present in various types of textiles. • Apply different techniques of preparation and dyeing of different textile material. • Perform finish effects on textile material. • Evaluate the different fastness properties of different dyed materials. • Analyze effect of different chemicals on different fibers.
PO4: Develop skills to collect, organize and communicate information.	• Understand the working environment of industries • Learn about present and future requirement of industries. • Develop writing, speaking and presentations skills. • Observe technological developments as per present and future needs of industries. • Collect, communicate and manage the data from connected devices.

	• Comprehend the importance of entrepreneurship and its role in nation's development. • Classify the various types of business and business organizations. • Identify the various resources / sources and / or schemes for starting a new venture. • Explain the principles of management including its functions in an organisation. • Conduct market survey and prepare project report. • Define the problem statement of the Major project / Industrial Training according to the need of industry. • Write the Major project / Industrial Training report effectively. • Present the Major project / Industrial Training report using PPT.
PO5: Accomplish own work and supervise others work.	• Take necessary safety precautions and measures. • Work in team for solving industrial problems • Develop competencies and skills required by relevant industries. • Define the problem statement of the Major project / Industrial Training according to the need of industry. • Work as a team member for successful completion of Industrial training / Major project. • Write the Major project / Industrial Training report effectively. • Present the Major project / Industrial Training report using PPT.
PO6: Select online open elective of own interest to promote self-learning.	• State the basic concepts and principles about the subject of interest. • Perform in a better way in the professional world. • Select and learn the subject related to own interest. • Explore latest developments in the field of

	interest. • Develop the habit of self-learning through online courses.

23. SUBJECTS & CONTENTS

(THIRD YEAR)

FIFTH SEMESTER

5.1 INDUSTRIAL TRAINING-II

L	P
-	2

RATIONALE

Industrial training will help the students to understand the working environment of relevant industries. The student will learn to work in team to solve the industrial problems. It will also give exposure about the present and future requirements of the relevant industries. This training is very important for development of required competencies and skills for employment and start– ups.

COURSE OUTCOMES

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

CO1: Understand the working environment of industries
CO2: Take necessary safety precautions and measures.
CO3: Learn about present and future requirement of industries.
CO4: Work in team for solving industrial problems
CO5: Develop competencies and skills required by relevant industries.
CO6: Develop writing, speaking and presentations skills.

PRACTICAL EXERCISES

1. Report writing based on industrial training.
2. Preparation of Power Point Slides based on industrial training and presentation by the candidate.
3. Internal Evaluation based on quality of Report, PPT preparation, PPT presentation and answer to queries.
4. External Evaluation based on quality of Report, PPT preparation, PPT presentation and answer to queries.

GUIDELINES

Students will be evaluated based on Industrial training report and their presentation using Power Point about the knowledge and skills gained during the training. The Headof the Department will depute faculty coordinators by assigning a group of students to each. The coordinators will mentor and guide the students in preparing the PPTs for final presentation. The following performance parameters are to be considered for assessment of the students out of 100 marks:

	Parameter	**Weightage**
i	Industrial assessment of the candidate by the trainer	40%
ii	Report Writing	20%
iii	Power Point Presentation	20%
iv	Viva-voce	20%

5.2 DENIM PROCESSING

L	P
2	4

RATIONALE

Textile processing students must have good knowledge of denim as it is the most popular fabric for all purposes. Denim processing include preparation, dyeing and finishing. So students must have thorough knowledge and skills of these processes. Hence emphasis has been laid on theory and practice of the denim processing.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:
CO1: Learn the chemistry involved in indigo dyeing
CO2: Understand processing sequence, methods of dyeing Denim fabric
CO3: Acquire knowledge of the various machines / equipment used in denim processing
CO4: Handle various weave effects on denim fabrics
CO5: Carry out various wash effects on denim fabric.

DETAILED CONTENTS

UNIT I

Introduction and Chemistry of indigo dye

Introduction and Past History of Indigo Dye Application, preamble to denim.
Chemistry of Indigo Dyeing:Reaction with Cellulosic Fibre and Source of pH Dependent Ring Dyeing.
Factor Affecting Dye Built-up on the Cellulosic material and degree of penetration.
Concentration of Indigo, Immersion Time of Yarn into Dye-Bath, Oxidation Time on Dye Uptake, Number of Dipping, Temperature and pH.

UNIT II

Indigo Dyeing Equipments and their advancement

Prerequisite of Indigo Dyeing Equipments:- Conditions and requirements for indigo dyeing, stock vat of indigo and preparation of dye bath of indigo. Prerequisite of Continuous Indigo Dyeing Range:- Pre-impregnation phase, dyeing phase and after treatment phase.

Types of Indigo dyeing machine:-Rope and sheet form dyeing. Merits and demerits of machines. Precautions while dealing with Indigo Dyeing Machines.

UNIT III

Weaving of Denim Fabric

Twill Fabric(Continuous Twill Weave, Warp Face Twills, Weft Face Twills, Warp and Weft Face Twills, Zigzag or Wavy Twills, Broken Twill). Denim Fabric Containing Blends of Cotton and Other Fibres. Defects in Denim Fabric Due to Faulty Yarn, Sizing and Weaving Faults.

UNIT IV

Finishing of Denim Fabric

Some Finishing and Rewetting Formulae (Permanent-Press Formula, Finishing Formula and Non-Resin Formula). Preshrinking of Denim. Integrated Finishing and Shrinking Range

Sanforset Process (Pre-Drying and Ammoniation), Skewing. New finishing line for denim.

Development of Ole Tymes Denim. Printing with Indigo:

- Glucose-Alkali Process, Hydrosulphite Process. Innovations towards Saving of Indigo Dye and Chemicals

UNIT V

Washing of Denim Fabric

Objective of Washing

Types of Washing: mechanical (Stone and sand paper) and chemical(Acid, oxidative agents and Enzymes)

Basic Enzyme Reaction, Factors Controlling Activity of Cellulase enzyme, Procedure of Enzyme Washing, Selection of Pumice Stones, Criteria for the Selection of Softener

Overdyed Denim, Quick-wash Denim,

Modified Ring Dyeing Technique for Quick Wash Denims, Advantages of Quick-Wash Denim.

PRACTICAL EXERCISES

1. To study the weave structure of a denim fabric.
2. To prepare a sample for over dyed denim.
3. To produce wash effects on denim with acid.
4. To produce wash effects on denim with stone.
5. To produce wash effects on denim with bleach.
6. To produce wash effects on denim with enzyme.

7. To study the effect of density of stones on wash effects.
8. To study the effect of size of stones on wash effects.
9. To produce a sample of the crushed denim.
10. To produce a sample of the double dyed denim.
11. To produce sand paper effect on denim.
12. To study the effect on strength by introducing elastane.
13. To produce sample of a printed denim.
14. To make a portfolio of different types of denim fabics.
15. To demonstrate denim processing by industrial visits.

RECOMMENDED BOOKS

1. Parmar, M. S. (1996). Denim: A Fabric for All: Dyeing, Weaving, Finishing. NITRA.
2. Trotman, E. R. (1985). Dyeing and Chemical Technology of Textile Fibres 6th Edition John Wiley & Sons Inc.
3. Klein, W. New Spinning Systems, Manual of Textile Technology, vol. 5. The Textile Institute.
4. Rao, J. V. (2010). Denim Washing 2nd Edition. NITRA.
5. Shah, D.L., Modern Quick Wash Denim Garment. Man-made Textile India.
6. Paul, R. (2015) Denim Manufacture, Finishing and Applications. Wood head publications

RECOMMENDED WEBSITES

1. https://ordnur.com/jeans/what-is-denim/
2. https://denimhunters.com/denim-wiki/denim-explained/dyeing/
3. https://www.zevadenim.com/denim-dyeing-process-you-must-know/
4. https://science.howstuffworks.com/environmental/green-tech/sustainable/denim-dyeing.htm
5. https://www.coats.com/en/information-hub/denim-wash

INSTRUCTIONAL STRATEGY

This is a skill based subject and topics taught in the class should be practiced in the lab regularly for development of required skills in the students. This subject contains five units of equal weight age with hands on practice for skill development.

5.3 ADVANCEMENTS IN TEXTILE PRINTING

L	P
2	4

RATIONALE

Textile processing diploma students must have thorough knowledge about principles and practices employed for printing. They must be aware of various operations, materials, equipments & processes used for printing. Hence in this subject the emphasis is made on development of skills in textile printing.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:
CO1: Learn the new technology of digital printing
CO2: Demonstrate the working of automatic printing machines.
CO3: Understand various methods of woolen printing
CO4: Differentiate between manual and automatic methods of printing
CO5: Describe the role of various chemicals used in printing of synthetic material.

DETAILED CONTENTS

UNIT I

Automatic Screen Printing

Introduction and working of different squeeze systems used in flat bed and rotary screen printing machines. Construction and working steps in these machines. Methods of making of Rotary Screens. Advantages & limitations of automatic screen printing machines and comparison with manual screen printing.

UNIT II

Printing of Woolen and Silk Materials

Preparation of woolen and silk material for printing
Printing of woolen and silk fabric with different classes of dyes. Printing ofcotton/wool blends. Printing of slivers. White & coloured discharge printing of silk. White & coloured resist printing of silk materials.

UNIT III

Printing of Polyester and their blends

Preparation & Printing of polyester fibre fabrics (100%polyester) with disperse dye by direct & discharge style.

Preparation & Printing of Polyester/cotton (PC), Polyester/viscose (P/V) Blended fabrics Using Two classes of colour ants-Disperse/Reactive, Disperse/vat and Disperse/Solublisedvat.

UNIT IV

Printing of Acrylic, Nylon and their blends

Preparation of Acrylic fibre fabric

Printing of Acrylic fabrics with cationic dyes & disperse dyes and their important blends with suitable dye combination.

Printing of Nylon textile material with nylon dyes, their important blends with suitable dye combination.

UNIT V

Digital Printing of Textiles

Introduction of Digital textile printing. Difference between digital and analog printing.

Colour concept (CYMK) in Digital Printing. Spot and Process colours.

Essential steps of digital textile printing.

Ink-jet Printing Technology Principles

Their advantages & disadvantages.

General machinery used in digital printing. Pre and Post-treatment required.

Ink-types and substrate, Properties of Pigment inks, Disperse inks, Acid inks, Reactive inks and their use.

Pigment printing: concept and application for all sorts of textile materials.

PRACTICAL EXERCISES

1. Printing of polyester fabric with disperse dyes by thermo-fixation methods.
2. Printing of polyester fabric with disperse dyes by carrier method.
3. Printing of polyester fabric with pigment colour.
4. Printing of silk fabric with acid dyes.
5. Printing of woolen fabric with acid dyes.
6. Printing of silk/woolen fabric with reactive dyes.
7. Printing of Nylon fabric with acid dyes.

8. Printing of Acrylic fabric with basic dyes.
9. Demonstration of flat bed printing machine in a process house/ print house.
10. To print a polyester/cotton blended fabric with pigments.
11. To print a woolen yarn to produce a multicolored yarn.

RECOMMENDED BOOKS

1 Shenai, V. A. (1979). Technology of Printing. Sevak Publications.
2 Miles, W. C. (1994). Textile Printing. Society of Dyers & Colourists.
3 Storey, J. (1974). Manual of Textile Printing. Thames & Hudson Ltd.
4 Ujiie, H. (2006). Digital Printing of Textiles. Woodhead Publication.
5 Rothwell, C. F. S. (2022). The Printing of Textile Fabrics: A Practical Manual On the printing of Cotton, Woollen, Silk and Half Silk Fabrics. Legare Street Press.

RECOMMENDED WEBSITES

1. https://once-tech.com/everything-you-wanted-to-know-about-automatic-screen-printing-machine/#:~:text=Working%20principle%20of%20automatic%20screen%20printing%20machine&text=The%20ink%20is%20squeezed%20from,fixed%20within%20a%20certain%20range
2. https://textilelearner.net/printing-of-silk-fabric-with-acid-dyes/
3. https://textilechemrose.blogspot.com/2017/12/polyester-printing.html
4. https://archive.nptel.ac.in/courses/116/102/116102052/

INSTRUCTIONAL STRATEGY

This is a skill based subject and topics taught in the class should be practiced in the lab regularly for development of required skills in the students. This subject contains five units of equal weight age with hands on practice for skills development.

5.4 COMPUTER COLOUR MATCHING

L	P
-	4

RATIONALE

Colour matching is an important activity for a diploma students of textile processing. They must have necessary knowledge & skills of software and hardware regarding computer aided colour matching for textiles. Hence this practical subject has been introduced with emphasis on development of skills through practice.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:
CO1: Explore basic concepts and use terminology related to computer colour matching
CO2: Perform colour matching tasks using hardware and software.
CO3: Practice recipe formulation on different textile material with varying classes of dyes.
CO4: Analyze shade differences reflectance values of white and dyed substrates.

PRACTICAL EXERCISES

1. To study about the fundaments of colour theory & colour mixing principles. Various standard illuminants, observing condition.
2. To study about concept of metamerism in textiles and matching of shade on colour matching cabinet
3. To study about the CIELAB system of specification of colour. Brief introduction of L*, a*, b*and colour difference.
4. To study about the colour matching instruments-spectrophotometer and colorimeters used in textile industry.
5. To use the CCM software i.e Creation of a data file for a particular class of dye.
6. To determine colour Strength of dyes and interpretation of results.
7. To predict dyeing recipe on different textile material with varying classes of dyes.
8. To predict dyeing recipe in case of re-dyeing operation for batch correction.
9. Evaluation of shades in different systems within given tolerance limits and results (Pass/ Fail System)

10. Assessment of whiteness, yellowness and brightness indices and critical evaluation of results.

RECOMMENDED BOOKS

1. Sule, A. D. (1997) Computer Colour Analysis- Textile Application, New Age International Private Limited.
2. Gandhi, R. S. Instrument Colour Measurement & Computer Aided Colour Matching for Textiles. Mahajan Publications.
3. Khedkar, N. S. G. Understanding Computer Colour Matching. Ritu Prakashan Bombay.
4. Billmeyer and Saltman's. Principal of Colour Technology 4th Edition. Wiley Publishers.
5. Peterson. (2006). Textile Colour Mixing. Abhishek Publication, Chandigarh.

RECOMMENDED WEBSITES

1. https://lupinepublishers.com/fashion-technology-textile engineering/fulltext/fundamentals-and-applications-of-computer-aided-colour-match-prediction-ccmp-system.ID.000148.php
2. https://textilelearner.net/computer-colour-matching-system-ccms/
3. https://www.hunterlab.com/blog/what-is-cielab-color-space/
4. https://support.hunterlab.com/hc/en-us/articles/203993635-Shade-Numbering-and-Sorting-Versus-Grouping-and-Sequencing-an03-07
5. https://www.xrite.com/learning-color-education/other-resources/what-is-a-spectrophotometer

INSTRUCTIONAL STRATEGY

This is hands on practice based subject for development of required skills in the students

5.5 TECHNOLOGY OF FINISHING-II

L	P
2	4

RATIONALE

Textile processing students are expected to have necessary knowledge and skills regarding various principles and procedures used in finishing applications. They should be acquainted with different types of machines used for finishing. In addition, relevant skills also need to be developed in them through lab practice.

COURSE OUTCOMES

After undergoing this subject, the students will be able to:
CO1: Learn the effects of different stabilization finishes
CO2: Explain the principle, process and chemicals used in various special finishes.
CO3: Interpret processing sequence for popular verities of fabrics.
CO4: Apply the knowledge of advanced finishing on various substrates.
CO5: Handle various treatments used on woolen material.

DETAILED CONTENTS

UNIT I

Special Finishes: Principle, Process, Chemicals and advantages
Waterproof & water repellent finishes: various temporary and permanent finishes, Flame retarding & flame proof finishes for cotton, wool and synthetic, concept of LOI and flammability testing.

UNIT II

Soil release finishes and soil repellent finish, Antibacterial& moth proof finishes, Delusturing of rayon & Weightening of silk & Trubenising.
Antistatic finishes: need of antistatic finishes, applications.

UNIT III

Stablization finishes: Purpose, agents and applications of the following.

Shrinking, Chemical treatments/chlorination, Resin treatments, Fulling, Crabbing, potting, Decatising. Finishing of woolen fabric- Acid& Alkaline milling of wool, Felting/ non felting of wool.

UNIT IV

Heat setting of synthetics:– Mechanism & Machines used.

Use of synthetic resins & rubber in finishing & their applications for coating application. Thermoplastic resins and thermo setting resins.

Finishing of special fabrics–sequence of operations for long cloth, poplins, voiles, drills, organdie finish, worsted woolens, woolen blankets, terrycot shirting/suiting, and terry wool.

UNIT V

Advancement in finishing such as Low wet pick up finishing.

- Foam finishing Technology.
- Kiss roll/luck roll Technology.
- Spraying techniques.
- Recent developments in finishing.

Sustainability issues in brief for finishing applications

PRACTICAL EXERCISES

1. To study the concept of flame retardency using vertical flame retardancy machine.
2. To study concept of water proofing using spray tester.
3. To study concept of water retardancy using spray tester.
4. To apply cellulose on cotton for bio polishing.
5. To analyze handle and drape of weighted silk.
6. To measure crease recovery angle of unfinished and finished fabric.
7. Toresinfinishcottonfabricsamplewithresinsindifferentconcentrations.
8. To apply various chemical finishes in different kind of fabrics.
9. To draw the line diagram of different finishing machines.
10. Industrial visit to study the working of various finishing machines.

RECOMMENDED BOOKS

1. Shenai, V.A. Textile Finishing Sewak Publications.
2. Marsh, J. T. Textile Finishing 2nd Edition. Chapman & Hall Publisher.
3. Shenai, V.A. Technology of Bleaching. Sewak Publications.
4. Hess, K. P. Textile Fibres & their use. J B Lippincott Company.

5. Corbman, B. P. (1985). Textile Fibre to Fabric McGraw Hill Education.
6. Murphy W.S. (2007).Textile Finishing Abhishek Publication, Chandigarh.
7. Edge. (2010). Practical Cotton Finishing. Abhishek Publication, Chandigarh.

RECOMMENDED WEBSITES

1. https://www.parisstextile.com/an-overview-of-water-repellent-waterproof/
2. https://drmsparmar.blogspot.com/2014/11/heat-setting-of-polyester-heat.html
3. https://www.intechopen.com/chapters/75103
4. https://www.cottonmonk.com/blog/different-fabric-finishing-processes/#:~:text=%E2%88%99%20Ammoniating,that%20cause%20swelling%20and%20shrinking.
5. https://textilevaluechain.in/news-insights/latest-trends-and-innovations-in-finishing/

INSTRUCTIONAL STRATEGY

This is a skill based subject and topics taught in the class should be practiced in the lab regularly for development of required skills in the students. This subject contains five units of equal weight age with hands on practice for skill development.

5.6 INTRODUCTION TO TECHNICAL TEXTILES

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RATIONALE

Textile field is having very wide range of products being offered. It includes areas related to sports, medical, defense, industrial etc. Textile processing students are expected to have good knowledge of these fields. This subject provides a basic outlook of this kind of textiles their properties and applications.

COURSE OUTCOMES

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

CO1: Learn the theory of technical textiles.

CO2: Study about application of technical textiles in different industrial areas.

CO3: Acquire the knowledge of different technical fields.

CO4: Identify various techniques / processes for making different types of technical textiles.

CO5: Describe general utility of different technical textiles.

DETAILED CONTENTS

UNIT I

Technical Textiles, Geo-Textiles

Introduction: Definition, classification of technical textiles.
Introduction, definition, fibers used for Geo-textiles and their properties.
Function & Application of Geo-Textiles/Geo-Synthetics.

UNIT II

Medical Textiles

Medical Textiles: Introduction, definition and fibres used.

Application of Medical Textiles: Based on their use to outside the body such as pressure garments, bandages, dressings, sutures, gowns, masks, caps, shoe covers etc. Inside the body such as bifurcated arterial prosthetic graft, artificial kidneys, joints, tendon, etc.)

UNIT III

Automotive Textiles

Introduction, Definition, Fibers used for automotive textiles.
Applications of Automotive Textiles: Upholstery, carpets, tyres, safety devices, filters and engine compartment items.
Protective Textiles: Introduction, Definition, Fibers used for protective textiles
Application of Protective Textiles: BulletProof fabric, fire proof fabric, high visibility fabric, protection from electromagnetic radiations, protection against micro-organisms, chemicals and pesticides.

UNIT IV

Industrial Textiles

Introduction, Definition, Fibers used for industrial textiles.
Application of Industrial Textiles: Cords and ropes, belts and filter fabrics.
Sports Textiles: Introduction, Definition, Fibers used for sports textiles
Application of Sports Textiles: Sports clothing, waterproof breathable materials, sports surfaces and equipments.
Textiles for Packaging: Introduction, Definition, Fibers used in packaging
Application of Packaging Textiles: Fabrics for bags and luggage, food packaging.
Coating and Laminating Textiles: applications of coating and laminating textiles.

UNIT V

Non-Woven Textiles

Introduction and Definition. Raw Material (fibers) used in manufacturing of non-woven textiles
Flow chart of production cycle of non- woven textiles.
Overview of Web formation methods: Brief on Purpose of web formation methods. Dry laid system, Wet laid system, Spun bond system and Melt blown system.
Web Bonding Methods: Purpose of bonding methods, Mechanical bonding, Thermal bonding and Chemical bonding.
Applications of non-woven textiles such as in filters.

PRACTICAL EXERCISES

1. Draw the chart of classification of technical textiles and its applications.
2. Collect and analyze sample of geo-textiles (anyone) w.r.t to its composition material, construction and any other relevant properties.
3. Collect and analyze samples of (anyone) medical textiles w.r.t to its composition material, construction and any other relevant properties.
4. Collect and analyze samples of (anyone) automotive textiles w.r.t to its composition material, construction and any other relevant properties.
5. Collect and analyze samples of (anyone) sports textiles w.r.t to its composition material, construction and any other relevant properties.
6. Collect and analyze samples of (anyone) industrial textiles w.r.t to its composition material, construction and any other relevant properties.
7. Collect and analyze a sample of non-woven carpet w.r.t material used, construction, extension, compactness, wettability and bonding property.
8. Draw flow chart of production cycle of non-woven process.
9. Draw line diagram and explain the dry-laid web formation method.
10. Draw line diagram and explain the wet-laid formation method.
11. Draw sketch and explain the spun bond system.
12. Draw sketch and explain the melt blown system.
13. Draw sketch and explain the needle punching bonding method.
14. Draw sketch and explain the thermo-bonding method.

RECOMMENDED BOOKS

1. Kothari, V. K. (2008).Technical Textiles, IAFL Publications, New Delhi.
2. A.R.Horrocks, A. R. Anand S. C. (2000) Handbook of Technical Textiles, Wood head Publishing Limited, Cambridge.
3. Khatwani, P.A.,Yardi, S.S.(2002)NCUTE-Programme on Technical textiles Nodal Centre for Upgradation of Textile Education-IIT Delhi.
4. Bajaj, P.and Sengupta, A.G. Industrial applications of Textiles: Textile for filtration and coated fabrics.
5. Moorthi, P.Madhava and Guru Prasad Sunder Shetty Non-Woven. Mahajan Publisher Pvt. Ltd., Ahmedabad.

RECOMMENDED WEBSITES

1. https://ittaindia.org/abouttechnicaltextile
2. https://ebooks.inflibnet.ac.in/hsp08/chapter/medical-textiles/
3. https://www.fibre2fashion.com/industry-article/1807/application-of-textiles-in-automobile
4. https://www.textilesphere.com/2019/12/coating-lamination-in-textiles.html
5. https://www.advancetextile.net/2020/09/what-is-nonwoven-fabric-describe-manufacturing-process.html

INSTRUCTIONAL STRATEGY

This is a skill based subject and topics taught in the class should be practiced in the lab regularly for development of required skills in the students. This subject contains five units of equal weight age with hands on practice for skill development.

5.7 OPEN ELECTIVE

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RATIONALE

Open electives are very important and play major role in implementation of National Education Policy. These subjects provide greater autonomy to the students in the curriculum, giving them the opportunity to customize it to reflect their passions and interests. The system of open electives also encourages cross learning, as students pick and choose subjects from the different streams.

COURSE OUTCOMES

At the end of the open elective, the students will be able to:

CO1: State the basic concepts and principles about the subject of interest.
CO2: Perform in a better way in the professional world.
CO3: Select and learn the subject related to own interest.
CO4: Explore latest developments in the field of interest.
CO5: Develop the habit of self-learning through online courses.

LIST OF OPEN ELECTIVES (The list is indicative and not exhaustive)

1. Computer Application in Business
2. Introduction to NGO Management
3. Basics of Event Management
4. Event Planning
5. Administrative Law
6. Introduction to Advertising
7. Moodle Learning Management System
8. Linux Operating System
9. E-Commerce Technologies
10. NCC
11. Marketing and Sales
12. Graphics and Animations

13. Digital Marketing
14. Human Resource Management
15. Supply Chain Management
16. TQM

GUIDELINES

Open Elective shall be offered preferably in online mode. Online mode open elective shall preferably be through Massive Open Online Courses (MOOCs) from Swayam, NPTEL, Upgrad, Udemy, Khan Academy or any other online portal to promote self-learning. A flexible basket of large number of open electives is suggested which can be modified depending upon the availability of courses at suggested portals and requirements. For online open electives, department coordinators shall be assigned to monitor and guide the group of students for selection of minimum 20 hours duration online course of their choice. For offline open electives, a suitable relevant subject shall be offered by the respective department to the students with minimum 40% of the total class strength as per present and future requirements.

Assessment of MOOCs open elective shall be based on continuous evaluation by the respective coordinator. The coordinator shall consider the submitted assignments by the students from time to time during the conduct of MOOCs. The MOOCs assessment shall be conducted by the coordinator along with one external expert by considering submitted assignments out of 100 marks.

In case, no suitable open elective is available online, only then the course may be conducted in offline mode. The assessment of offline open elective shall be internal and external. The offline open elective internal assessment of 40 marks shall be based on internal sessional tests; assignments etc. and external assessment of 60 marks shall be based on external examination at institute level.

NOTE

The students enrolled under NCC will compulsorily undertake NCC as an open elective subject.

SUGGESTED WEBSITES

1. https://swayam.gov.in/
2. https://www.udemy.com/
3. https://www.upgrad.com/
4. https://www.khanacademy.org/

SIXTH SEMESTER

6.1 PROCESS QUALITY CONTROL IN TEXTILE WET PROCESSING

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RATIONALE

Textile Processing students have to deal with chemical processes related to preparation, dyeing, printing & finishing of textiles. They must be fully aware of the various check points / control parameters, and standards and necessary actions to improve production & quality of the processed fabric.

COURSE OUTCOMES

After undergoing the course, the students will be able to:
CO1: Learn about necessary actions and precautions during the process to maintain quality.
CO2: Acquire knowledge of various textile processing techniques.
CO3: Understand the control parameters for different processes.
CO4: Explain the working of various machinery used for textile processing.
CO5: Study different quality standards for textile wet processes.

DETAILED CONTENTS

UNIT I

Introduction and Scope of process and quality control in Textile Wet Processing.
Processes & Quality Control measures- checkpoints/control parameters, quality standards and necessary actions and precautions required in the following processes
Grey Fabric Inspections, Stitching, Shearing & cropping and Singeing.

UNIT II

Processes & Quality Control measures- checkpoints/control parameters, quality standards and necessary actions. Precautions required in the following processes:
Desizing, Scouring and Bleaching (Hypochlorite Bleaching & Hydrogen Per oxide bleaching)

a) In kier (Batch operation)
b) In Pad-Roll system(Semi-continuous)

c) In J-Box machine(Continuous process)

Souring, Mercerization, Heat Setting and Washing

UNIT III

Study of various check points/control parameters (Process & machine parameters), quality standards, precautions and necessary action in the dyeing operation.

General considerations: Selection of dyes, chemicals &Auxiliaries.

Overview on Process & quality control measures in Batch, Continuous and Semi- Continuous Dyeing machines such as fiber/ yarn dyeing; Jigger dyeing: Steps to reduce shade variation in jigger dying.; High Temperature/High pressure Beam dyeing: Control parameters and precautions; Jet Dying; Padding Mangle and Drying and steaming machines, soaper.

UNIT IV

Process and quality control in Textile Printing.

Objectives of process control in Printing.

Process/quality control parameters/ check points & general precautions to be taken for the following for screen and roller printing.

Control parameters during drying, fixation and after-treatments.

UNIT V

Process and quality control in mechanical and chemical finishing operations

Study of process/ quality control parameters, precautions and necessary actions to be taken in the various finishing processes i.e. Stenter Finishing, Calendering, Sanforizing, Decatising, Carbonisation.

RECOMMENDED BOOKS

1. Vaidya A. A. Process and quality control in Textile Chemical Wet Processing. ATIRA.
2. Rastogi, Shah. Process control in Chemical Processing of Textiles, ATIRA.
3. Trotman, E. R. (1985) Dyeing & Chemical Technology of Textile Fibres. John Wiley & Sons Inc.
4. Satsangi, S. S. Stains & Stains Removal. U.B.Publisher, Delhi.
5. Satsangi, S. S.(1986) Fabric Defect. U.B. Publisher, Delhi.

RECOMMENDED WEBSITES

1. https://www.scribd.com/document/214649004/Process-Control-in-Wet-Processing
2. https://elearn.daffodilvarsity.edu.bd/pluginfile.php/2311000/mod_resource/content/2/7%29%20Quality%20control%20in%20wet%20processing.pdf
3. https://www.sulphurdyes.com/PROCESS%20CONTROL%20AND%20SAFETY%20IN%20CHEMICAL%20PROCESSING.pdf

INSTRUCTIONAL STRATEGY

This is a theoretical subject and for effective teaching audiovisual aids may be used. Industrial tours to be conducted to show specialized operations. This subject contains five units of equal weight age.

6.2 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

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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. This subject focuses on imparting the necessary competencies and skills of enterprise set up and its management.

COURSE OUTCOMES

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

CO1: Comprehend the importance of entrepreneurship and its role in nation's development.
CO2: Classify the various types of business and business organizations.
CO3: Identify the various resources / sources and / or schemes for starting a new venture.
CO4: Explain the principles of management including its functions in an organisation.
CO5: Conduct market survey and prepare project report.

DETAILED CONTENTS

UNIT I

Entrepreneurship: Concept and definitions, classification and types of entrepreneurs, entrepreneurial competencies, Traits / Qualities of entrepreneurs, manager v/s entrepreneur, role of Entrepreneur, barriers in entrepreneurship, Sole proprietorship and partnership forms of business organisations, small business vs startup, critical components for establishing a start-up, Leadership: Definition and Need, Manager Vs leader, Types of leadership

UNIT II

Definition of MSME (micro, small and medium enterprises), significant provisions of MSME Act, importance of feasibility studies, technical, marketing and finance related problems faced by new enterprises, major labor issues in MSMEs and its related laws, Obtaining financial assistance through various government schemes like Prime Minister Employment Generation Program (PMEGP) Pradhan Mantri Mudra Yogna (PMMY) , Make in India, Start up India,

Stand up India , National Urban Livelihood Mission (NULM); Schemes of assistance by entrepreneurial support agencies at National, State, District level: NSIC, NRDC, DC:MSME, SIDBI, NABARD, Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubator (TBI) and Science and Technology Entrepreneur Parks (STEP).

UNIT III

NATURE AND FUNCTIONS OF MANAGEMENT: Definition, Nature of Management, Management as a Process, Management as Science and Art, Management Functions, Management and Administration, Managerial Skills, Levels of Management; Leadership.

PLANNING AND DECISION MAKING: Planning and Forecasting - Meaning and definition, Features, Steps in Planning Process, Approaches, Principles, Importance, Advantages and Disadvantages of Planning, Types of Plans, Types of Planning, Management by Objective. Decision Making-Meaning, Characteristics.

UNIT IV

ORGANISING AND ORGANISATION STRUCTURE: Organising Process - Meaning and Definition, Characteristics Process, Need and Importance, Principles, Span of Management, Organisational Chart - Types, Contents, Uses, Limitations, Factors Affecting Organisational Chart.

STAFFING: Meaning, Nature, Importance, Staffing process. Manpower Planning, Recruitment, Selection, Orientation and Placement, Training, Remuneration.

CONTROLLING AND CO-ORDINATION Controlling - Meaning, Features, Importance, Control Process, Characteristics of an effective control system, Types of Control. Co-ordination - characteristics, essentials.

UNIT V

Market Survey and Opportunity Identification, Scanning of business environment, Assessment of demand and supply in potential areas of growth, Project report Preparation, Detailed project report including technical, economic and market feasibility, Common errors in project report preparations, Exercises on preparation of project report.

RECOMMENDED BOOKS

1. BS Rathore and Dr JS Saini, "A Handbook of Entrepreneurship", Aapga Publications, Panchkula (Haryana).

2. Entrepreneurship Development, Tata McGraw Hill Publishing Company Ltd., New Delhi.
3. CB Gupta and P Srinivasan, “Entrepreneurship Development in India”, Sultan Chand and Sons, New Delhi.
4. Poornima M Charantimath, “Entrepreneurship Development - Small Business Enterprises”, Pearson Education, New Delhi.
5. David H Holt, “Entrepreneurship: New Venture Creation”, Prentice Hall of India Pvt. Ltd., New Delhi.
6. PM Bhandari, “Handbook of Small Scale Industry”.
7. L M Prasad, “Principles and Practice of Management”, Sultan Chand & Sons, New Delhi.

SUGGESTED WEBSITES

1. https://ipindia.gov.in/

INSTRUCTIONAL STRATEGY

Some of the topics may be taught using question/answer, assignment or seminar 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 organizations on visit. Approach extracted reading and handouts may be provided. In addition, different activities like conduct of entrepreneurship awareness camp extension lecturers by outside experts, interactions sessions with entrepreneurs and industrial visits may also be organized. This subject contains five units of equal weightage.

6.3 PROGRAMME ELECTIVE – I
6.3.1 PROCESS HOUSE MANAGEMENT

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RATIONALE

Textile Processing students are responsible for production, planning and control. They are also required to ensure maintenance of equipment & machine, material handling, safety measures etc. for effective utilization of resources. Hence in this subject, emphasis is given on development of skills in management of process house.

COURSE OUTCOMES

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

CO1: Understand the concept of plant layout.

CO2: Acquire the knowledge of plant maintenance and material handling.

CO3: Study the role of safety in process house.

CO4: Explain role of pollution boards in controlling pollution

CO5: Learn about energy audit of process house.

DETAILED CONTENTS

UNIT I

Plant Layout & Production

- Concept of plant layout
- Types of layout (process, product and combination type)
- Factors affecting plant layout
- Types of production-mass production, job production and batch production
- Material planning and allocation
- Process planning and process sheet
- Record keeping regarding men, materials and machine
- Inventory control: need of inventory control, levels in inventory control.
- Duty& responsibility of shift in-charge

UNIT II

Maintenance& Material Handling

- Objective and importance of maintenance
- Types of maintenance-procedures and advantages
- Importance of material handling in a process house
- Handling of dyes& chemicals- methods & precautions
- Benefited systems of handling of processed goods.

UNIT III

Accidents and Safety Measures

- Types of accidents-fire, mechanical & chemical accidents.
- Common sources of different types of accidents and their prevention.
- Methods of minimising the accidents in a process house
- Introduction and function of cost estimation. Elements of cost and cost estimation procedure.

UNIT IV

Environment Protection

- Tolerance limit enforced by state Pollution Boards & its purpose.
- Characteristics of process waste streams-process, possible pollutants & nature of waste water.
- Design layout & functioning of an effluent treatment plant.

UNIT V

Water Energy (Steam) Source & its conservation

- Steam and water consumption
- Reutilization of water
- Recovery of chemicals from wastewater
- Methods of minimizing water & steam consumption
- Need &scope of suitable ventilation& lightening system in a process house.
-

RECOMMENDED BOOKS

1. Chauhan, B. S. (2012). Art of Dyeing, Cleaning, Scouring, and Finishing. Nabu Press.

2. Park, J. J. S. (2000). Dye House Management Manual. Multi-Tech Publishing Company.
3. Rattan, J. B. (2017). Modern Textile Management. Abhishek Publication, Chandigarh.
4. Trivedi, S. S. Economy, Energy and Environment in Textile Wet Processing.
5. Shenai, V. A. Occupational Health and Safety in Textile Mills. Sevak Publications, Mumbai.
6. Gulrajni, M. L. Energy Conservation in Textile Wet Processing. Mahajan Publications Pvt. Ltd.

RECOMMENDED WEBSITES

1. https://textilechemrose.blogspot.com/2018/09/plant-layout.html
2. https://www.textilesphere.com/2022/08/material-handling-in-textile-industry.html
3. https://textilefocus.com/safety-and-health-problems-in-textile-industry/
4. https://iwaponline.com/wst/article/85/7/2076/87619/Reviewing-textile-wastewater-produced-by
5. https://textilesschool.com/ventilation-in-textile-industries/

INSTRUCTION STRATEGY

This is a theoretical subject for developing fundamental concepts of process house management and it contains five units of equal weight age.

6.3.2 SCIENCE OF CLOTHING COMFORT

L	P
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RATIONALE

Comfort is inseparable requirement of clothing for end users. Textile processing students at this level are expected to have good concept of science related to comfort clothing. This subject will help the textile processing students to acquire knowledge about the concept, need, characteristic, perception and evaluation of comfort for various type of cloths.

COURSE OUTCOMES

After undergoing this subject, the students will be able to:
CO1. Learn various elements and factors of comfort in clothing.
CO2. Acquire knowledge about the right clothing for a particular end use.
CO3. Understand the cooling science of human body.
CO4. Study the comfort in different scales.
CO5. Explore factors expressing human comfort.

DETAILED CONTENTS

UNIT I

Concept of clothing comfort. Elements of comfort like thermo physiological, sensorial, psychological and fitting. Primary factors in clothing comfort: function, feel, fit and fashion, human clothing interactions.

UNIT II

Need and selection of clothing, function of clothing, Characteristic of clothing: material, tactile and thermo psychological. Factors affecting selection of clothing.

UNIT III

Science behind cooling of human body: perspiration, ventilation, conduction of heat etc. Retention of body heat and comfort, effect of relative humidity and temperature on comfort. Concept of multilayer clothing systems and its application.

UNIT IV

Factors expressing human comfort: Average skin temperature, degree of skin wetness, rare of sweating, amount of sweat, amount absorbed by clothing and rate of heart beat.

UNIT V

Importance of psychological scaling, types of scale, category scale (numbered and descriptive), limitation of category scale. Necessity and steps of Wear trial technique. Sensory system of human skin, function of human skin w.r.t comfort.

RECOMMENDED BOOKS

1. Spelic, I. (2019) Standard method for thermal comfort assessment of clothing. CRC Press.
2. Song, G. Improving comfort in clothing. Woodhead Publications pvt. Ltd.
3. Das, A. (2010) Science in clothing comfort. The Textile Institute.
4. Peter's, R. H. (1960). Moisture in Textiles. The Textile Institute.

RECOMMENDED WEBSITES

1. https://www.fibre2fashion.com/industry-article/6946/the-science-behind-clothing-comfort?amp=true
2. https://www.mdpi.com/2673-7248/3/4/24
3. https://textiles.ncsu.edu/tpacc/comfort-performance/
4. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8585350/

INSTRUCTIONAL STRATEGY

This subject includes five units of equal weightage. Teacher is required to explain the concept and its application keeping in view the practical / Industrial approach.

6.4. PROGRAMME ELECTIVE II
6.4.1 KNIT & OTHER FABRIC PROCESSING

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RATIONALE

Dyeing is an important process in textile processing industries. Textile processing students must have through knowledge and skills of dyeing materials and processes related to denim, knits, towels, carpets etc. This subject will help the students in development of skills required in denim and other fabric processing

COURSE OUTCOMES:

At the end of the course students will be able to:

CO1: Learn the concept of carpet processing.

CO2: Study the processing of jute, linen and spandex containing material.

CO3: Understand the processing sequence, methods, finishing of Denim fabric and.

CO4: Acquire knowledge about the processing sequence, method and precautions.

CO5: Explain the processing of terry towel products.

DETAILED CONTENTS

UNIT-I

Knit goods and brief concepts of warp knits, weft knits, courses, wales, stitch and loop density. Vocabulary related to knits:- Knit tuck and miss stitch, single jersey and rib fabrics, purl and interlock fabric, Types of knitting machines. Property of yarn used in knitted fabrics. Factors to be considered in knit processing, process sequences in tubular and open width form.

UNIT-II

Pretreatment of knitted textile materials and precautionary measures.

Application areas of knit goods. Dyeing of knit goods with direct, reactive, vat and sulphur. Principle, construction and working of machines used in knit processing (winch and soft flow dyeing machines). Various Chemical and auxiliaries used in processing. Mechanical finishing:- Shearing, raising, drying and compacting. Problems in knit processing and their remedies.

Precautions to be taken while knit processing.

UNIT-III

Terry towel: Process sequence and machines used for terry towel manufacturing, essential properties of terry towel fabrics like pile properties, water absorbency. Type and application of terry fabrics. Different stages of towel processing and finishing. Defects in terry fabrics

UNIT-IV

Carpet Processing. Different fibres suitable for carpets, types of carpets, essential properties of carpet fabric. Dyeing and printing of carpets. Mechanical and chemical finishing of carpets

UNIT-V

Jute, linen and spandex General properties and uses of jute, linen and spandex fibres. Their pretreatment and dyeing processes. Woollenisaion of jute. Wet processing of Cotton / Spandex.

PRACTICAL EXERCISES

1. To desize a sample knitted fabric.
2. To scour a sample of knitted fabric.
3. To bleach a sample of knitted fabric.
4. To dye knitted fabric sample by various dyes.
5. To dye jute yarn by various dyes.
6. To dye linen yarn by various dyes.
7. To dye spandex blends by various dyes.
8. To analyse a carpet sample.
9. To dye a sample of carpet with suitable dyes.
10. To demonstrate carpet processing by industrial visits.
11. To demonstrate terry towel processing by industrial visits.

RECOMMENDED BOOKS

1. Chakraborty, J. N. (2009). Fundamentals and Practices in Colouration of Textiles. Woodhead Publications Ltd.
2. Kumar, P. S. (2014). Processing of knitted fabrics. Woodhead Publications Ltd.
3. Patil, S. J. (2006). Manufacturing of Terry Towel. Universal Book Corporation, Mumbai.

4. Crowshaw, G. H.Textile Floor covering. Textile Progress, Vol. 9, No. 2 Textile Institute.
5. O'shea, M.Interior Furnishing. Textile Progress, Vol. 11, No. 1, Textile Institute.
6. Pointon, H. (1975) Carpet Surface. Textile Trade Press, UK.

RECOMMENDED WEBSITES

1. https://www.textileflowchart.com/2015/06/flow-chart-of-textile-wet-processing-for-knit-fabric.html
2. https://ordnur.com/jeans/what-is-denim/
3. https://textile-craft.blogspot.com/2013/12/terry-towel-manufacturing-process.html
4. http://cepc.co.in/carpet-production-process
5. https://www.cottoninc.com/wp-content/uploads/2017/12/TRI-3012-Wet-Processing-of-Cotton-Spandex-Fabric.pdf
6. https://vasantkothari.com/content/view_presentation/450/09-Denim-Washing

INSTRUCTIONAL STRATEGY

This is a skill based subject and topics taught in the class should be practiced in the lab regularly for development of required skills in the students. This subject contains five units of equal weight age with hands on practice for skill development.

6.4.2 SUSTAINABLE TEXTILE WET PROCESSING

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RATIONALE

Textile wet Processing sector utilizes high quantities of water, energy and chemicals. Some chemicals are also harmful for environment. Students at this level are expected to have good knowledge of sustainable textile wet processing. This subject will focus on eco-friendly chemicals, processes and machinery used in textile wet processing.

COURSE OUTCOMES

At the end of the course students will be able to:
CO1. Learn the existing chemical processes and new techniques for sustainability.
CO2. Study green chemistry for textile chemical Processing.
CO3. Acquire knowledge about the sustainable approaches in Textile dyeing and printing.
CO4. Explore the alternative application techniques to reduce water pollution load.
CO5. Explain the role of enzymes in textile wet processing.

DETAILED CONTENTS

UNIT I

Sustainability, Principles of sustainability, Triple bottom line, Sustainability issues in current textile production. Various toxic/ harmful substances used in Textile industry.

UNIT II

Introduction to sustainable fibre production, Greener textile materials, Greener preparatory processes like ozone assisted pretreatments. Use of recycleing techniques in wet Processing.

UNIT III

Eco-friendly Processing: Enzyme with their definition, sources, types, mechanism of application. Various types of enzyme used in textile processing, advantage and disadvantage of enzymes, different process of textile processing with enzyme application.

UNIT IV

Sustainable approaches in textile coloration: Water-less dyeing (supercritical CO2 dyeing). Digital Printing technique. Greener dyeing processes, Salt free reactive dyeing concept. Plasma technology in textile processing.

UNIT V

Sustainable Waste water treatment: Effluent load and effluent treatment plant. Alternative ways of reduction waste water load in processing. Sustainable chemical management and zero discharges. E-control in textile chemical processing.

RECOMMENDED BOOKS

1. Muthu, S. S. (2018) Sustainable innovations in Textile chemical processes. Springer, Textile science and clothing technology.
2. Guebitz, G. M.(2006). Biotechnology in Textile Processing. CRC Press.
3. Schindler, W. D. (2004). Chemical finishing of textiles. Woodhead Publications Pvt. Ltd.
4. Muthu, S. S.(2017). Sustainable fibres and textiles. The Textile institute.

RECOMMENDED WEBSITES

1. https://www.fibre2fashion.com/industry-article/9636/sustainable-fibres-for-a-greener-fashion-industry?amp=true
2. http://eco2dye.com/phone/textile-dyeing.html
3. https://www.creative-enzymes.com/resource/application-of-enzymes-in-textile-industry_62.html
4. https://www.thierry-corp.com/plasma-knowledgebase/plasma-treatment-of-textiles
5. https://www.textileworld.com/textile-world/features/2022/02/significance-of-sustainability-in-textiles/

INSTRUCTIONAL STRATEGY

This is a theoretical subject and for effective teaching audiovisual aids may be used and industrial tours to be conducted to show latest machines and processes. This subject contains five units of equal weight age.

6.5 FIBER TO FINISHED FABRIC PRACTICES

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RATIONALE

Textile processing students are expected to have good practical knowledge of fibers to finished fabrics. This subject will help the students to get familiar with the various practices that are used in Textile Processing house from fiber to finished fabric. It will further the students for mass production of goods from raw material to finished material till it enters market.

COURSE OUTCOMES

At the end of the course students will be able to:
CO1: Identify the constituent fibers present in various types of textiles.
CO 2: Apply different techniques of preparation and dyeing of different textile material.
CO 3: Perform finish effects on textile material.
CO 4: Evaluate the different fastness properties of different dyed materials.
CO 5: Analyze effect of different chemicals on different fibers.

PRACTICAL EXERCISES

1. To prepare sample book for different variety of cotton fabrics like Voile, Dhoti, Rubia, Casement, Terry Rubia, Tarpaulin cloth w.r.t EPI, PPI, Count, absorbency etc.
2. To prepare profile book for different variety of medical fabrics PPE kit, mask cloth, aprons and gloves w.r.t material used, density, EPI, PPI, GSM, water & air permeability, absorbency.
3. To prepare profile book for different variety of printed fabrics used in various fields like furnishing, apparels, tent cloth etc. w.r.t type of dyes used w.r.t fading, weave, yarn counts used.
4. To make a project file displaying raw material and end product of various processes/ machines for conversion of fibers to yarn.
5. To make a project file displaying raw material and end product of various processes/ machines for conversion of yarn to woven fabric.
6. To make a project file displaying raw material and end product of various processes/ machines for conversion of yarn to knitted fabric.

7. To make a project file displaying raw material and end product of various processes/ machines for conversion of fibers to nonwovens .
8. To analyze effect of acids/alkalis on different fibers.
9. To study and determine wet ability/absorbency properties of different fibers.
10. Quantitative identification of different fibers in different blends of materials.
11. To prepare a sample book depicting conversion of grey fabric to full bleached fabric (100% Cotton) as per process sequence.
12. To prepare a sample book depicting conversion of grey fabric to full bleached fabric (P/C Blends) as per process sequence.
13. To prepare a sample book depicting conversion of grey fabric to pastel shades. (Pink, Cream, Sky blue etc. on 100% Cotton with reactive dyes as per process sequence.
14. To prepare a sample book depicting conversion of grey fabric to medium shades. (Grey, Silver Grey etc.) on 100% Cotton with reactive dyes as per process sequence.
15. To prepare a sample book depicting conversion of grey fabric to dark and extra dark shades. (coffee, navy, black etc.) on 100% Cotton with Sulphur/Aniline dyes as per process sequence.
16. To prepare samples for washing fastness, as per ISO test methods for dyed cotton fabrics, do testing and grading with grey scales.
17. To prepare samples for crocking as per ISO test methods for dyed cotton fabrics, do testing and grading with grey scales.
18. To prepare samples as per standard test method for checking light fastness under day light for dyed tent cloth fabric, do testing and grading.
19. To enlist various companies, their dyes and chemical with trade names.
20. To assess the purity of hydrogen per oxide.
21. To assess different soft finishes according to material and their add on %.
22. To study effect of softener finishes on shades of dyed and printed fabrics.
23. To study effect of starching finishes on shades of dyed and printed fabrics.
24. To study effect of starching on weight addition and handle.

RECOMMENDED BOOKS

1. Shenai, V.A. Technology of Bleaching 3rd Edition. Sevak Publication, Mumbai.
2. Trotman, E.R. (1985) Dyeing and Chemical Technology of Textile Fibres. John Wiley & Sons.
3. Shenai, V.A. Introduction to Textile Fibers. Sevak Publications Mumbai.

4. Marssh, J.T (1948). Textile finishing. Chapman & Hall, United Kingdom.
5. Hall. Chemical Testing of Textile. Mahajan Publication, Ahemdabad.

RECOMMENDED WEBSITES

1. https://www.textilecoach.net/post/fiber-blend-composition-analysis-in-textiles
2. https://www.textilesphere.com/2020/04/colour-fastness-in-textile-testing.html
3. https://www.cottonworks.com/wp-content/uploads/2018/01/Dyeing_Booklet
4. https://www.textileproperty.com/trade-names-of-reactive-dyes/

INSTRUCTIONAL STRATEGY

This is hands on practice based subject for development of required skills in the students. Recipes and standard procedures shall also be provided to students for successful completion of syllabus.

6.6 MAJOR PROJECT / INDUSTRIAL TRAINING

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RATIONALE

Major project/Industrial training work will help in developing the relevant skills among the students as per National Skill Qualification Framework. It aims at exposing the students to the present and future needs of various relevant industries. It is expected from the students to get acquainted with desired attributes for industrial environment. For this purpose, students are required to be involved in industrial training / Major Project Work in different establishments.

COURSE OUTCOMES

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

CO1: Define the problem statement of the Industrial training / Major project according to the need of industry.

CO2: Work as a team member for successful completion of Industrial training / Major project.

CO3: Write the Internship / Major project report effectively.

CO4: Present the Internship / Major project report using PPT.

GUIDELINES

Depending upon the interest of the students, they can go for Industrial training / Major project as per present and future demand of the industry. The supervisors may guide the students to identify their project work and chalk out their plan of action well in advance. As an Industrial training / Major project activity each student is supposed to study the operations at site and prepare a detailed project report of the observations/processes/activities. The supervisor may create a group of 4-5 students as per their interest to work as a team for successful completion of the Industrial training / Major Project.

The supervisor shall evaluate the students along with one external industry / academic expert by considering the following parameters:

	Parameter	**Weightage**
I	Defining problem statement, focus and approach	20%
ii	Innovation / creativity	20%
iii	Report Writing	20%
iv	Power Point Presentation	20%
v	Viva - voce	20%

24. ASSESMENT TOOLS AND CRITERION

The assessment is carried out by conducting:

1. Formative assessments
2. Summative assessments

1. FORMATIVE ASSESSEMENT

The formative assessment will be evaluated on the basis of the internal assessments for theory subjects and practical by the concerned teachers for evaluating the knowledge and skill acquired by students and the behavioral transformation of the students. This internal assessment is primarily carried out by collecting evidence of competence gained by the students by evaluating them at work based on assessment criteria, asking questions and initiating formative discussions to assess understanding and by evaluating records and reports, and sessional marks are awarded to them.

2. SUMMATIVE ASSESSMENT

The summative assessment will include end semester examination for theory part for each candidate and practical examination with viva voice. Each Performance Criteria will be assigned marks proportional to its importance and proportion of marks for Theory and Skills Practical for each subject should be laid down. The following assessment tools are used for effective student evaluation:

1. Theory
2. Practical
3. Minor & Major Project
4. Massive Open Online Courses (MOOCs)
5. Viva Voce
6. Industrial / In House Training
7. Professional Industrial Training

1. Theory Assessment

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

i. Sessional /class-tests,
ii. Quizzes,
iii. Assignments,
iv. Seminars / Presentations
v. Attendance
vi. Case Studies

For Summative evaluation of theory, the question paper may comprise of three sections.

i. It should contain objective type question and multiple choice questions. The objective type items should be used to evaluate students' performance in knowledge, comprehension and at the most application domains only.

ii. It should contain short answer questions.

iii. Descriptive type questions, with some internal choice of the questions set may be given in this section

2. Practical Assessment

Evaluation of students performance in practical work (Laboratory experiments, Workshop practical /field exercises) aims at assessing students ability to apply or practice the concepts, principles and procedures, manipulative skills, ability to observe and record, ability to interpret and draw conclusions and work related attitudes. This will comprise of a creation of mock environment, wherever applicable in the skill lab which is equipped with all required equipment for development of desired skills. Candidate's soft skills, communication, aptitude, safety consciousness, quality consciousness etc. will be ascertained by observation and will be marked in observation checklist along with the assessment of Job carried out in labs and maintenance of Lab Record Files.

Formative and summative evaluation may comprise of weight ages to performance on task, quality of product, general behavior and it should be followed by viva-voce of the

relevant subject. The end product will be measured against the specified dimensions and standards to gauge the level of skill achievements

3. Minor and Major Project Assessment

The purpose of evaluation of project work is to assess student's ability to apply, in an integrated manner, knowledge and skills in solving real life problems, manipulative skills, ability to observe, record, creativity and communication skills. The project work assigned should be of relevance to the core skill, state of the art topics and the project areas that are pertaining to enhance job skill and enhance occupational opportunities. For both, minor and major project, Formative and summative evaluation may comprise of weight ages to performance on task, quality of product, nature and relevance of project and general behavior.

The formative assessment should include the continuous assessment based on the work allocated and mid semester viva voice or presentation. The final assessment will be the combination of the project undertaken, report submission and should be followed by viva-voce of the relevant subject.

In case of the assessment of this component, the team of examiners should be constituted and half of the examiners in the team should be invited from outside of the institute as expert for conducting the examination.

4. Massive Open Online Courses (MOOCs) Assessment

Open Elective and Multi-Disciplinary Elective may be covered through Massive Open Online Courses (MOOCs) to promote self learning. These platforms promise open, online courses to massive numbers of students as they are free to join; they provide a wide range of courses. They allow for space and time flexibility and their participants can benefit from various online communication tools and access to quality content.

The coordinating Department/Centre/Office shall monitor every student to adopt the courses online of their choice and preference on Swayam portal. The duration of courses will vary depending on the level and credit points. Courses offered in the duration of 4-10 weeks for 2 to 3 credits at diploma level are to be opted. Students can get a certificate after registering and attending the classes and submitting the assignments/quizzes and qualifying nationwide conducted written exam.

On successful completion of each course, the institution offering the MOOCs course would issue the certificate, along with the number of credits and grades, through which the student can get credits transferred into his marks certificate issued by the parent institution. There may be standard norms for the host Institution to conduct the course that may include continuous evaluation through assignments, online quizzes, case studies, online writing exercises, term examinations, student feedback, online forum management, etc. The coordinating Department/Centre/Office of the respective department shall monitor every student and submit to the Office of Examinations, a score sheet before the close of the even semester.

5. Viva Voce Assessment

This tool will be used to assess the conceptual understanding and the behavioral aspects as regards the job role and the specific task at hand. It will also include questions on safety, quality, environment and equipment's etc. Ask questions on non-prescribed tasks to ensure that the learners have complete knowledge on the assessment

6. Industrial / In-house Training Assessment

The two mandatory internships after First and Second Year of are to be assessed in 3rd and 5th semester subsequently. The training should be preferably done in the industry but can also be in house depending upon the stream and availability of resources in and around the institute. Faculty should be assigned each student and made responsible for the evaluation and assessment of the training. Formative assessment should be taken from the industry/institute/ department on the basis of performance, behavior and learning capabilities. Summative evaluation may comprise of weight ages on the basis of report submission / presentation followed by viva-voce of the relevant subject.

7. Professional Industrial Training Assessment

Evaluation of professional industrial training report and viva-voce/ presentation aims at assessing students' understanding of 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. Formative and summative evaluation may comprise of weight ages to performance on task, quality of product, general behavior and it should be followed by viva-voce of the relevant subject.

The formative assessment should include the evaluation from the employer where the student is doing his training in the ratio of 40:60. The final assessment will be the combination of the

employer assessment and evaluation by the faculty of the institute which shall include report submission/ presentation/ seminar followed by viva-voce of the relevant subject.

SGPA AND CGPA ASSESSMENT

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

i. The SGPA is the ratio of sum of the product of the number of credits with the marks scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e

$$SGPA\ (Si) = \sum(Ci \times Gi) / \sum Ci$$

where Ci is the number of credits of the ith course and Gi is the marks scored by the student in the ith course.

ii. The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

$$CGPA = \sum(Ci \times Si) / \sum Ci$$

where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

iii. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

25. TEACHING LEARNING TOOLS FOR EFFECTIVE IMPLEMENTATION

For effective implementation of curriculum, the faculty and staff of institutions 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 only a proper mix of different teaching methods in all these places of instruction can bring the changes in students behaviour as stipulated in the curriculum document. It is important to understand curriculum document holistically and further be aware of intricacies of Teaching-Learning Tools for achieving curriculum objectives. Given below are certain recommendations which may help in carrying out teaching-learning effectively:

PROGRAMME LEVEL RECOMMENDATIONS

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 at institute level. The Head of the institute has a great role to play in its dissemination and percolation up to grass-root level.

3. Heads of Department are required to prepare academic plan at department level referring to institutional academic plan.

COURSE LEVEL RECOMMENDATIONS

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. Teachers are required to plan various instructional experiences viz. theory lecture, expert lectures, lab/workshop practical's, guided library exercises, field visits, study tours, camps etc. In addition, they have to carry out progressive assessment of theory, assignments, library, practical's and field experiences. Teachers are also required to do all these activities within a stipulated period which is made available to them in the academic plan at Board level. With the amount of time to their credit, it is essential for them to use it judiciously by planning all above activities properly and ensure

execution of the plan effectively. Following is the gist of suggestions for subject teachers for effective utilization of Teaching Learning Tools to achieve the course objectives:

1. Teachers need to ensure attainment of course outcomes so as to help the students achieve program outcomes and also meet the desired learning outcomes in five domains of NSQF i.e. Process, Professional knowledge, Professional skills, Core skills and Responsibility.

2. Teachers are required to prepare a course plan, taking into account number of weeks available and courses to be taught.

3. 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.

4. Teachers are required to plan for expert lectures from field/industry. For this, necessary steps need to be taken such as planning in advance, identifying field experts, making correspondence to invite them, taking necessary budgetary approval etc.

5. 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.

6. Concept based industrial/field visits may be planned and executed for such contents of course which are abstract in nature and no other requisite resources are readily available in institute to impart them effectively.

7. Lot of focus needs to be laid on skill development. There is need for planning practical experiences in right perspective. These slots in a course are the avenues to use problem based learning and experiential learning effectively. The development and use of lab manuals will enable the institutes to provide lab experiences effectively.

8. Emphasis should to laid on developing soft skills like communication skills, personality Development, self-learning, inter personal skills, problem solving, and creativity etc.

9. Where ever possible, it is essential to use activity based learning rather than relying on delivery based conventional teaching all the time. While teaching, the teacher should make extensive use of audio visual aids such as video films, power point presentations and IT tools.

10. Teachers may take an initiative in establishing liaison with industries and field organizations for imparting field experiences to the students.

11. To enhance digital learning, open electives and multi-disciplinary electives have been provided in the curriculum to be taken up in the form of MOOCs. For Open electives, some courses may be identified out of the prescribed list given in the curriculum keeping in mind the interest of students. Similarly, for multi-disciplinary electives, courses to be offered may be identified by considering their relevance and utility. Every year SWAYAM is notifying the list of courses which are going to be offered in forthcoming even and odd semester. The institute needs to select the courses that are offered on SWAYAM platform or any other online platform.

12. For effective implementation of Massive Open Online Courses (MOOCs), a faculty member in the department may be identified and given the responsibility to coordinate various activities related to MOOCs. The concerned faculty member will facilitate in registration of students for MOOCs. The faculty member will also be responsible for compiling the result of students on the completion of MOOCs and pass on the information to the concerned authority.

13. Flexibility has been provided in the curriculum for the students to choose a course related to the discipline as per their interest. For effective implementation of discipline-specific electives, the institute should identify some courses from the list of courses prescribed in the curriculum. The courses should be selected and offered keeping in mind the interest of students, infrastructure and expertise available in and around the institute related to the courses. Option for discipline-specific elective may be taken from students through a form and a course, with more than 10 students opting for it, may be run.

14. Students should be made aware about issues related to ecology and environment, safety, concern for wastage of energy and other resources etc.

15. Any relevant contents beyond the syllabus may be covered by the teacher or experts in extra time.

16. Minor project should be identified and allocated taking into consideration the inputs from industry stake-holders, and departmental faculty. The minor project work should be such

that it enhances the fundamental skill-sets of the students from industry perspective and subsequently helps them to handle major project.

17. For major project work, students may be given relevant and well thought out problems, which are purposeful and develop practical skills. This will help the students in developing creativity and confidence for their gainful employment.

18. A Project bank may be developed in consultation with related industry, research institutes and other relevant field organizations. It may be ensured that that the students take up some live problems being faced by industry as part of project work.

26. LIST OF EXPERTS

1. Controller of Examination, Haryana State Board of Technical Education, Panchkula.
2. Controller of Administration & Finance, Haryana State Board of Technical Education, Panchkula.
3. Joint Secretary, Haryana State Board of Technical Education, Panchkula.
4. Deputy Secretary, Training & Placement, Haryana State Board of Technical Education, Panchkula.
5. Deputy Secretary, Examination, Haryana State Board of Technical Education, Panchkula.
6. Deputy Secretary, Academic, Haryana State Board of Technical Education, Panchkula.
7. Assistant Secretary, Academic, Haryana State Board of Technical Education, Panchkula.
8. Dr. Puneet Sood, Director, National Institute of Fashion Technology, Kannur.
9. Dr. Vishu Arora, Associate Professor, Department of Textile Design, National Institute of Fashion Technology, Panchkula.
10. Dr. Lalit Jaipura, Associate Professor, Department of Textile Technology, National Institute of Technology, Jalandhar.
11. Mr. Mandeep Nagpal, Head of Department, Department of Textile Processing, Government Polytechnic, Hisar.
12. Mr. Rajesh Kalra, Senior Lecturer, Department of Textile Processing, Government Polytechnic, Hisar.
13. Mrs. Kanak Prabha, Lecturer, Department of Textile Processing, Govt. Polytechnic, HIsar
14. Mr. Sanjay Sigger, Lecturer, Department of Textile Processing, Govt. Polytechnic, HIsar

15. Mr. Ajay Jindal, Lecturer, Department of Textile Processing, Government Polytechnic, Hisar.
16. Ms. Shruti Nigam, Founder, Department of Textile Design, Yellow Stitch, Mohali.
17. Ms. Radhika Sen, Creative Associate, Department of Fashion Design, Byju & Whitehatjr, Banglore.
18. Mr. Dharmender Sharma, Manager, Department of Production, DCM, Hisar.
19. Mr. Naveen Bhutani, General Manager, Quality Department, Richa Global Exports Pvt. Ltd., Mansesar, Gurgaon
20. Mr. Balram Maurya, Manager, Marketing and Merchandising, Faridabad, Haryana
21. Sh. Rohit Khanna, Managing Director, KISCO India Private Ltd., Chandigarh.
22. Ms. Vijay Lakshami, Assistant Professor, NIFT Kannur, Kerela
23. Ms. Pallabi Das, Assistant Professor, NIFT Daman Deu
24. Dr. Sangeeta, Ex. Associate Professor, Home Science College, Chandigarh.
25. Ms. Anila, Assistant Professor, Home Science College, Chandigarh.
26. Dr. Amit Madhu, Assistant Professor, TIET, Bhiwani, Haryana.
27. Dr. Sandeep Sachan, Director, NIFT, Daman Deu
28. Mr. Rajinder, Executive, Department of Purchase, Vardhman Textiles Limited, Ludhiana
29. Smt. Pushpa Rani, Senior Lecturer, Applied Science Department, Government Polytechnic, Sonipat, Haryana.
30. Smt. Krishna Bhoria, Lecturer, Applied Science Department, Government Polytechnic, Ambala, Haryana.
31. Smt. Preetpal Kaur, Guest Faculty, Applied Science Department, Government Polytechnic, Ambala, Haryana.

32. Ms. Monika, Lecturer, Applied Science Department, Seth Jai Parkash Polytechnic, Damla, Haryana.
33. Dr. Neena Sharma, English Department, MCM College, Chandigarh.
34. Mr. Satyawan Dhaka, Senior Lecturer, Applied Science Department, Government Polytechnic, Nilokheri.
35. Mrs. Sapna Sang, Lecturer, Applied Science Department, Seth Jai Parkash Polytechnic, Damla.
36. Mr. Ravi Bansal, Lecturer, Applied Science Department, Government Polytechnic, Manesar.
37. Mrs. Kiran, Lecturer, Applied Science Department, Government Polytechnic, Sonepat.
38. Dr. Naveen Jha, Assistant Professor, Department of Mathematics, Government Engineering College, Bharatpur.
39. Dr. Bhajan Lal, Lecturer, Applied Science Department, Government Polytechnic for Women, Sirsa, Haryana.
40. Sh. Anil Nain, Lecturer, Applied Science Department, Government Polytechnic, Hisar, Haryana.
41. Dr. Sarita Mann, Lecturer, Applied Science Department, Government Polytechnic, Ambala, Haryana.
42. Smt. Bindu Verma, Lecturer, Applied Science Department, Seth Jai Parkash Polytechnic, Damla, Haryana.
43. Dr. Vidhi Grover, Lecturer, Applied Science Department, Seth Jai Parkash Polytechnic, Damla.

44. Mr. Tavinder Singh, Lecturer, Applied Science Department, Government Polytechnic, Sirsa.
45. Ms. Sunita Rani, Lecturer, Applied Science Department, Government Polytechnic, Ambala.
46. Dr. KG Srinivasa, Professor CSE, IIIT-Naya Raipur.
47. Dr. Pankaj Sharma, Professor, Applied Science Department, NITTTR, Chandigarh.
48. Dr. Ashok Kumar, Associate Professor, Applied Science Department, NITTTR, Chandigarh.
49. Dr. KC Lachhwani, Assistant Professor, Applied Science, NITTTR, Chandigarh.
50. Dr. Rajesh Mehra, Professor and Head, Curriculum Development Centre, NITTTR, Chandigarh.
51. Dr. AB Gupta, Professor & Head, Education & Educational Management Department, NITTTR, Chandigarh.
52. Er. PK Singla, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh.
53. Dr. SK Gupta, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh.
54. Dr. Meenakshi Sood, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh.

27. APPENDIX

Sr. No.	LIST OF EQUIPMENT
1.	Mechanical stirrers
2.	Laboratory padding mangle
3.	Laboratory curing chamber
4.	Mini steamer loop ager
5.	Block printing table (wooden/steel)
6.	Screen printing table (Industrial) for hand screen printing
7.	Colour mixing plastic containers
8.	Paste preparation steel mugs of different capacity
9.	Measuring cylinders of different capacity
10.	Baby screens
11.	Industrial screen
12.	Flammability tester
13.	Hot plate
14.	Exposure table for making screen with glass top
15.	Computer systems (with standard accessories) and software for printing designs for making screens
16.	Stainless steel dye baths (double walled) for dyeing of bigger samples
17.	Steam iron
18.	Simple iron
19.	Electric oven
20.	Dye baths for smaller samples
21.	Rota dyer
22.	Spray guns
23.	Transfer printing machine
24.	Blocks of different types (single colours) (Wooden, metal, casting, pin)
25.	Colour matching cabinet
26.	C.R.A tester
27.	Grey scales

28.	Crock meter
29.	Perspiro meter
30.	Electric dryer
31.	Basket centrifuge
32.	Semi automatic washing machine
33.	Squeezes for screen printing (of different sizes)
34.	Electronic balance
35.	High Temperature high pressure water bath beaker dyeing machine
36.	Glycerin bath beaker dyeing machine
37.	Laboratory jigger
38.	Laboratory winch
39.	Laundrometer
40.	Hank dyeing machine
41.	Wrap reel
42.	Hot plates
43.	Automatic washing machine
44.	Refrigerator
45.	Analytical balance
46.	pH meter (electronic)
47.	Blue Wool Standards
48.	Spectrophoto meter compatible with the computer for e.g. colour scan
49.	Lea strength tester
50.	Cloth strength tester
51.	Quadrant balance
52.	Beesley balance
53.	Pilling tester
54.	Twist – De-twist tester
55.	Bursting strength tester
56.	Tearing strength tester
57.	Tensile strength tester

58.	GSM cutter
59.	Muffle furnace
60.	Projection Microscope
61.	Steamer
62.	Drying and curing chamber
63.	HTHP Yarn Dyeing Lab Model


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